USDA Natural Resources
Conservation Service

Ecological site R035XY315UT
Upland Shallow Loam (Pinyon-Utah Juniper) AWC <3

Accessed: 05/18/2024

General information

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

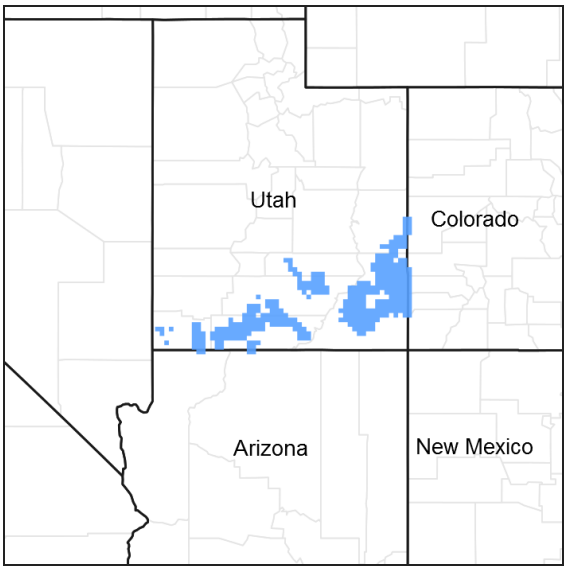


Figure 1. Mapped extent

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

MLRA notes

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

Site concept: This site occurs in the upland zone of the Colorado and Green River Plateaus Region (MLRA 35) in Southern Utah. It is found on structural benches, plateaus, mesas, and cuestas at elevations between 5200 and 8000 feet. Average annual precipitation is 12 to 16 inches, with much of the summer precipitation occuring as convective thunderstorms from July through October. Soils are shallow sandy loams over bedrock derived from sandstone residuum, eolian deposits, colluvium, and/or slope alluvium. The soil moisture regime is aridic ustic and the soil temperature regime is mesic. Two-needle pinyon is the dominant plant, and Utah juniper is also abundant. Divers shrubs and grasses make up a small component of the plant community. This site rarely burned under natural conditions. Cheatgrass is the most likely invader, but it does not dominate on this site.

Classification relationships

Modal Soil: Rizno FSL — loamy, mixed (Calcareous), mesic Lithic Ustic Torriorthents

Ecological site concept

This ecological site has an Available Water Capacity (AWC) of less than 3 inches.

Associated sites

R035XY221UT	**Semidesert Shallow Loam (Utah Juniper-Pinyon)**
R035XY237UT	**Semidesert Shallow Gypsum (Mormontea)**
R035XY302UT	**Upland Dissected Slope (Twoneedle Pinyon-Utah Juniper)**
R035XY306UT	**Upland Loam (Basin Big Sagebrush)**
R035XY308UT	**Upland Loam (Mountain Big Sagebrush)**
R035XY311UT	**Upland Shallow Dissected Slope (Pinyon-Utah juniper)**
R035XY312UT	**Upland Shallow Loam (Black sagebrush)**
R035XY313UT	**Upland Shallow Loam (Cliffrose)**
R035XY314UT	**Upland Shallow Sand (Pinyon-Utah Juniper)**
R035XY317UT	**Upland Steep Stony Loam (Utah Juniper-Pinyon)**
R035XY318UT	**Upland Stony Loam (Wyoming Big Sagebrush, Indian Ricegrass)**
R035XY321UT	**Upland Stony Loam (Pinyon-Utah Juniper)**
R035XY328UT	**Upland Very Steep Stony Loam (Pinyon-Utah Juniper)**
R048AY415UT	**Mountain Loam (Oak)**

Similar sites

R035XY316UT	**Upland Shallow Loam (Pinyon-Utah Juniper) AWC >3** This ecological site has an AWC of less than 3 inches, while ecological site R035XY315UT has an AWC of greater than 3 inches. There is a corresponding difference in total vegetative production.
R035XY311UT	**Upland Shallow Dissected Slope (Pinyon-Utah juniper)**

