USDA Natural Resources
Conservation Service

Ecological site R035XY328UT
Upland Very Steep Stony Loam (Pinyon-Utah Juniper)

Accessed: 05/11/2025

General information

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

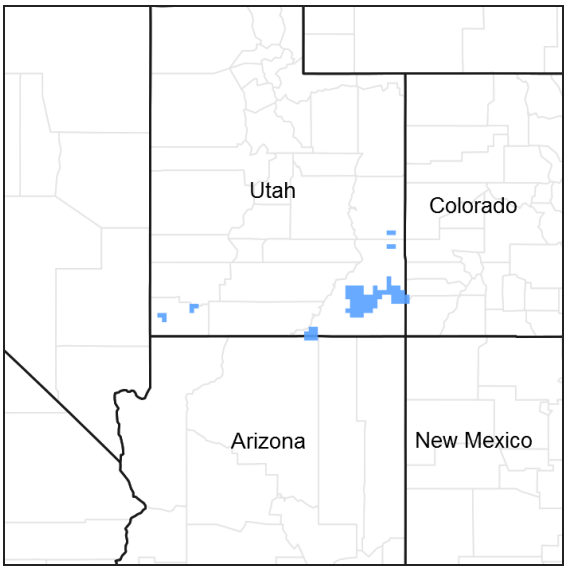


Figure 1. Mapped extent

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

Classification relationships

Modal Soil: Strych Family — loamy-skeletal, mixed, mesic Ustollic calciorthids
Type Location: Arch Canyon and the Scarps Near Blue Notch

Associated sites

R035XY317UT	**Upland Steep Stony Loam (Utah Juniper-Pinyon)**
R035XY321UT	**Upland Stony Loam (Pinyon-Utah Juniper)**

Similar sites

R035XY317UT	**Upland Steep Stony Loam (Utah Juniper-Pinyon)**

Table 1. Dominant plant species

Tree	(1) *Pinus edulis*
Shrub	Not specified
Herbaceous	(1) *Leymus salinus*

Physiographic features

This site occurs on steep mountain slopes, very steep mountain slopes, and steep hillslopes. Runoff is medium to high. Slopes range from 40-80%, and elevations are generally 5000-8500ft.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill
Elevation	5,000–8,500 ft
Slope	40–80%
Aspect	N, SW

Climatic features

The climate is characterized by warm summers and cool to cold winters. Large fluctuations in daily temperatures are common. The mean annual high temperature is 64 degrees Fahrenheit and the mean annual low temperature is 38 degrees Fahrenheit. Approximately 77% occurs as rain from March through October. On the average, February, May, and June are the driest months and August through October are the wettest months. Precipitation is extremely variable from month to month and from year to year but averages between 11-14 inches per year. Much of the summer precipitation occurs as convection thunderstorms.

Table 3. Representative climatic features

Frost-free period (average)	161 days
Freeze-free period (average)	188 days
Precipitation total (average)	14 in

Influencing water features

Soil features

The soil is deep and well drained. It formed in alluvium and colluvium derived mainly from sandstone, shale and sedimentary rock. Soils are loamy-skeletal, usually with more than 50 percent rock fragments throughout the soil profile. The surface is often stony or bouldery. The water supplying capacity is 2 to 5 inches. The average annual soil loss in potential is approximately .3 tons per acre.

This site has been used in the following soil surveys and has been correlated to the following components:
UT633 – Canyonlands Area, Parts of Grand and San Juan Counties – Strych
UT638 – San Juan County – Strych
UT641 – Washington County Area –Menefee
UT643 – San Juan County, Navajo Reservation –Ustic Torriorthents; Ustic Haplogrids

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Very stony fine sandy loam (2) Very gravelly loam (3) Cobbly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid

Soil depth	20–60 in
Surface fragment cover <=3"	13–32%
Surface fragment cover >3"	0–31%
Available water capacity (0-40in)	2–5 in
Calcium carbonate equivalent (0-40in)	1–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	18–22%
Subsurface fragment volume >3" (Depth not specified)	16–32%

Ecological dynamics

This site developed under Colorado Plateau ecological conditions and included natural influences of herbivory, and climate; however due to the remote location, broken topography, steep slopes (40-80%), 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 and twoneedle pinyon.

