USDA Natural Resources
Conservation Service

Ecological site R035XY221UT
Semidesert Shallow Loam (Utah Juniper-Pinyon)

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.

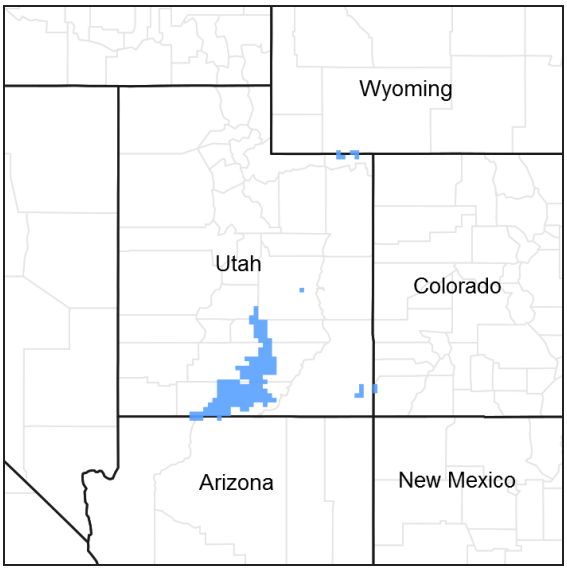

Figure 1. Mapped extent

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.

Ecological site concept

Site Concept: This site occurs in the semidesert zone of the Colorado and Green River Plateaus region (MLRA35) in Southern Utah. It is found on escarpments, hillsides, and structural benches at elevations between 4800 and 6900 feet. Average annual precipitation ranges from 8 to 13 inches, with much of the summer precipitation coming as convective thunderstorms from July to October. Soils are shallow to sandstone bedrock and formed in residuum, colluvium, slope alluvium or eolian deposits derived from sandstone and siltstone. Textures range from loams to loamy sands and may have few to very many rock fragments on the soil surface and throughout the profile. The soil temperature and moisture regimes are mesic and ustic aridic (torric) respectively. Utah juniper is the dominant plant, and two-needle pinyon can also be abundant. This site is does not burn regularly, and is susceptible to establishment of cheatgrass and other non-native species in small amounts.

Associated sites

R035XY006UT	**Alkali Fan (Valley Saltbush)**
R035XY124UT	**Desert Shallow Clay (Mat Saltbush)**
R035XY209UT	**Semidesert Loam (Wyoming Big Sagebrush)**
R035XY212UT	**Semidesert Sand (Fourwing Saltbush)**
R035XY217UT	**Semidesert Sandy Loam (Spiny Hopsage)**

R035XY222UT	**Semidesert Shallow Loam (Utah Juniper- James Galleta)**
R035XY225UT	**Semidesert Shallow Sand (Cutler"s Jointfir)**
R035XY227UT	**Semidesert Shallow Sand (Utah Juniper-Pinyon)**
R035XY230UT	**Semidesert Shallow Sandy Loam (Shadscale)**
R035XY234UT	**Semidesert Shallow Shale (Utah Juniper-Pinyon)**
R035XY237UT	**Semidesert Shallow Gypsum (Mormontea)**
R035XY239UT	**Semidesert Shallow Clay (Shadscale-Utah Juniper)**
R035XY240UT	**Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)**
R035XY246UT	**Semidesert Stony Loam (Utah Juniper-Pinyon)**
R035XY328UT	**Upland Very Steep Stony Loam (Pinyon-Utah Juniper)**

Similar sites

R034BY233UT	**Semidesert Shallow Loam (Utah Juniper-Pinyon)**
R035XY234UT	**Semidesert Shallow Shale (Utah Juniper-Pinyon)**
R035XY238UT	**Semidesert Shallow Hardpan (Utah Juniper-Pinyon)**
R035XY240UT	**Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)**
R028AY238UT	**Semidesert Shallow Loam (Utah Juniper-Bluebunch Wheatgrass)**