Table 1. Dominant plant species

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

Physiographic features

This site occurs on structural benches, plateaus, mesas, and cuestas. Runoff is high to very high (due to the shallow depth). Slopes typically range from 2-15%, but can be as high as 50%. Elevations are generally 5200-8000 ft.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Plateau (3) Mesa
Flooding frequency	None
Ponding frequency	None
Elevation	1,585–2,438 m
Slope	2–50%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by warm summers and cold winters. Large fluctuations in daily temperatures are common. Average annual precipitation ranges from 12 to 16 inches, with much of the summer precipitation in the form of convective thunderstorms from July to October. On the average February, May, and June are the driest months and August, September, and October are the wettest months. In average years, plants begin growth around March 10 and end groth around October 10.

Table 3. Representative climatic features

Frost-free period (average)	126 days
Freeze-free period (average)	150 days
Precipitation total (average)	406 mm

Influencing water features

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

Soil features

Soils of this site are shallow sandy loams over sandstone bedrock. They formed in eolian deposits, slope alluvium and/or colluvium over residuum derived mainly from sandstone and shale parent materials. Rock fragments are uncommon on the soil surface and in the profile, but can be abundant in some areas for this site. The soil moisture regime is aridic ustic and the soil temperature regime is mesic. Available water holding capacity ranges from 0.8 to 2.5 inches of water in the entire profile. These soils are usually in complex with rock outcrop. On areas where soils are very shallow, production and plant density are lower.

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

UT631 – Henry Mountains Area – Redcreek; Tolman
UT633 – Canyonlands Area – Rizno; Shalako
UT636 – Panguitch Area – Lazear; Ustic Torrifluvents; Zyme
UT638 – San Juan County – Rizno; Skos
UT639 – San Juan Area – Montevale
UT646 – Dixie National Forest – Lazear; Rizno; Skos; Ustic Torrifluvents
UT651 – Fishlake National Forest – Rizno; Skos
UT685 – Capital Reef National Park – Kydestya, Vessilla, Nozhoni, Gladel;
UT686 – Escalante Grande Staircase National Monument – Arabrab; Aridic Ustorthents; Atarque; Blazon; Bond; Clapper; Colskel; Menefee; Sojourn; Vessilla; Zigzag
UT689 –Glen Canyon National Recreation Area – Gladel

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone and shale (2) Eolian sands–conglomerate (3) Slope alluvium–sandstone
Surface texture	(1) Fine sandy loam (2) Sandy loam (3) Very stony very fine sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	10–51 cm
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–27%

Available water capacity (0-101.6cm)	2.03–6.35 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	6–15%
Subsurface fragment volume >3" (Depth not specified)	0–27%