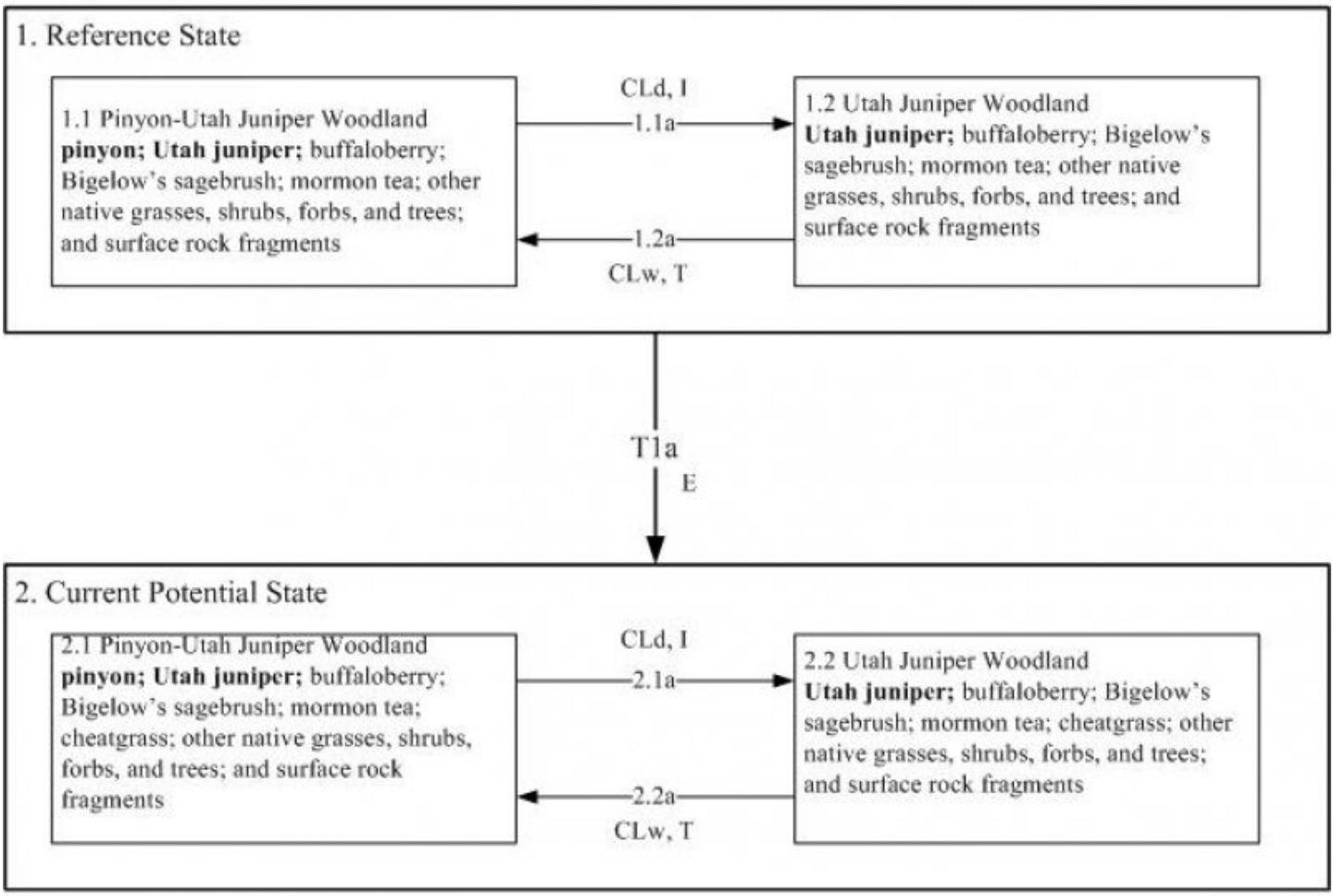
There is no evidence to indicate that this site historically maintained a short burn frequency. Until further research indicates that fire played a role in the ecosystem processes of this site, the state and transition model will not include fire as a disturbance mechanism in the reference state. However, 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 perennial grasses 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.