Table 1. Dominant plant species

Tree	(1) *Juniperus osteosperma* (2) *Pinus edulis*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on structural benches, hillslopes, escarpments and dipslopes of cuestas. Run off is high (due to the shallow depth). Slopes typically range from 2-25%, but can be as steep as 70%. Elevations are generally 4800-6900 ft but this site has been found as low as 4200 ft.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Hill (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	1,463–2,103 m
Slope	2–25%

Climatic features

The climate is characterized by hot summers and cool to warm winters. Large fluctuations in daily temperatures are common. Mean annual high temperatures range from 60-70 degrees Fahrenheit and mean annual low temperatures range from 32-40 degrees Fahrenheit. Approximately 70-75% of moisture occurs as rain from March through October. On the average, February, May, and June are the driest months and July through October are the wettest months. Precipitation is extremely variable from month to month and from year to year but averages between 9-13 inches. Much of the summer precipitation occurs as convection thunderstorms.

Table 3. Representative climatic features

Frost-free period (average)	148 days
Freeze-free period (average)	172 days
Precipitation total (average)	330 mm

Influencing water features

Due to its landscape position, this site is not typically influenced by streams or wetlands.

Soil features

The soils of this site are very shallow to shallow and well drained or somewhat excessively drained. They usually form in residuum derived from sandstone and siltstone, but may also form in colluvium, slope alluvium or eolian deposits over sandstone residuum. Textures range from loams to loamy sands and may have few to very many rock fragments on the soil surface and throughout the profile. The soil temperature and moisture regimes are mesic and ustic aridic (torric) respectively. Soils are nonsaline to slightly saline, and the water holding capacity ranges from 0.4 to 1.7 inches of water for the entire profile.

This site has been used in the following soil surveys and has been correlated to the following components:

UT642 – Kane County Area – Daklos; Hideout; Kenzo
UT685 – Capital Reef National Park – Reef, Lazeer, Fourmile bench family, Rizno, Atchee, Skyvillage family, Simel, Daklos, Moclom, Tesihim, Ignacio family, Bullpen family;
UT686 – Escalante Grande Staircase National Monument – Skyvillage; Daklos; Hillburn; Hideout; Reef; Atchee; Formilibench; Travessilla; Lazear
UT688 – Canyonlands National Park – Reef

Typical Profile:
A – 0-2 inches; fine sandy loams; moderately alkaline
C – 2-11 inches; gravelly fine sandy loam; moderately alkaline
2R – 11+ inches; sedimentary parent material

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone and siltstone
Surface texture	(1) Sandy loam (2) Loamy sand (3) Very channery loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	10–51 cm
Surface fragment cover <=3"	0–45%
Surface fragment cover >3"	0–15%
Available water capacity (0-101.6cm)	1.02–4.32 cm
Calcium carbonate equivalent (0-101.6cm)	1–15%
Electrical conductivity (0-101.6cm)	0–3 mmhos/cm

Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–70%
Subsurface fragment volume >3" (Depth not specified)	0–22%

Ecological dynamics

This site developed under the Colorado Plateau climatic 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 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 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. Currently there is no documentation to indicate that this ecological site is affected by drought and/or insects, however, managers should be aware of the possible impacts of drought and insects on this ecological site. 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