Ecological dynamics

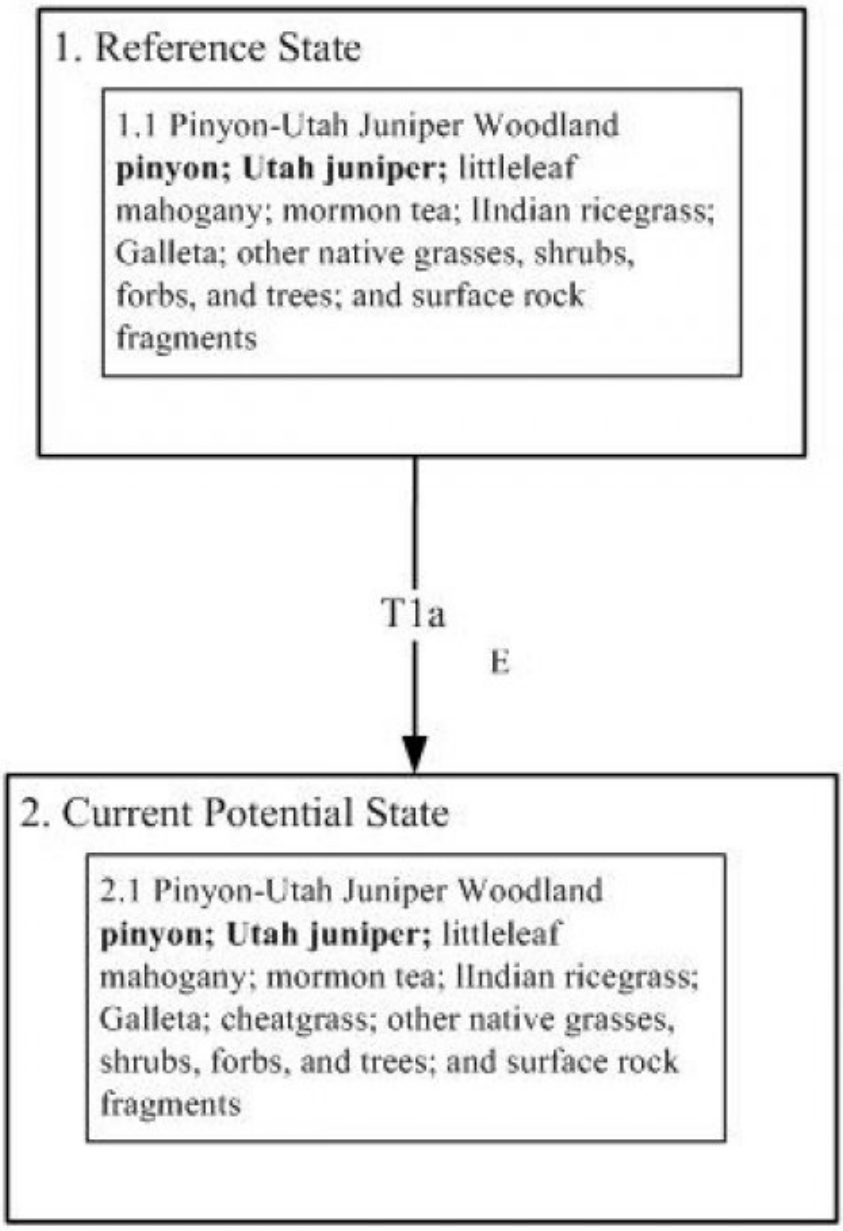
This site's plant species composition is generally dominated by Utah juniper and twoneedle pinyon.
Drought and insects appear to be the main driving factors in many of the Pinyon/Juniper communities of Utah. Betancourt et al. (1993), noted that Pinyon and Juniper woodlands in the southwest appear to 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. Large die offs of pinions due to insects and drought have not been recorded for this ecological site. However, given the tendency for pinions to be susceptible to insect and drought kill, managers should be aware of the possibility.

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.

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

R035XY315UT Upland Shallow Loam (Pinyon-Utah Juniper)



Legend:
E = Establishment of non-native species

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 twoneedle pinyon and Utah juniper, however depending on disturbance history, native grasses, forbs, or other shrubs may occupy significant composition in the plant community. Typically, in the reference state this site is self sustainable; however once invasive plants establish, return to this community may not be possible. Study of relict areas (Mason et al. 1967) and Capitol Reef National Park were used to develop the reference state concepts. Reference State: Twoneedle pinyon and Utah juniper woodland Indicators: A community dominated by twoneedle

pinyon and Utah juniper, where shrubs, and native perennial grasses and forb production is variable. Feedbacks: 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. Trigger: The establishment of invasive plant species.

Community 1.1
Utah Juniper-Pinyon Woodland

Figure 4. Reference State

This community phase is characterized by a twoneedle pinyon and Utah juniper upper canopy. In the lower canopy, commonly seen grasses include Indian ricegrass and galleta. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground is variable (6-16%) depending on surface rock cover, which is also variable (8-54%). The composition by air dry weight is approximately 20% perennial grasses, 10% forbs, 45% shrubs, and 25% trees. In average years, plants begin growth around March 10 and end growth around October 10.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	336	516	695
Shrub/Vine	67	135	224
Grass/Grasslike	22	34	56
Forb	11	17	22
Total	**436**	**702**	**997**

Table 6. Ground cover

Tree foliar cover	18-34%
Shrub/vine/liana foliar cover	2-14%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-2%
Non-vascular plants	0%
Biological crusts	0-4%
Litter	12-24%
Surface fragments >0.25" and <=3"	0-27%
Surface fragments >3"	0-27%
Bedrock	4-20%
Water	0%

Bare ground	6-14%

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	–	2-14%	0-5%	0-2%
>0.3 <= 0.6	–	0-12%	0-5%	0-2%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	3-8%	–	–	–
>4 <= 12	10-34%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

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: Twoneedle pinyon and Utah juniper woodland Indicators: A community dominated by twoneedle pinyon and Utah juniper, where shrubs, and native perennial grasses and forb production is variable. Feedbacks: Disturbances that may allow for the establishment of invasive species.