Drought and insects appear to be the main driving factors in many of the Pinyon/Juniper communities of Utah. 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 without major energy inputs. 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

R035XY328UT Upland Very Steep Stony Loam (Pinyon-Utah Juniper)



Legend:
CLd = Climate-drought
CLw = Climate-wet
I = Insect herbivory
T = Time
E = Establishment of non-native species

State 1
Reference State

The Reference State has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and influences such as grazing and recreational uses. Through literature review, historical accounts and observations of trends in plant community dynamics under a variety of uses have been considered. Community phases, community pathways, states, transitions, and thresholds, have been determined through similar studies and experience. This state represents the natural range of variability that historically dominated the dynamics of this ecological site. This state includes the biotic communities that would be expressed on the ecological site if all successional sequences were completed without modern disturbances under the present environmental conditions; natural disturbances are inherent in its development. This state is dominated by pinyon and Utah juniper with a well developed understory of native shrubs, perennial grasses and perennial and annual forbs. The primary disturbance mechanisms for this site in the reference condition include drought and insects. Reference State: Community phases maintained by drought and insect pathogen cycles Indicators: A community dominated by twoneedle pinyon and Utah juniper, where shrubs, and native perennial grasses and forb production is variable. Feedbacks:

Infrequent but regular droughts that reduce pinyon cover. Disturbances that may allow for the establishment of invasive species. At-risk Community Phase: this community is at risk when native plants are stressed and nutrients become available for invasive plants to establish.

Community 1.1
Pinyon-Juniper Woodland

This plant community phase is characterized by an overstory canopy of pinyon and Utah juniper, with a shrub and perennial grass understory. Shrubs commonly seen include buffaloberry, Bigelow's sagebrush, and mormon tea. Grasses that typically inhabit this site include Indian ricegrass and Salina wildrye. Forb composition varies greatly depending on seed source, soil, and growing conditions. Other grasses and shrubs are present; however, species composition varies from one site to the next. Surface rock fragments ranging from gravels to boulders make up the majority of cover for this site and may be as high as 56%.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	260	330	400
Grass/Grasslike	45	60	80
Shrub/Vine	30	40	80
Forb	5	10	15
Total	**340**	**440**	**575**

Table 6. Ground cover

Tree foliar cover	12-20%
Shrub/vine/liana foliar cover	3-10%
Grass/grasslike foliar cover	2-10%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	5-10%
Surface fragments >0.25" and <=3"	13-32%
Surface fragments >3"	0-31%
Bedrock	20-60%
Water	0%
Bare ground	4-20%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	2-8%	0-5%
>0.5 <= 1	–	0-5%	0-8%	0-5%
>1 <= 2	–	3-10%	0-8%	0-5%
>2 <= 4.5	–	0-5%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 1.2
Utah Juniper Woodland

This plant community phase is characterized by an overstory canopy of Utah juniper, with a shrub and perennial grass understory. Shrubs commonly seen include buffaloberry, Bigelow's sagebrush, and mormon tea. Grasses that typically inhabit this site include Indian ricegrass and Salina wildrye. Forb composition varies greatly depending on seed source, soil, and growing conditions. Other grasses and shrubs are present; however, species composition varies from one site to the next. Surface rock fragments ranging from gravels to boulders make up the majority of cover for this site and may be as high as 56%.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	260	330	400
Grass/Grasslike	45	60	80
Shrub/Vine	30	40	80
Forb	5	10	15
Total	**340**	**440**	**575**

Table 9. Ground cover

Tree foliar cover	12-20%
Shrub/vine/liana foliar cover	3-10%
Grass/grasslike foliar cover	2-10%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	5-10%
Surface fragments >0.25" and <=3"	13-32%
Surface fragments >3"	0-31%
Bedrock	20-60%
Water	0%
Bare ground	4-20%

Table 10. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	2-8%	0-5%
>0.5 <= 1	–	0-5%	0-8%	0-5%
>1 <= 2	–	3-10%	0-8%	0-5%
>2 <= 4.5	–	0-5%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Pathway 1.1a
Community 1.1 to 1.2

1.1a – This pathway occurs as drought or insect herbivory removes the pinyon canopy. When this pathway occurs as a response to drought, shrub and grass production may be slow until more normal climatic patterns return. The canopy is opened and sunlight is able to reach the understory allowing for nutrients to be captured by perennial grasses and shrubs.