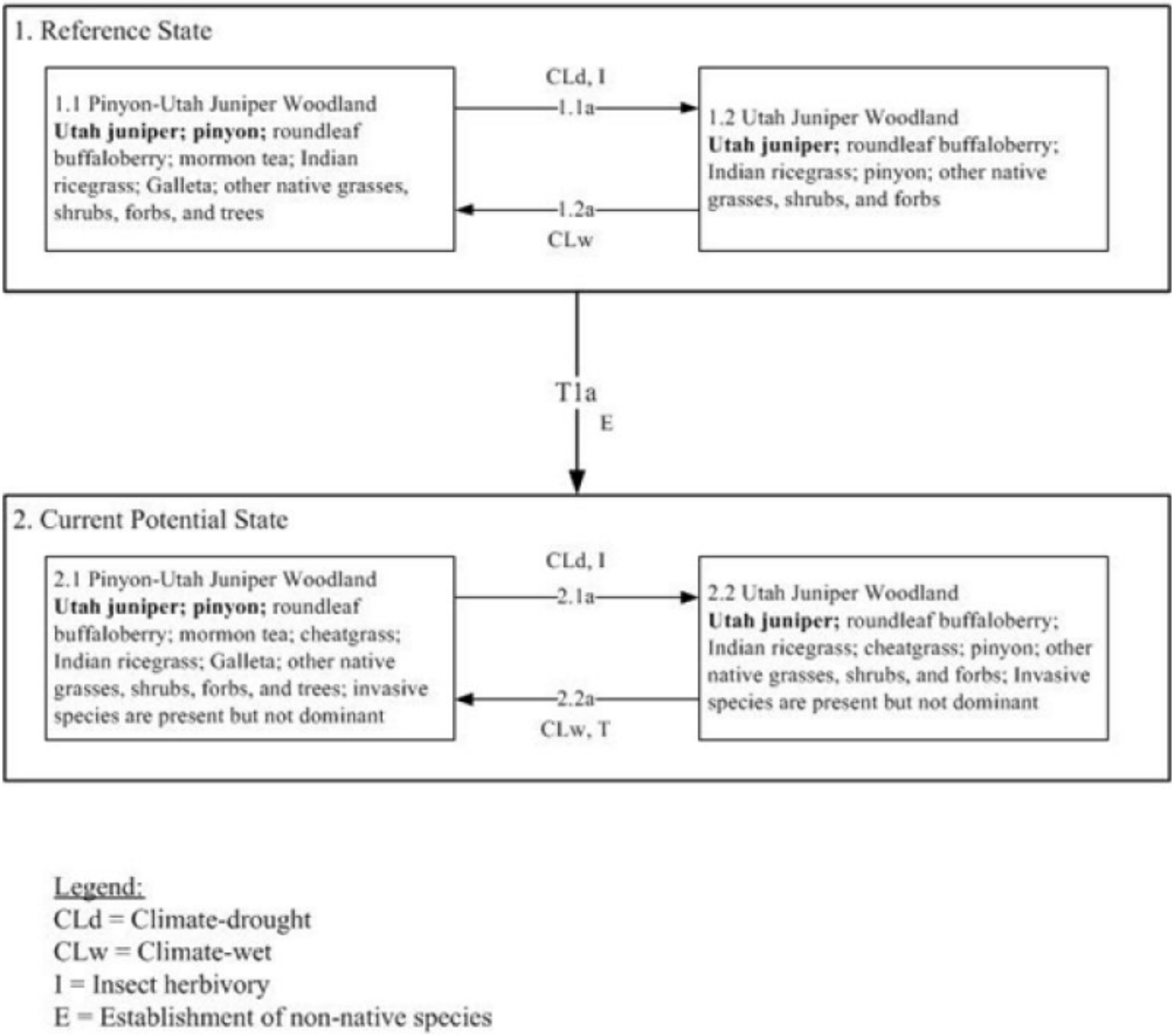

Figure 4. State-and-Transition Model

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 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, where twoneedle pinyon shrubs, and native perennial grasses and forbs may or may not be present. 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
Pinyon-Utah Juniper Woodland

Figure 5. Pinyon-Utah Juniper Woodland

This community phase is characterized by a Utah juniper and pinyon 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 5 percent forbs, 15 percent grasses, 25 percent shrubs and 60 percent trees. Bare ground is variable (16-30%) depending on biological crust cover, which is also variable (0-52%) and surface rock fragments (5-56%).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	179	235	426
Shrub/Vine	56	78	112
Grass/Grasslike	22	45	78
Forb	11	22	34
Total	**268**	**380**	**650**

Table 6. Ground cover

Tree foliar cover	6-16%
Shrub/vine/liana foliar cover	6-16%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-2%
Non-vascular plants	0%
Biological crusts	0-52%
Litter	3-5%
Surface fragments >0.25" and <=3"	0-45%
Surface fragments >3"	0-15%
Bedrock	4-20%
Water	0%
Bare ground	16-30%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	0-2%
>0.15 <= 0.3	–	4-14%	0-5%	0-2%
>0.3 <= 0.6	–	2-12%	0-5%	0-2%
>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 Woodland

This community phase is characterized by a Utah juniper 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 5 percent forbs, 15 percent grasses, 25 percent shrubs and 60 percent trees. Bare ground is variable (16-30%) depending on biological crust cover, which is also variable (0-52%) and surface rock fragments (5-56%).