Community 2.1
Utah Juniper-Pinyon Woodland

This community phase is characterized by a twoneedle pinyon and Utah juniper upper canopy. In the lower canopy, commonly seen grasses include Indian ricegrass and galleta. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground is variable (6-16%) depending on surface rock cover, which is also variable (8-54%). The composition by air dry weight is approximately 20% perennial grasses, 10% forbs, 45% shrubs, and 25% trees. In average years, plants begin growth around March 10 and end growth around October 10.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	336	516	695
Shrub/Vine	67	135	224
Grass/Grasslike	22	34	56
Forb	6	17	22
Total	**431**	**702**	**997**

Table 9. Ground cover

Tree foliar cover	18-34%

Shrub/vine/liana foliar cover	2-14%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-2%
Non-vascular plants	0%
Biological crusts	0-4%
Litter	12-24%
Surface fragments >0.25" and <=3"	0-27%
Surface fragments >3"	0-27%
Bedrock	4-20%
Water	0%
Bare ground	6-14%

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	–	2-14%	0-5%	0-2%
>0.3 <= 0.6	–	0-12%	0-5%	0-2%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	3-8%	–	–	–
>4 <= 12	10-34%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Transition T1
State 1 to 2

This transition occurs when non-native invasive species, particularly cheatrass, establish on the site.

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Trees**			336–695	
	twoneedle pinyon	PIED	*Pinus edulis*	291–527	16–24
	Utah juniper	JUOS	*Juniperus osteosperma*	67–224	5–12
	black sagebrush	ARNO4	*Artemisia nova*	56–101	–
	mormon tea	EPVI	*Ephedra viridis*	56–101	–
	Mexican cliffrose	PUME	*Purshia mexicana*	6–67	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–67	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–56	0–4
	ponderosa pine	PIPO	*Pinus ponderosa*	0–45	0–2
	needle and thread	HECO26	*Hesperostipa comata*	0–22	0–1

	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–11	0–2
	James' galleta	PLJA	*Pleuraphis jamesii*	0–11	0–2
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–11	0–1
	muhly	MUHLE	*Muhlenbergia*	0–6	0–2
	muttongrass	POFE	*Poa fendleriana*	0–6	0–2
Grass/Grasslike					
1	**Grasses**			6–56	
	blue grama	BOGR2	*Bouteloua gracilis*	0–22	0–2
	Grass, perennial	2GP	*Grass, perennial*	0–22	0–2
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–22	0–2
	needle and thread	HECO26	*Hesperostipa comata*	0–22	0–2
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–20	0–4
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	6–20	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–17	0–3
	sedge	CAREX	*Carex*	0–11	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–6	0–2
	muttongrass	POFE	*Poa fendleriana*	0–6	0–2
	Sandberg bluegrass	POSE	*Poa secunda*	0–6	0–2
Forb					
2	**Forbs**			6–22	
	Forb, annual	2FA	*Forb, annual*	0–22	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–22	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–20	0–5
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–11	0–5
	cryptantha	CRYPT	*Cryptantha*	0–11	0–2
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–6	0–2
	Mt. Diablo helianthella	HECA2	*Helianthella castanea*	0–6	0–2
	rusty lupine	LUPU	*Lupinus pusillus*	0–6	0–2
	rayless tansyaster	MAGR2	*Machaeranthera grindelioides*	0–6	0–2
	Colorado four o'clock	MIMU	*Mirabilis multiflora*	0–6	0–2
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–6	0–2
	mat rockspirea	PECA12	*Petrophytum caespitosum*	0–6	0–2
	Utah penstemon	PEUT	*Penstemon utahensis*	0–6	0–2
	Southern Sierra phacelia	PHAU	*Phacelia austromontana*	0–6	0–2
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–6	0–2
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–6	0–2
	low greenthread	THCA11	*Thelesperma caespitosum*	0–6	0–2
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–6	0–2
	Charleston Mountain goldenbush	ERCO40	*Ericameria compacta*	0–6	0–2
	mustard	BRASS2	*Brassica*	0–6	0–2
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–6	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–6	0–2
	rabbit ear rockcress	ARPE	*Arabis pendulina*	0–6	0–1