Pathway 1.2a
Community 1.2 to 1.1

1.2a – This pathway occurs as normal to above average precipitation patterns coupled with time allow for the reestablishment of pinyon and other less drought tolerant shrubs and grasses.

State 2
Current Potential State

The current potential state is similar to the reference state; however invasive species are present. This state is generally dominated by Utah juniper and twoneedle pinyon, however depending on disturbance history, native grasses, forbs, or other shrubs may dominate the site. Primary disturbance mechanisms include 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. Current Potential State: Community phases maintained by drought and insect herbivory cycles Indicators: A community dominated by twoneedle pinyon and Utah juniper, where shrubs, and native perennial grasses and forb production is variable. Feedbacks: Infrequent, but regular droughts to reduce tree cover.

Community 2.1
Pinyon-Juniper Woodland

This plant community phase is characterized by an overstory canopy of pinyon and Utah juniper, with a shrub and perennial grass understory. Shrubs commonly seen include buffaloberry, Bigelow’s sagebrush, and mormon tea. Grasses that typically inhabit this site include Indian ricegrass and Salina wildrye. Forb composition varies greatly depending on seed source, soil, and growing conditions. Other grasses and shrubs are present; however, species composition varies from one site to the next. Surface rock fragments ranging from gravels to boulders make up the majority of cover for this site and may be as high as 56%.

Table 11. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	260	330	400
Grass/Grasslike	45	60	80
Shrub/Vine	30	40	80
Forb	5	10	15
Total	**340**	**440**	**575**

Table 12. Ground cover

Tree foliar cover	12-20%
Shrub/vine/liana foliar cover	3-10%
Grass/grasslike foliar cover	2-10%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	5-10%
Surface fragments >0.25" and <=3"	13-32%
Surface fragments >3"	0-31%
Bedrock	20-60%
Water	0%
Bare ground	4-20%

Table 13. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	2-8%	0-5%
>0.5 <= 1	–	0-5%	0-8%	0-5%
>1 <= 2	–	3-10%	0-8%	0-5%
>2 <= 4.5	–	0-5%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 2.2
Utah Juniper Woodland

This plant community phase is characterized by an overstory canopy of Utah juniper, with a shrub and perennial grass understory. Shrubs commonly seen include buffaloberry, Bigelow’s sagebrush, and mormon tea. Grasses that typically inhabit this phase include cheatgrass Indian ricegrass and Salina wildrye. Pinyon may be present in small amounts. Forb composition varies greatly depending on seed source, soil, and growing conditions. Other grasses and shrubs are present; however, species composition varies from one site to the next. Surface rock fragments ranging from gravels to boulders make up the majority of cover for this site and may be as high as 56%.

Table 14. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	260	330	400
Grass/Grasslike	45	60	80
Shrub/Vine	30	40	80
Forb	5	10	15
Total	**340**	**440**	**575**

Table 15. Ground cover

Tree foliar cover	12-20%
Shrub/vine/liana foliar cover	3-10%
Grass/grasslike foliar cover	2-10%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	5-10%
Surface fragments >0.25" and <=3"	13-32%
Surface fragments >3"	0-31%
Bedrock	20-60%
Water	0%
Bare ground	4-20%

Table 16. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	2-8%	0-5%
>0.5 <= 1	–	0-5%	0-8%	0-5%
>1 <= 2	–	3-10%	0-8%	0-5%
>2 <= 4.5	–	0-5%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Pathway 2.1a
Community 2.1 to 2.2

2.1a – This pathway occurs as drought or insect herbivory removes the pinyon canopy. When this pathway occurs as a response to drought, shrub and grass production may be slow until more normal climatic patterns return. The canopy is opened and sunlight is able to reach the understory allowing for nutrients to be captured by perennial grasses and shrubs.

Pathway 2.2a
Community 2.2 to 2.1

2.2a – This pathway occurs as normal to above average precipitation patterns coupled with time allow for the

reestablishment of pinyon and other less drought tolerant shrubs and grasses.

Transition T1a
State 1 to 2

T1a – This transition is from the native perennial warm and cool season grass understory in the reference state to a state that contains invasive species. Events include intense continuous grazing of perennial grasses, prolonged drought, and surface disturbances, etc. However invasive species such as cheatgrass have been known to invade intact perennial plant communities with little to no disturbances. Once invasive plants are found in the plant community a threshold has been crossed.