Pathway 1.1a
Community 1.1 to 1.2

This pathway occurs when climate becomes drier to the point that mature pinyon trees die, leaving Utah juniper to dominate the overstory alone.

Pathway 1.2a
Community 1.2 to 1.1

This pathway occurs as climate patterns provide moisture sufficient for pinyon pine establishment in the plant community.

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 and twoneedle pinyon, 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 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 where twoneedle pinyon, shrubs and native perennial grasses and forbs may or may not be present. Invasive grasses and forbs are present.

Community 2.1
Pinyon-Utah Juniper Woodland

This community phase is characterized by a Utah juniper and pinyon upper canopy. In the lower canopy, commonly seen grasses include cheatgrass 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 (20-50%).

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	179	235	426
Shrub/Vine	56	78	112
Grass/Grasslike	22	45	78
Forb	11	22	34
Total	**268**	**380**	**650**

Table 9. Ground cover

Tree foliar cover	6-16%
Shrub/vine/liana foliar cover	6-16%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-2%
Non-vascular plants	0%
Biological crusts	0-52%
Litter	3-5%
Surface fragments >0.25" and <=3"	0-45%
Surface fragments >3"	0-15%
Bedrock	4-20%
Water	0%
Bare ground	16-30%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	0-2%
>0.15 <= 0.3	–	4-14%	0-5%	0-2%
>0.3 <= 0.6	–	2-12%	0-5%	0-2%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	3-13%	–	–	–
>4 <= 12	3-13%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 2.2
Utah Juniper Woodland

This community phase is characterized by a Utah juniper upper canopy. In the lower canopy, commonly seen grasses include cheatgrass 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 (20-50%).

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	179	235	426
Shrub/Vine	56	78	112
Grass/Grasslike	22	45	78
Forb	11	22	34
Total	**268**	**380**	**650**

Table 12. Ground cover

Tree foliar cover	6-16%
Shrub/vine/liana foliar cover	6-16%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-2%
Non-vascular plants	0%
Biological crusts	0-52%
Litter	3-5%
Surface fragments >0.25" and <=3"	0-45%
Surface fragments >3"	0-15%
Bedrock	4-20%
Water	0%
Bare ground	16-30%

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	0-2%
>0.15 <= 0.3	–	4-14%	0-5%	0-2%
>0.3 <= 0.6	–	2-12%	0-5%	0-2%
>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

This pathway occurs when climate becomes drier to the point that mature pinyon trees die, leaving Utah juniper to dominate the overstory alone.

Pathway 2.2a
Community 2.2 to 2.1

This pathway occurs as climate patterns provide moisture sufficient for pinyon pine establishment in the plant community.

Transition T1a
State 1 to 2

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 14. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Dominant Trees**			179–426	
	Utah juniper	JUOS	*Juniperus osteosperma*	157–314	6–12
	twoneedle pinyon	PIED	*Pinus edulis*	22–112	1–4
Grass/Grasslike					
0	**Dominant Grasses**			22–78	
	James' galleta	PLJA	*Pleuraphis jamesii*	6–78	1–5
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–67	0–5
	blue grama	BOGR2	*Bouteloua gracilis*	0–45	0–3
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–45	0–3
	threeawn	ARIST	*Aristida*	0–34	0–3
1	**Sub-Dominant Grasses**			0–45	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–45	0–10
	Grass, perennial	2GP	*Grass, perennial*	0–11	0–5
	squirreltail	ELEL5	*Elymus elymoides*	0–11	0–2
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–1	0–2
Forb					
2	**Forbs**			11–34	
	Forb, annual	2FA	*Forb, annual*	0–22	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–22	0–5
	desert princesplume	STPI	*Stanleya pinnata*	0–15	0–5
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–9	0–3
	mountain pepperweed	LEMO2	*Lepidium montanum*	0–6	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–3	0–2
	buckwheat	ERIOG	*Eriogonum*	0–3	0–2
	rock goldenrod	PEPU7	*Petradoria pumila*	0–3	0–2
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–2	0–2
	Arizona four-nerve daisy	TEACA	*Tetraneuris acaulis var. arizonica*	0–2	0–2