Shrub/Vine					
3	**Shrubs**			67–224	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–146	0–4
	Gambel oak	QUGA	*Quercus gambelii*	0–112	0–10
	mormon tea	EPVI	*Ephedra viridis*	11–112	1–8
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–112	0–8
	black sagebrush	ARNO4	*Artemisia nova*	0–101	0–8
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–90	0–8
	manzanita	ARCTO3	*Arctostaphylos*	0–56	0–5
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–45	0–4
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–45	0–2
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–34	0–4
	spiny phlox	PHHO	*Phlox hoodii*	0–22	0–2
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–22	0–2
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–22	0–2
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–20	0–5
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	0–17	0–4
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–11	0–5
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–11	0–2
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–11	0–2
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–11	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–9	0–4
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	0–6	0–2
	Spanish bayonet	YUHA	*Yucca harrimaniae*	0–6	0–2
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–6	0–2
	mountain ball cactus	PESI	*Pediocactus simpsonii*	0–3	0–2

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Trees**			336–695	
	twoneedle pinyon	PIED	*Pinus edulis*	291–527	16–24
	Utah juniper	JUOS	*Juniperus osteosperma*	67–224	5–12
	black sagebrush	ARNO4	*Artemisia nova*	56–101	–
	mormon tea	EPVI	*Ephedra viridis*	56–101	–
	Mexican cliffrose	PUME	*Purshia mexicana*	6–67	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–67	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–56	0–4
	ponderosa pine	PIPO	*Pinus ponderosa*	0–45	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–11	0–2
	cheatgrass	BRTE	*Bromus tectorum*	1–11	0–2
	James' galleta	PLJA	*Pleuraphis jamesii*	0–11	0–2

	[illegible]	[illegible]	*Poa juncifolia*	[illegible]	[illegible]
	muttongrass	POFE	*Poa fendleriana*	0–6	0–2
	muhly	MUHLE	*Muhlenbergia*	0–6	0–2
Grass/Grasslike					
1	**Grasses**			22–56	
	Grass, perennial	2GP	*Grass, perennial*	0–34	0–2
	blue grama	BOGR2	*Bouteloua gracilis*	0–22	0–2
	needle and thread	HECO26	*Hesperostipa comata*	0–22	0–2
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–22	0–2
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–20	0–4
	purple threeawn	ARPU9	*Aristida purpurea*	0–17	0–3
	sedge	CAREX	*Carex*	0–17	0–1
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–11	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–6	0–2
	muttongrass	POFE	*Poa fendleriana*	0–6	0–2
	Sandberg bluegrass	POSE	*Poa secunda*	0–6	0–2
Forb					
2	**Forbs**			6–22	
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–20	0–5
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–11	0–5
	cryptantha	CRYPT	*Cryptantha*	0–11	0–2
	rabbit ear rockcress	ARPE	*Arabis pendulina*	0–11	0–1
	Forb, annual	2FA	*Forb, annual*	0–11	–
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–6	0–2
	Charleston Mountain goldenbush	ERCO40	*Ericameria compacta*	0–6	0–2
	mustard	BRASS2	*Brassica*	0–6	0–2
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–6	0–2
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–6	0–2
	rusty lupine	LUPU	*Lupinus pusillus*	0–6	0–2
	rayless tansyaster	MAGR2	*Machaeranthera grindelioides*	0–6	0–2
	Colorado four o'clock	MIMU	*Mirabilis multiflora*	0–6	0–2
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–6	0–2
	mat rockspirea	PECA12	*Petrophytum caespitosum*	0–6	0–2
	Utah penstemon	PEUT	*Penstemon utahensis*	0–6	0–2
	Southern Sierra phacelia	PHAU	*Phacelia austromontana*	0–6	0–2
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–6	0–2
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–6	0–2
	low greenthread	THCA11	*Thelesperma caespitosum*	0–6	0–2
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–6	0–2
	Mt. Diablo helianthella	HECA2	*Helianthella castanea*	0–6	0–2
Shrub/Vine					
3	**Shrubs**			67–224	
	alderleaf mountain	CEMO2	*Cercocarpus montanus*	0–146	0–4

