USDA Natural Resources
Conservation Service

Ecological site R035XY314UT
Upland Shallow Sand (Pinyon-Utah Juniper)

Accessed: 05/03/2024

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.

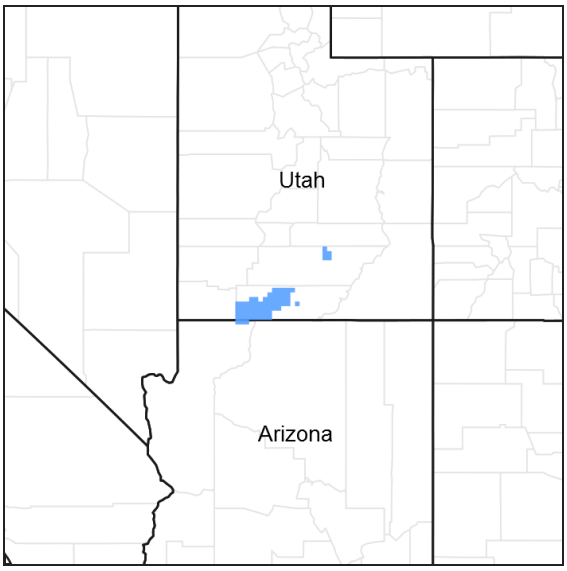

Figure 1. Mapped extent

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 sandsheets, dunes, and blowouts atop structural benches and mesas at elevations between 5200 and 7900 feet. Average annual precipitation is 11 to 15 inches, with much of the summer precipitation occuring as convective thunderstorms from July through October. Soils are shallow sands over bedrock derived from eolian deposits and sandstone residuum. 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. Diverse shrubs, including mahogany and manzanita, can also be very abundant, while grasses and forbs make up a very 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.

Similar sites

R035XY324UT	**Upland Sand (Utah Juniper-Pinyon)** This site has deep sandy soils, and much higher production of grasses and shrubs.
R035XY323UT	**Upland Stony Sand (Utah Juniper-Pinyon)** This site has deep stony sandy soils, and has much higher production.

R035XY227UT	**Semidesert Shallow Sand (Utah Juniper-Pinyon)** This site has similar soils and plant community composition, but recieves less than 11 inches of precipitation.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on sand sheets, dunes, and blowouts atop structural benches and mesas. It is found on 2-50% slopes at elevations between 5200 and 7900 feet.

Table 2. Representative physiographic features

Landforms	(1) Sand sheet (2) Dune (3) Blowout
Flooding frequency	None
Ponding frequency	None
Elevation	1,585–2,408 m
Slope	2–50%

Climatic features

The climate of this site is characterized by warm summers and cold winters. Average annual precipitation ranges from 11-15 inches. June is typically the driest month, as well as April and May. About 30% of the precipitation occurs as cool-season moisture from January to March, while 40% of the moisture occurs as convective thunderstorms from July through October. Large fluctuations in daily temperature are common, and precipitation varies greatly from month to month and from year to year.

Modeled climate data (PRISM) was used to develop this section.

Table 3. Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	140 days
Precipitation total (average)	381 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 shallow sands with very few rock fragments on the soil surface and throughout the profile. They formed in eolian sand deposits and/or residuum derived from sandstone. Textures range from loamy fine sands to fine sands with rapid permeabilitiy and somewhat excessive drainage. The soil moisture regime is aridic ustic and the soil temperature regime is mesic. Available water-holding capacity ranges from 0.5 to 2.0 inches of water in the entire profile, depending mostly on soil depth.

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

UT629 - Loa, Marysvale Area - Hozho;
UT642 - Kane County Area - Parkwash;
UT685 - Capitol Reef - Parkwash, Nizhoni;
UT686 - Escalante Grand Staircase - Parkwash;

Table 4. Representative soil features

Parent material	(1) Eolian sands–sandstone
Surface texture	(1) Loamy fine sand (2) Fine sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Rapid to very rapid
Soil depth	10–51 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–7%
Available water capacity (0-101.6cm)	1.27–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	0–2%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.2–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

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.

The suitability for range seeding is poor. The major limiting factor is shallow soils, lack of dependable precipitation and low available water capacity.