	greenthread	THELE	*Thelesperma*	0–2	0–2
	beardtongue	PENST	*Penstemon*	0–2	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–2	0–1
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	0–1	0–1
	low pussytoes	ANDI2	*Antennaria dimorpha*	0–1	0–1
	widewing springparsley	CYPU	*Cymopterus purpurascens*	0–1	0–1
	lupine	LUPIN	*Lupinus*	0–1	0–1
Shrub/Vine					
3	**Shrubs**			56–112	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	13–28	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–20	0–5
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–18	0–5
	Mexican cliffrose	PUME	*Purshia mexicana*	0–17	0–4
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–17	0–4
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–17	0–3
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	4–17	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	4–17	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–12	0–5
	blackbrush	CORA	*Coleogyne ramosissima*	0–11	0–5
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–11	0–5
	sumac	RHUS	*Rhus*	0–6	0–2
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–6	0–2
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–6	0–2
	Cutler's jointfir	EPCU	*Ephedra cutleri*	0–4	0–2
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–2	0–2
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–2	0–1
	black sagebrush	ARNO4	*Artemisia nova*	0–2	0–1
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–1	0–1
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–1	0–1
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–1	0–1
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–1	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–1	0–1

Table 15. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Dominant Trees**			179–426	
	Utah juniper	JUOS	*Juniperus osteosperma*	179–404	6–12
	twoneedle pinyon	PIED	*Pinus edulis*	0–22	0–2
Grass/Grasslike					
0	**Dominant Grasses**			22–78	

	threeawn	ARIST	*Aristida*	0–34	0–5
	James' galleta	PLJA	*Pleuraphis jamesii*	0–34	0–5
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–11	0–5
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–8	0–5
1	**Sub-Dominant Grasses**			0–45	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–45	0–10
	blue grama	BOGR2	*Bouteloua gracilis*	4–17	–
	Grass, perennial	2GP	*Grass, perennial*	0–11	0–5
	squirreltail	ELEL5	*Elymus elymoides*	0–11	0–2
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–1	0–2
Forb					
2	**Forbs**			11–34	
	Forb, annual	2FA	*Forb, annual*	0–22	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–22	0–5
	desert princesplume	STPI	*Stanleya pinnata*	0–15	0–5
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–9	0–3
	mountain pepperweed	LEMO2	*Lepidium montanum*	0–6	0–2
	rock goldenrod	PEPU7	*Petradoria pumila*	0–3	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–3	0–2
	buckwheat	ERIOG	*Eriogonum*	0–3	0–2
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–2	0–2
	Arizona four-nerve daisy	TEACA	*Tetraneuris acaulis var. arizonica*	0–2	0–2
	greenthread	THELE	*Thelesperma*	0–2	0–2
	beardtongue	PENST	*Penstemon*	0–2	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–2	0–1
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	0–1	0–1
	low pussytoes	ANDI2	*Antennaria dimorpha*	0–1	0–1
	widewing springparsley	CYPU	*Cymopterus purpurascens*	0–1	0–1
	lupine	LUPIN	*Lupinus*	0–1	0–1
Shrub/Vine					
3	**Shrubs**			56–112	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	13–28	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–20	0–5
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–18	0–5
	Mexican cliffrose	PUME	*Purshia mexicana*	0–17	0–4
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–17	0–4
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–17	0–3
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	4–17	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	4–17	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–12	0–5
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–11	0–5
	blackbrush	CORA	*Coleogyne ramosissima*	0–11	0–5
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–6	0–2

	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–6	0–2
	sumac	RHUS	*Rhus*	0–6	0–2
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–6	0–2
	Cutler's jointfir	EPCU	*Ephedra cutleri*	0–4	0–2
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–2	0–2
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–2	0–1
	black sagebrush	ARNO4	*Artemisia nova*	0–2	0–1
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–1	0–1
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–1	0–1
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–1	0–1
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–1	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–1	0–1