Additional community tables

Table 17. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
0	**Dominant Trees**			260–400	
	twoneedle pinyon	PIED	*Pinus edulis*	200–340	10–20
	Utah juniper	JUOS	*Juniperus osteosperma*	60–100	2–10
Shrub/Vine					
0	**Dominant Shrub**			25–80	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–45	0–5
	mormon tea	EPVI	*Ephedra viridis*	25–40	3–6
3	**Sub-Dominant Shrubs**			5–30	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–10	0–5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–6	0–2
	mormon tea	EPVI	*Ephedra viridis*	0–5	0–6
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–5	0–5
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–5	0–5
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	0–5	0–5
	yucca	YUCCA	*Yucca*	0–5	0–2
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–5	0–2
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	0–5	0–2
	desert princesplume	STPI	*Stanleya pinnata*	0–5	0–2
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–5	0–2
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–5	0–2
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–2	0–2
Grass/Grasslike					
0	**Dominant Grasses**			40–80	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–50	0–8
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–40	0–5
	blue grama	BOGR2	*Bouteloua gracilis*	0–5	0–2
1	**Sub-Dominant Grasses**			0–10	
	Grass, annual	2GA	*Grass, annual*	0–10	–
	Grass, perennial	2GP	*Grass, perennial*	0–10	–

	needle and thread	HECO26	*Hesperostipa comata*	0–5	0–2
	Sandberg bluegrass	POSE	*Poa secunda*	0–5	0–2
Forb					
2	**Sub-Dominant Forbs**			0–15	
	Forb, annual	2FA	*Forb, annual*	0–10	–
	Forb, perennial	2FP	*Forb, perennial*	0–10	–
	Utah fleabane	ERUT	*Erigeron utahensis*	0–5	0–2
	gilia	GILIA	*Gilia*	0–2	0–2
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–2	0–2
	spiderlily	HYMEN2	*Hymenocallis*	0–2	0–2
	Utah penstemon	PEUT	*Penstemon utahensis*	0–2	0–2
	longleaf phlox	PHLO2	*Phlox longifolia*	0–2	0–2
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–2	0–2
	Townsend daisy	TOWNS	*Townsendia*	0–2	0–2
	brickellbush	BRICK	*Brickellia*	0–2	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–2	0–2
	fleabane	ERIGE2	*Erigeron*	0–2	0–2

Table 18. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
0	**Dominant Trees**			150–300	
	Utah juniper	JUOS	*Juniperus osteosperma*	100–200	8–15
	twoneedle pinyon	PIED	*Pinus edulis*	50–100	2–10
Shrub/Vine					
0	**Dominant Shrub**			25–80	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–45	0–5
	mormon tea	EPVI	*Ephedra viridis*	25–40	3–6
3	**Sub-Dominant Shrubs**			5–30	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–10	0–5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–6	0–2
	mormon tea	EPVI	*Ephedra viridis*	0–5	0–6
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–5	0–5
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–5	0–5
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	0–5	0–5
	yucca	YUCCA	*Yucca*	0–5	0–2
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–5	0–2
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	0–5	0–2
	desert princesplume	STPI	*Stanleya pinnata*	0–5	0–2
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–5	0–2
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–5	0–2

	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–2	0–2
Grass/Grasslike					
0	**Dominant Grasses**			40–80	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–50	0–8
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–40	0–5
	blue grama	BOGR2	*Bouteloua gracilis*	0–5	0–2
1	**Sub-Dominant Grasses**			0–10	
	Grass, annual	2GA	*Grass, annual*	0–10	–
	Grass, perennial	2GP	*Grass, perennial*	0–10	–
	needle and thread	HECO26	*Hesperostipa comata*	0–5	0–2
	Sandberg bluegrass	POSE	*Poa secunda*	0–5	0–2
Forb					
2	**Sub-Dominant Forbs**			0–15	
	Forb, annual	2FA	*Forb, annual*	0–10	–
	Forb, perennial	2FP	*Forb, perennial*	0–10	–
	Utah fleabane	ERUT	*Erigeron utahensis*	0–5	0–2
	gilia	GILIA	*Gilia*	0–2	0–2
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–2	0–2
	spiderlily	HYMEN2	*Hymenocallis*	0–2	0–2
	Utah penstemon	PEUT	*Penstemon utahensis*	0–2	0–2
	longleaf phlox	PHLO2	*Phlox longifolia*	0–2	0–2
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–2	0–2
	Townsend daisy	TOWNS	*Townsendia*	0–2	0–2
	brickellbush	BRICK	*Brickellia*	0–2	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–2	0–2
	fleabane	ERIGE2	*Erigeron*	0–2	0–2