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

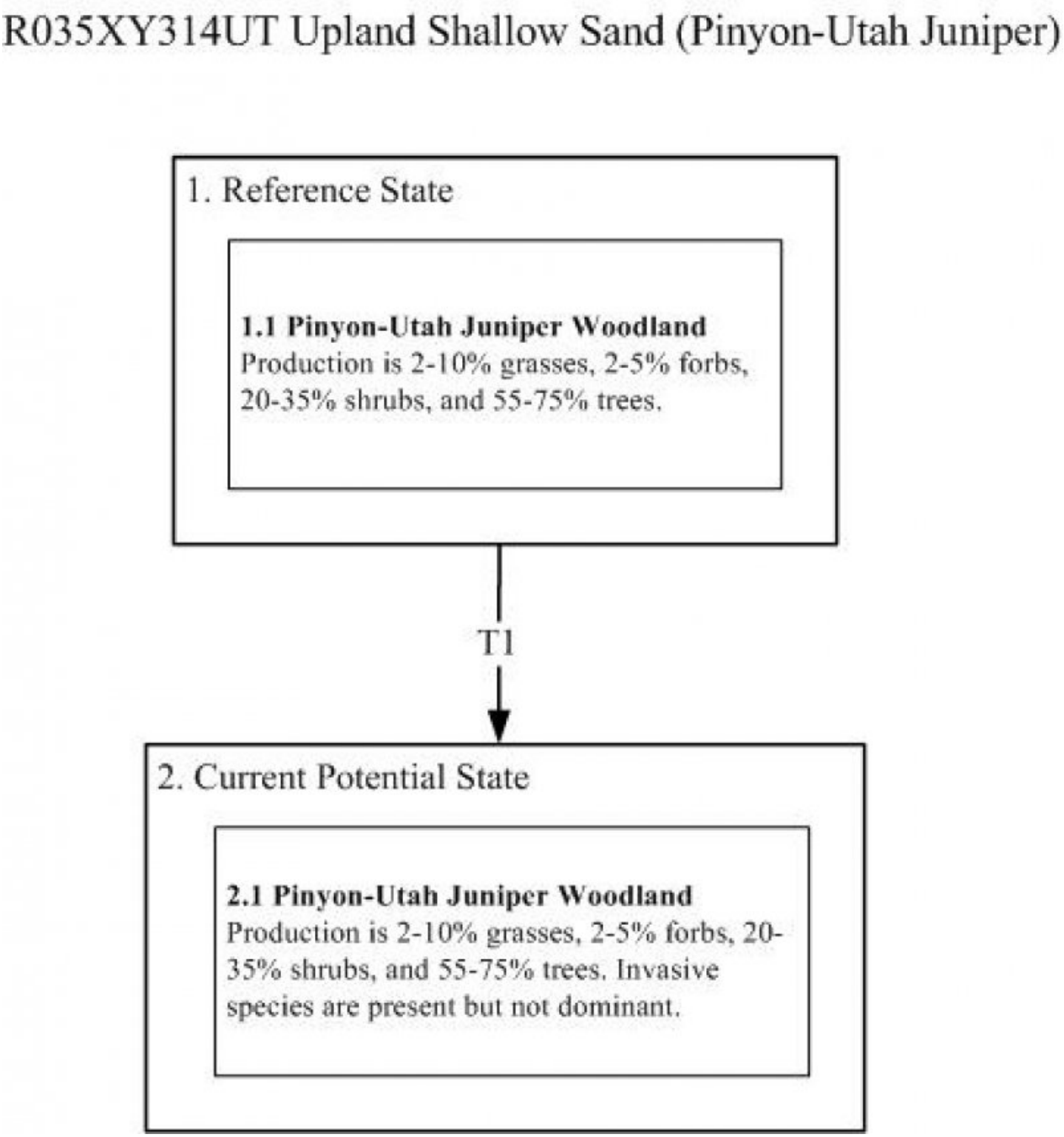

Figure 4. State-and-Transition Model

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 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 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
Pinyon-Utah Juniper Woodland

Survey, Parkwash soil. UTM NAD83 Zone 12S, 484294 E. 4211809 N. Photo by Jake Owens, August 16, 2010.