Table 16. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Dominant Trees**			179–426	
	Utah juniper	JUOS	*Juniperus osteosperma*	157–314	6–12
	twoneedle pinyon	PIED	*Pinus edulis*	22–112	1–4
Grass/Grasslike					
0	**Dominant Grasses**			22–78	
	James' galleta	PLJA	*Pleuraphis jamesii*	6–78	1–5
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–67	0–5
	blue grama	BOGR2	*Bouteloua gracilis*	0–45	0–3
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–45	0–3
	threeawn	ARIST	*Aristida*	0–34	0–3
	cheatgrass	BRTE	*Bromus tectorum*	1–22	1–3
1	**Sub-dominant**			0–45	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–45	0–10
	Grass, perennial	2GP	*Grass, perennial*	0–11	0–5
	squirreltail	ELEL5	*Elymus elymoides*	0–11	0–2
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–1	0–2
Forb					
2	**Forbs**			11–34	
	Forb, annual	2FA	*Forb, annual*	0–22	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–22	0–5
	desert princesplume	STPI	*Stanleya pinnata*	0–15	0–5
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–9	0–3
	mountain pepperweed	LEMO2	*Lepidium montanum*	0–6	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–3	0–2
	buckwheat	ERIOG	*Eriogonum*	0–3	0–2
	rock goldenrod	PEPU7	*Petradoria pumila*	0–3	0–2

	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–2	0–2
	Arizona four-nerve daisy	TEACA	*Tetraneuris acaulis var. arizonica*	0–2	0–2
	greenthread	THELE	*Thelesperma*	0–2	0–2
	beardtongue	PENST	*Penstemon*	0–2	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–2	0–1
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	0–1	0–1
	low pussytoes	ANDI2	*Antennaria dimorpha*	0–1	0–1
	widewing springparsley	CYPU	*Cymopterus purpurascens*	0–1	0–1
	lupine	LUPIN	*Lupinus*	0–1	0–1
Shrub/Vine					
3	**Shrubs**			56–112	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	13–28	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–20	0–5
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–18	0–5
	Mexican cliffrose	PUME	*Purshia mexicana*	0–17	0–4
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–17	0–4
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–17	0–3
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	4–17	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	4–17	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–12	0–5
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–11	0–5
	blackbrush	CORA	*Coleogyne ramosissima*	0–11	0–5
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–6	0–2
	sumac	RHUS	*Rhus*	0–6	0–2
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–6	0–2
	Cutler's jointfir	EPCU	*Ephedra cutleri*	0–4	0–2
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–2	0–2
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–2	0–1
	black sagebrush	ARNO4	*Artemisia nova*	0–2	0–1
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–1	0–1
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–1	0–1
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–1	0–1
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–1	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–1	0–1

Table 17. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Dominant Trees**			179–426	
	Utah juniper	JUOS	*Juniperus osteosperma*	179–404	6–12
	twoneedle pinyon	PIED	*Pinus edulis*	0–22	0–2
Grass/Grasslike					