Table 19. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
0	**Dominant Trees**			260–400	
	twoneedle pinyon	PIED	*Pinus edulis*	200–340	10–20
	Utah juniper	JUOS	*Juniperus osteosperma*	60–100	2–10
Shrub/Vine					
0	**Dominant Shrub**			25–80	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–45	0–5
	mormon tea	EPVI	*Ephedra viridis*	25–40	3–6
3	**Sub-Dominant Shrubs**			5–30	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–10	0–5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–6	0–2
	mormon tea	EPVI	*Ephedra viridis*	0–5	0–6
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	0–5	0–5

	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	0–5	0–5
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–5	0–5
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–5	0–5
	yucca	YUCCA	*Yucca*	0–5	0–2
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–5	0–2
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–5	0–2
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–5	0–2
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	0–5	0–2
	desert princesplume	STPI	*Stanleya pinnata*	0–5	0–2
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–2	0–2
Grass/Grasslike					
0	**Dominant Grasses**			40–80	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–50	0–8
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–40	0–5
	cheatgrass	BRTE	*Bromus tectorum*	1–10	0–2
	blue grama	BOGR2	*Bouteloua gracilis*	0–5	0–2
1	**Sub-Dominant Grasses**			0–10	
	Grass, annual	2GA	*Grass, annual*	0–10	–
	Grass, perennial	2GP	*Grass, perennial*	0–10	–
	needle and thread	HECO26	*Hesperostipa comata*	0–5	0–2
	Sandberg bluegrass	POSE	*Poa secunda*	0–5	0–2
Forb					
2	**Sub-Dominant Forbs**			0–15	
	Forb, annual	2FA	*Forb, annual*	0–10	–
	Forb, perennial	2FP	*Forb, perennial*	0–10	–
	Utah fleabane	ERUT	*Erigeron utahensis*	0–5	0–2
	gilia	GILIA	*Gilia*	0–2	0–2
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–2	0–2
	spiderlily	HYMEN2	*Hymenocallis*	0–2	0–2
	Utah penstemon	PEUT	*Penstemon utahensis*	0–2	0–2
	longleaf phlox	PHLO2	*Phlox longifolia*	0–2	0–2
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–2	0–2
	Townsend daisy	TOWNS	*Townsendia*	0–2	0–2
	brickellbush	BRICK	*Brickellia*	0–2	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–2	0–2
	fleabane	ERIGE2	*Erigeron*	0–2	0–2

Table 20. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
0	**Dominant Trees**			150–300	
	Utah juniper	JUOS	*Juniperus osteosperma*	100–200	8–15
	twoneedle pinyon	PIED	*Pinus edulis*	50–100	2–10