Figure 5. Phase 1.1

This state is dominated by two-needle pinyon with abundant Utah juniper. Shrubs such as littleleaf mountainmahogany and manzanita often dominate the understory. Herbaceous species are not typically very abundant. Composition by air-dry weight is 2-10% grasses, 0-5% forbs, 25-40% shrubs, and 55-75% trees.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	168	252	336
Shrub/Vine	56	112	168
Grass/Grasslike	11	28	39
Forb	6	17	28
Total	**241**	**409**	**571**

Table 6. Ground cover

Tree foliar cover	10-20%
Shrub/vine/liana foliar cover	5-15%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-10%

Litter	5-15%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-7%
Bedrock	0-10%
Water	0%
Bare ground	30-45%

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	–	0-5%	0-5%	0-3%
>0.3 <= 0.6	–	5-10%	0-5%	0-2%
>0.6 <= 1.4	0-5%	0-5%	–	–
>1.4 <= 4	10-20%	–	–	–
>4 <= 12	0-5%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

State 2
Current Potential State

The current potential state is similar to the reference state in community structure and ecological function, however invasive species are present. This state is generally dominated by twoneedle pinyon and Utah juniper, with mahogany and/or manzanita abundant in the understory. 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 has reduced resillience due to the presence of non-native invasive species. Current Potential State: Twoneedle pinyon and Utah juniper woodland Indicators: A community dominated by twoneedle pinyon and Utah juniper, where non-native invasive species are present. Feedbacks: Disturbances that may allow for the establishment of invasive species.

Community 2.1
Invaded Pinyon-Utah Juniper Woodland

This phase is dominated by two-needle pinyon and Utah juniper, with non-native invasive species present but not dominant. Shrubs such as littleleaf mountainmahogany and manzanita often dominate the understory. Herbaceous species are not typically very abundant. Composition by air-dry weight is 2-10% grasses, 0-5% forbs, 25-40% shrubs, and 55-75% trees.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	168	252	336
Shrub/Vine	56	112	168
Grass/Grasslike	11	28	39
Forb	6	17	28
Total	**241**	**409**	**571**

Table 9. Ground cover

Tree foliar cover	10-20%
Shrub/vine/liana foliar cover	5-15%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-10%
Litter	5-15%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-7%
Bedrock	0-10%
Water	0%
Bare ground	30-45%

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	–	0-5%	0-5%	0-3%
>0.3 <= 0.6	–	5-10%	0-5%	0-2%
>0.6 <= 1.4	0-5%	0-5%	–	–
>1.4 <= 4	10-20%	–	–	–
>4 <= 12	0-5%	–	–	–
>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	**Dominant Trees**			168–336	
	twoneedle pinyon	PIED	*Pinus edulis*	112–280	8–15
	Utah juniper	JUOS	*Juniperus osteosperma*	56–168	4–8
Shrub/Vine					
0	**Dominant Shrub**			28–140	
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–101	0–7
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–84	0–5
	greenleaf manzanita	ARPA6	*Arctostaphylos patula*	0–56	0–4
2	**Sub-dominant Shrubs**			0–73	

3	**Sub-dominant Shrubs**			0–73	
	mormon tea	EPVI	*Ephedra viridis*	0–34	0–2
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–34	0–2
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–17	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–11	0–1
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–11	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–11	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	0–1
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–6	0–1
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–6	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–6	0–1
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–6	0–1
Grass/Grasslike					
1	**Grasses**			11–39	
	Grass, perennial	2GP	*Grass, perennial*	0–22	0–2
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–17	0–1
	blue grama	BOGR2	*Bouteloua gracilis*	0–17	0–1
	Grass, annual	2GA	*Grass, annual*	0–17	0–1
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–11	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–11	0–1
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–6	0–1
	muttongrass	POFE	*Poa fendleriana*	0–6	0–1
	Sandberg bluegrass	POSE	*Poa secunda*	0–6	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–6	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–6	0–1
Forb					
2	**Forbs**			6–28	
	Forb, perennial	2FP	*Forb, perennial*	0–22	0–2
	Forb, annual	2FA	*Forb, annual*	0–17	0–1
	ponderosa pine	PIPO	*Pinus ponderosa*	0–13	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–11	0–1
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–11	0–1
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–11	0–1
	hoary tansyaster	MACA2	*Machaeranthera canescens*	0–11	0–1
	beardtongue	PENST	*Penstemon*	0–6	0–1
	cleftleaf wildheliotrope	PHCR	*Phacelia crenulata*	0–6	0–1
	nodding buckwheat	ERCE2	*Eriogonum cernuum*	0–6	0–1
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–6	0–1
	Bonneville pea	LABR	*Lathyrus brachycalyx*	0–6	0–1
	milkvetch	ASTRA	*Astragalus*	0–6	0–1
	bastard toadflax	COUM	*Comandra umbellata*	0–6	0–1