	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–140	0–4
	mormon tea	EPVI	*Ephedra viridis*	11–112	1–8
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	0–112	0–8
	Gambel oak	QUGA	*Quercus gambelii*	0–112	0–8
	black sagebrush	ARNO4	*Artemisia nova*	0–101	0–8
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–90	0–8
	manzanita	ARCTO3	*Arctostaphylos*	0–84	0–5
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–45	0–4
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–45	0–2
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–45	0–2
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–34	0–4
	spiny phlox	PHHO	*Phlox hoodii*	0–22	0–2
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–22	0–2
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–20	0–5
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	0–17	0–4
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–11	0–5
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–11	0–2
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–11	0–2
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–11	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–9	0–4
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	0–6	0–2
	Spanish bayonet	YUHA	*Yucca harrimaniae*	0–6	0–2
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–6	0–2
	mountain ball cactus	PESI	*Pediocactus simpsonii*	0–3	0–2

Animal community

--Wildlife Interpretations--
The scarcity of water up on the mesas limits the species richness and the abundance of large mammals. This site provides thermal cover and limited forage opportunities for mule deer and elk. Birds, bats, lizards, snakes and rodents are more common. Birds from several families are common, from hawks to sparrows. 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. 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, and several species of Peromyscus. Coyotes and kit foxes will also forage in the area; however dens are likely to be located in other ecological sites due to shallow soils and/or presence rocks fragments and rock outcrop. 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
Animals – The Yellow-billed Cuckoo (Coccyzus americanus) and the Mexican Spotted Owl (Strix occidentalis lucida) may use this ecological site. This site also provides foraging and roosting opportunities for Bald Eagles (Haliaeetus leucocephalus). Ferruginous Hawks (Buteo regalis), and Northern Goshawks (Accipiter gentilis) are also spotted foraging and roosting in this site. If the area is open, possible suitable nesting habitat for ferruginous hawks is available.

--Grazing Interpretations--
This site provides fair grazing conditions for livestock during spring, summer, and fall when in good ecological

condition due to accessibility and nutritious forage. However, this site often lacks natural perennial water sources, which can influence the suitability grazing. Care should be taken to maintain the native perennial grasses and shrubs due to the poor suitability for re-seeding or restoring this site. The suitability for reseeding and/or restoration is poor due to the shallow soil characteristics of the site.

The plant community is primarily twoneedle pinyon and Utah juniper with an understory or shrubs which provide browse for cattle, sheep, and goats. Cattle will typically only use mormontea in the late fall and winter when nutrient needs cannot be met by palatable shrubs and dormant grasses alone. Rabbitbrush is rarely used as forage by livestock species. The presence of grasses, including Indian ricegrass and galleta, provide grazing habitat for all classes of livestock. Utah juniper and pinyon pine provide good cover for livestock. 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--

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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). Slopes range from 2-15 percent on this site. However, slope does not affect the runoff or soil loss on this site. Average runoff is typically about 0.6 inches per year, but may be as high as 2.14 inches in a single 100-year storm event. Soil loss is typically.08 tons per acre on an average year, and from .3 tons per acre during a 100-year storm event. Long-term soil loss is not a concern on this site. Average rainfall ranges from 12-16 inches per year, but a single 100-year storm event can generate 3 inches of precipitation in a 24-hour period.
The grasses and forbs in the tree interspaces have a minimal impact on water flow patterns due to low production. Heavy grazing does not significantly alter the hydrology since this pinyon juniper community is not typically affected by livestock. Interspaces are typically protected by rock fragments.