Shrub/Vine					
0	**Dominant Shrub**			25–80	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–45	0–5
	mormon tea	EPVI	*Ephedra viridis*	25–40	3–6
3	**Sub-Dominant Shrubs**			5–30	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–10	0–5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–6	0–2
	mormon tea	EPVI	*Ephedra viridis*	0–5	0–6
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	0–5	0–5
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–5	0–5
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–5	0–5
	yucca	YUCCA	*Yucca*	0–5	0–2
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–5	0–2
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–5	0–2
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–5	0–2
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	0–5	0–2
	desert princesplume	STPI	*Stanleya pinnata*	0–5	0–2
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–2	0–2
Grass/Grasslike					
0	**Dominant Grasses**			40–80	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–50	0–8
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–40	0–5
	cheatgrass	BRTE	*Bromus tectorum*	1–10	0–2
	blue grama	BOGR2	*Bouteloua gracilis*	0–5	0–2
1	**Sub-Dominant Grasses**			0–10	
	Grass, annual	2GA	*Grass, annual*	0–10	–
	Grass, perennial	2GP	*Grass, perennial*	0–10	–
	needle and thread	HECO26	*Hesperostipa comata*	0–5	0–2
	Sandberg bluegrass	POSE	*Poa secunda*	0–5	0–2
Forb					
2	**Sub-Dominant Forbs**			0–15	
	Forb, annual	2FA	*Forb, annual*	0–10	–
	Forb, perennial	2FP	*Forb, perennial*	0–10	–
	Utah fleabane	ERUT	*Erigeron utahensis*	0–5	0–2
	gilia	GILIA	*Gilia*	0–2	0–2
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–2	0–2
	spiderlily	HYMEN2	*Hymenocallis*	0–2	0–2
	Utah penstemon	PEUT	*Penstemon utahensis*	0–2	0–2
	longleaf phlox	PHLO2	*Phlox longifolia*	0–2	0–2
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–2	0–2
	Townsend daisy	TOWNS	*Townsendia*	0–2	0–2

	brickellbush	BRICK	*Brickellia*	0–2	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–2	0–2
	fleabane	ERIGE2	*Erigeron*	0–2	0–2

Animal community

--Wildlife Interpretation--
The scarcity of water on this site 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.

--Threatened and Endangered Wildlife – This site provides foraging and roosting opportunities for Bald Eagles. Peregrine Falcons will usually nest more to the edge of the cliffs, but due to the typically location of this site near cliffs, the area will provide foraging and resting opportunities. Ferruginous hawks, and Northern Goshawks are also spotted foraging and roosting in this site. When the area is open, suitable nesting habitat for ferruginous hawks exists

--Grazing Interpretations—
Due to the steep slopes associated with this site, livestock grazing is not typically a factor. This site provides fair grazing conditions for wildlife. However, this site often lacks natural perennial water sources, which can influence the suitability for wildlife grazing. Mule deer, desert bighorn sheep, pronghorn antelope, and elk may utilize this site, though in many places the populations will be small and have little grazing impact.

The plant community is primarily Utah Juniper and pinyon; sub dominants include Utah serviceberry, singleleaf ash, 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 and salina wildrye, and when present these grasses provide good foraging conditions for many 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.

--References--

Relative Forage Preference of Plants for Grazing Use by Season: Plants commonly found in Major Land Resource Area D35 --The Colorado Plateau. 2007

Stubbendieck, J., S. L. Hatch, and C. H. Butterfield. 1997. North American range plants. Lincoln, NE: University of Nebraska Press. 501p.

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

Hydrological functions

Runoff and Soil Loss

The following runoff and soil loss data was generated using the Rangeland Hydrology and Erosion Model Web Tool (See citation below).
Hydrology and erosion are approximately the same for both state 1 and state 2 (refer to STM). Soil textures range from loam to sandy loam and slope ranges from 40-80 percent on this site. There is no difference in runoff due to soil texture or slope (about 0.5inches/year). However, slope does have an impact on soil loss. Average runoff is typically about 0.5 inches/year, but may be as high as 2 inches in a single 100-year storm event. Soil loss ranges from 0.2(about 40% slope) to 0.35 (about 80% slope) tons per acre on an average year, and from 0.9 (about 40% slope) to 1.4 (about 80% slope) tons per acre during a 100-year storm event. Long-term soil loss is not a concern on this site, but rather the rare storm events (i.e. 25, 50 or 100 year storms) result in significant soil loss that are more likely to impact the soil resource. Average rainfall ranges from 8-12 inches per year, but a single 100-year storm event can generate 2 inches of precipitation in a 24-hour period.
Individual trees, shrubs, and grass are uniformly distributed, resulting in high tortuosity which slows down overland flow and promotes on-site infiltration. Heavy grazing does not significantly alter the hydrology since this site is not typically affected by livestock. Interspaces are typically protected by rock fragments.