Grass/Grasslike					
0	**Dominant Grasses**			22–78	
	James' galleta	PLJA	*Pleuraphis jamesii*	6–78	1–5
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–67	0–5
	blue grama	BOGR2	*Bouteloua gracilis*	0–45	0–3
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–45	0–3
	threeawn	ARIST	*Aristida*	0–34	0–3
	cheatgrass	BRTE	*Bromus tectorum*	1–22	1–3
1	**Sub-dominant**			0–45	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–45	0–10
	Grass, perennial	2GP	*Grass, perennial*	0–11	0–5
	squirreltail	ELEL5	*Elymus elymoides*	0–11	0–2
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–1	0–2
Forb					
2	**Forbs**			11–34	
	Forb, annual	2FA	*Forb, annual*	0–22	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–22	0–5
	desert princesplume	STPI	*Stanleya pinnata*	0–15	0–5
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–9	0–3
	mountain pepperweed	LEMO2	*Lepidium montanum*	0–6	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–3	0–2
	buckwheat	ERIOG	*Eriogonum*	0–3	0–2
	rock goldenrod	PEPU7	*Petradoria pumila*	0–3	0–2
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–2	0–2
	Arizona four-nerve daisy	TEACA	*Tetraneuris acaulis var. arizonica*	0–2	0–2
	greenthread	THELE	*Thelesperma*	0–2	0–2
	beardtongue	PENST	*Penstemon*	0–2	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–2	0–1
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	0–1	0–1
	low pussytoes	ANDI2	*Antennaria dimorpha*	0–1	0–1
	widewing springparsley	CYPU	*Cymopterus purpurascens*	0–1	0–1
	lupine	LUPIN	*Lupinus*	0–1	0–1
Shrub/Vine					
3	**Shrubs**			56–112	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	13–28	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–20	0–5
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–18	0–5
	Mexican cliffrose	PUME	*Purshia mexicana*	0–17	0–4
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–17	0–4
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–17	0–3
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	4–17	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	4–17	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–12	0–5

	singleleaf ash	FRAN2	*Fraxinus anomala*	0–11	0–5
	blackbrush	CORA	*Coleogyne ramosissima*	0–11	0–5
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–6	0–2
	sumac	RHUS	*Rhus*	0–6	0–2
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–6	0–2
	Cutler's jointfir	EPCU	*Ephedra cutleri*	0–4	0–2
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–2	0–2
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–2	0–1
	black sagebrush	ARNO4	*Artemisia nova*	0–2	0–1
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–1	0–1
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–1	0–1
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–1	0–1
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–1	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–1	0–1

Animal community

--Livestock and Wildlife Grazing--
--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 and 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 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, mormon tea, and buffaloberry. These shrubs provide good winter browse for cattle, sheep, goats, pronghorn antelope, elk, mule deer, and bighorn sheep. Grasses include Indian ricegrass and galleta, and when present these grasses 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.

--References--

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

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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 2-15 percent on this site. There is no difference in soil loss or runoff due to soil texture. Slope does not affect the runoff on this site, but does have an impact on soil loss. Average runoff is typically about 0.55 inches per year, but may be as high as 2.4 inches in a single 100-year storm event. However, soil loss ranges from 0.065(about 2% slope) to 0.09 (about 15% slope) tons per acre on an average year, and from 0.31(about 2% slope) to .53 (about 15% slope) tons per acre during a 100-year storm event. Long-term soil loss is not a concern on this site. Average rainfall ranges from 9-12 inches per year, but a single 100-year storm event can generate 3.8 inches of precipitation in a 24-hour period.
Individual brush and tree plants are uniformly distributed, resulting in some tortuosity which slows down overland flow and promotes on-site infiltration. The grasses and forbs in the shrub interspaces have a minimal impact on water flow patterns due to low production. Heavy grazing does not significantly alter the hydrology since this site is not typically affected by livestock. Interspaces are often protected by biological soil crusts, rock fragments, or a weak physical soil crust. Soil physical crusts and weak biological crusts (light cyanobacteria) are the most susceptible to water erosion.

Soil Group
The soils associated with this ecological site are generally in Hydrologic Soil Group D due to the shallow depth (NRCS National Engineering Handbook). Hydrologic groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water.

--References--
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Recreational uses

Recreational uses are hiking, hunting, and aesthetics.

Wood products

The site index is 25 to 35. Wood products are firewood and fenceposts.

Other information

--Poisonous and Toxic Plant Communities--
Toxic plants associated with this site include woolly locoweed and broom snakeweed. Woolly locoweed is toxic to all classes of livestock and wildlife. Locoweed is palatable and has 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 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 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.

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Type locality

Location 1: Garfield County, UT	
Township/Range/Section	T36 S R8 E S18

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Contributors

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Rangeland health reference sheet

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

Author(s)/participant(s)	Robert Stager (BLM), F.E. Busby (USU), Dana Truman (NRCS), Paul Curtis (BLM), Shane A. Green (NRCS)
Contact for lead author	shane.green@ut.usda.gov
Date	09/12/2008
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** A. On more gentle slopes (< 15 %): Very few. Rills may be 10 or more feet in length. Rills are most likely to form below adjacent exposed bedrock or water flow patterns where sufficient water accumulates to cause erosion. B. On steep slopes (> 15 %): Few rills are present. Where they occur, rills may extend down entire slope.