Soil Group Curve Number
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.

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Recreational uses

Recreation activities include aesthetic value and opportunities for camping, hiking and hunting. The more open canopy, gentle slopes, and proximity of this site to the canyon walls, makes this site popular for hiking trails. The tall trees and opens understory creates camp sites that provide shade and protection from the wind. Trees provide screening values for camping and picnicking. In addition, during certain years, this site provides good opportunities for pinyon nut collection.

Wood products

Posts and firewood

Other information

--Poisonous/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 will typically only graze broom snakeweed when other forage is unavailable and generally in winter when toxicity levels are at their lowest. (Knight and Walter, 2001)

Potentially toxic plants associated with this site include Wyoming big sagebrush. Wyoming big sagebrush contains sesquiterpene lactones and monoterpenes which have been suspected of being toxic to sheep. An experimental dosage of ¾ lbs of big sagebrush fed to sheep for three days was found to be lethal. (Knight and Walter, 2001)

Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors, such as after a rain storm during a drought, cool/cloudy days, and soils high in nitrogen and low in sulfur and phosphorus, all which cause increased nitrate accumulation. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora and thus are able to degrade the toxin before clinical poisoning can occur. (Knight and Walter, 2001)

--Invasive Plant Communities--
Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are the non-native annual invaders including cheatgrass, Russian thistle, kochia, halogeton, and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible.

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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.

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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:** One steeper slopes (>10): Rills are long and common. On more gentle slopes (< 10 %): Rills are few, but occur throughout site. Rills may be 6 to 10 feet in length. Sides of rills may be up to 3 inches high. 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 (> 12 %): Common. Occur throughout the site. Rills may extend down entire slope.

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2. **Presence of water flow patterns:** Frequent and occur throughout area. Interspaces between well developed biological soil crusts appear to be water depression storage areas but actually serve as water flow patterns across areas covered with biological soil crust during episodic precipitation events. Evidence of flow will increase somewhat with slope.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals form at the base of plants that occur on the edge of rills. On steep slopes (>12%), 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 present. Some 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):** 6 – 16 %. Most bare ground is associated with water flow patterns, rills, and gullies. The soil surface is covered by up to 54% 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. Ground cover + bare ground = 100%.

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5. **Number of gullies and erosion associated with gullies:** None to few on gentle slopes (< 10 %). On steep slopes and areas below adjacent exposed bedrock, gullies may be numerous. 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 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):** On gentle slopes (< 10 %) most litter accumulates at base of plants. Woody stems from trees not moved unless present in water flow pattern, rill, or gully. On steep slopes (> 20 %), 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, and a rating of 2 to 4 in the interspaces. The average should be a 4. 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 varies from 1 to 2 inches. Structure is medium platy. Color is light red (2.5YR6/6). There is little if any difference under canopy or in interspaces and a recognizable A horizon is expected to be present throughout. 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 within 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: Dominance by average annual production: Shrubs >> Trees (Pinion > Juniper) > cool season perennial grasses > warm season perennial grasses > forbs. Functional/structural groups may appropriately contain non-native

species if their ecological function is the same as the native species in the reference state (e.g. Crested wheatgrass, Intermediate wheatgrass, etc.)

Sub-dominant: galleta, Mormontea, Indian ricegrass, Nevada bluegrass. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

Other:

Additional: Biological soil crust is variable in it's expression where present on this site and is measured as a component of ground cover.
Following a recent disturbance such as fire, drought, or insects that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. If a disturbance has not occurred for an extended period of time, woody species may continue to increase crowding out the perennial herbaceous understory species. In either case, these conditions would 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):** Several standing dead trees may be present on the site and approximately 30 % of the trees can show evidence of decadence. All age classes of perennial grasses should be present under average growing condition with a decrease in age class expression under below average conditions, or on sites with high (usually greater than 65%) similarity index (late seral to historic climax). 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):** Litter cover 12-24%. Variability may occur due to weather.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 500-890lbs/acre

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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 and introduced annual forbs are 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.