Soil Group Curve Number

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

--References--
National Engineering Handbook. US Department of Agriculture, Natural Resources Conservation Service. Available: http://www.info.usda.gov/CED/Default.cfm#National%20Engineering%20Handbook. Accessed February 25, 2008.
NRCS Grazing Lands Technology Institute. 2003. National Range and Pasture Handbook. Fort Worth, TX, USA: US Department of Agriculture, Natural Resources Conservation Service, 190-VI-NRPH.
Southwest Watershed Research Center. 2008. Rangeland Hydrology and Erosion Model Web Tool. Tuscon, Arizona, USA: US Department of Agriculture, Agricultural Research Service. Available at http://apps.tucson.ars.ag.gov/rhem/. Accessed on Dec, 2010.

Recreational uses

Use of this site is limited because of steep slopes.

Wood products

Posts and Firewood

Other information

--Poisonous and Toxic Plant Communities--
Toxic plants associated with this site include woolly locoweed, broom snakeweed, and wavy leaf (Havard) 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). Havard 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

--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 completly 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 maintained a short burn frequency. Only a few species in the association show fire scars and can be aged. This ecological site is comprised of scattered 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. 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.

--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.

Type locality

Location 1: Wayne County, UT	
UTM zone	N
UTM northing	4232237
UTM easting	0474216
General legal description	Location is in Capitol Reef National Park

Other references

--Other References--

Betancourt, J. L., E. A. Pierson, K. A. Rylander, J. A. Fairchild-Parks, and J. S. Dean. 1993. Influence of history and climate on New Mexico pin˜on-juniper woodlands. Pages 42–62 in E. F. Aldon, and D. W. Shaw, editors. Managing pinon-juniper ecosystems for sustainability and social needs. USDA Forest Service Technical Report RM-236.

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

National Engineering Handbook. US Department of Agriculture, Natural Resources Conservation Service. Available: http://www.info.usda.gov/CED/Default.cfm#National%20Engineering%20Handbook. Accessed February 25, 2008.

NPS.gov. 2008. Canyonlands National Park. Nature and Science. Available: http://www.nps.gov/cany/naturescience/. Accessed on January 4, 2008.

Contributors

George Cook

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 Stager (BLM), Dana Truman (NRCS), Paul Curtis (BLM), Shane A. Green (NRCS), Randy Beckstrand (BLM)
Contact for lead author	
Date	01/30/2007
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Common. Occur throughout the site. Rills may extend down entire slope or to obstructions such as large boulders.

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

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3. **Number and height of erosional pedestals or terracettes:** Common-Pedestals form at the base of plants that occur on the edge of water flow patterns, rills and gullies. Gullies may remove soil from the base of trees exposing roots that resemble pedestals. Interspaces between well developed biological soil crusts resemble pedestals and may be up to 2 inches high. Terracettes are common. 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):** 20 – 30 %. Most bare ground is associated with water flow patterns, rills, and gullies. Soil is covered by

25-50% rock fragments. 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:** Gullies are few to common. Length often extends from exposed bedrock until gully reaches a stream or an area where water and sediment accumulate, but they may be wide and shallow and armored with very large rocks. Gullies may remove soil from 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.

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter is moved with even moderate precipitation events and spring runoff, accumulating down slope behind plants and rock features in the site. Woody stems may be washed from site. Gullies may remove accumulated litter from under trees.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 4 or 5 under the plant canopies using the soil stability kit test, and a rating of 3 to 4 in the interspaces. The average should be a 4. Surface texture is stony fine sandy loam. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface is 1 inch deep. Structure is weak thin platy. Color is yellowish brown (10YR5/4). There is little if any difference under canopy or in interspaces and a recognizable A horizon is expected to be present throughout. 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 plants and/or well developed biological soil crusts (where present) intercept raindrops reducing splash erosion and provide areas of surface detention to store water allowing additional time for infiltration.

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

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

    Dominant: Perennial bunchgrasses > Shrubs > Trees (Pinion > Juniper)

    Sub-dominant: forbs

Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Crested wheatgrass, Intermediate wheatgrass, etc.)
Biological soil crust is variable in its expression where present on this site and is measured as a component of ground cover.

Additional: Disturbance regime includes parasites, insects, and drought. Dominants— Salina Wildrye, Utah Juniper, Pinyon Pine, Utah serviceberry. Sub Dominants— Indian ricegrass, forbs. 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):** Several standing dead trees may be present on the site and approximately 20 % of the trees can show evidence of decadence. 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):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 340-575lbs/acre annually

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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:** Cheatgrass is most likely to invade this site.

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