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2. **Presence of water flow patterns:** Some sinuous flow patterns wind around perennial plants and surface rock. Evidence of flow patterns is expected to increase somewhat with slopes greater than 15%. Water flow patterns are long (15-20 feet), narrow (<1 foot wide), and spaced widely (5-10 yards) on gentle slopes (<15%) and more closely (<5 yards) on steeper slopes (>15%).

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3. **Number and height of erosional pedestals or terracettes:** Rare small pedestals may form at the base of plants that occur on the edge of water flow patterns, but should not show any exposed roots. Terracettes are fairly common, forming behind debris dams of small to medium sized litter (up to 2 inches in diameter) in water flow patterns. These debris dams may accumulate smaller litter (leaves, grass and forb stems) and sediment.

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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 – 60 %. (Soil surface is typically covered 10 to 50 percent surface fragments). Most bare ground is associated with water flow patterns, rills, and gullies. 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. Ground cover + bare ground = 100%.

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5. **Number of gullies and erosion associated with gullies:** None to rare on gentle slopes (< 15%). On steep slopes and areas below adjacent exposed bedrock, gullies may occur. Length often extends from exposed bedrock until gully reaches a stream or an area where water and sediment accumulate. Gullies may remove soil from base of shrubs and/or trees exposing roots. Gullies may show slightly more indication of erosion as slope increases, or as the site occurs adjacent to steep sites/watershed with concentrated flow patterns.

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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. The stones on the soil surface armor and reduces the potential for wind erosion.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter accumulates at the base of plants. Woody litter is usually not moved unless present in water flow patterns, rills, or gullies.

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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 an erosion rating of 4 or 5 under the plant canopies, and a rating of 4 in the interspaces. The average should be a 4. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface typically varies from 2 to 4 inches. Structure typically varies from fine granular to subangular blocky. Color typically varies from brown (10YR5/3) to pale brown (10YR6/3). The A horizon characteristics are the same under plant canopies or in the interspaces. Refer to soil survey for more detailed information about your specific site.

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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 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. 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 (beyond the reference state) reduces understory vegetation causing an associated increase in 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, although bedrock is found from 4 to 20 inches of soil surface. In addition, 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: trees (Juniper > Pinion) > sprouting shrubs (Buffaloberry, Mormontea, Rabbitbrush)

    Sub-dominant: warm season perennial grasses (Galleta) = cool season perennial grasses (Indian ricegrass) = non sprouting shrubs (Cliffrose, Snakeweed) > forbs > Biological soil crusts

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

    Additional: Factors contributing to temporal variability include insects and other pathogens (mistletoe), drought, extreme precipitation events, etc. Factors contributing to spatial variability include slope, amount of rock fragments, aspect, etc. Following a recent disturbance such as fire, drought or insects that may remove the woody vegetation, forbs and perennial grasses (herbaceous species) may become more dominate in the community. These conditions may reflect a functional community phase within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above-average precipitation, there should be very little recent mortality or decadence apparent in trees, shrubs, or grasses. During severe (multi-year) drought up to 20% of the junipers may die, either from drought or pathogens such as mistletoe. There may be partial mortality of individual bunchgrasses and other shrubs during drought. Some bunchgrass and shrub mortality may occur during severe droughts, particularly on the shallower and coarser soils associated with this site. Because woody stems may persist for many years, juniper (especially older trees) will normally have dead stems within the plant canopy.

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14. **Average percent litter cover (%) and depth (in):** Litter cover (including under plants) nearly all of which should be fine litter. Depth should be 1 leaf thickness in the interspaces and up to ¼" under canopies, and up to ¾" under tree canopies. Litter cover may increase to 30% on some years due to increased production of plants.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 240-580 #/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, Broom snakeweed, and Mustard may invade the community.

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