Table 12. Community 2.1 plant community composition

				Annual Production	Foliar Cover

Group	Common Name	Symbol	Scientific Name	(Kg/Hectare)	(%)
Tree					
0	**Dominant Trees**			168–336	
	twoneedle pinyon	PIED	*Pinus edulis*	112–280	8–15
	Utah juniper	JUOS	*Juniperus osteosperma*	56–168	4–8
Shrub/Vine					
0	**Dominant Shrub**			28–140	
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–101	0–7
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–84	0–5
	greenleaf manzanita	ARPA6	*Arctostaphylos patula*	0–56	0–4
3	**Sub-dominant Shrubs**			0–73	
	mormon tea	EPVI	*Ephedra viridis*	0–34	0–2
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–34	0–2
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–17	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–11	0–1
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–11	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–11	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	0–1
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–6	0–1
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–6	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–6	0–1
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–6	0–1
Grass/Grasslike					
1	**Grasses**			11–39	
	Grass, perennial	2GP	*Grass, perennial*	0–22	0–2
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–17	0–1
	blue grama	BOGR2	*Bouteloua gracilis*	0–17	0–1
	Grass, annual	2GA	*Grass, annual*	0–17	0–1
	cheatgrass	BRTE	*Bromus tectorum*	0–11	0–1
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–11	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–11	0–1
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–6	0–1
	muttongrass	POFE	*Poa fendleriana*	0–6	0–1
	Sandberg bluegrass	POSE	*Poa secunda*	0–6	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–6	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–6	0–1
Forb					
2	**Forbs**			6–28	
	Forb, perennial	2FP	*Forb, perennial*	0–22	0–2
	Forb, annual	2FA	*Forb, annual*	0–17	0–1
	ponderosa pine	PIPO	*Pinus ponderosa*	0–13	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–11	0–1
	sulphur flower buckwheat	ERUM	*Eriogonum umbellatum*	0–11	0–1

	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–11	0–1
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–11	0–1
	hoary tansyaster	MACA2	*Machaeranthera canescens*	0–11	0–1
	beardtongue	PENST	*Penstemon*	0–6	0–1
	cleftleaf wildheliotrope	PHCR	*Phacelia crenulata*	0–6	0–1
	nodding buckwheat	ERCE2	*Eriogonum cernuum*	0–6	0–1
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–6	0–1
	Bonneville pea	LABR	*Lathyrus brachycalyx*	0–6	0–1
	milkvetch	ASTRA	*Astragalus*	0–6	0–1
	bastard toadflax	COUM	*Comandra umbellata*	0–6	0–1

Animal community

--Livestock and Wildlife Grazing--

This site provides fair grazing conditions for livestock and wildlife 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 for livestock and wildlife grazing. Care should be taken to maintain the native perennial grasses and shrubs due to the poor suitability for re-seeding or restoring this site. The suitability for reseeding and/or restoration is poor due to the lack of precipitation at critical times and shallow soil characteristics. This site may occur in mule deer and desert bighorn sheep habitat; however in many places the populations will be small and have little grazing impact on the site.

The plant community is primarily shrubs, including mountain big sagebrush, mormontea, greenleaf manzanita, antelope bitterbrush, and broom snakeweed, which provide browse for cattle, sheep, goats, mule deer, and bighorn sheep. The presence of grasses, including Indian ricegrass, blue grama and needleandthread, provide desirable grazing conditions for all classes of livestock and wildlife. Utah juniper, pinyon pine, and the occasional ponderosa pine provide good cover for livestock and wildlife. Mule deer and goats may utilize these trees as forage. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. However, forb composition should be monitored for species diversity, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation must be made.

--References--

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

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

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

Recreational uses

Recreational activities include aesthetic values, hiking, and hunting.

Wood products

The site index for this site is 45. Wood is used for fenceposts and firewood.

Other information

--Poisonous/Toxic Plant Communities--

Toxic plant communities associated with this site include broom snakeweed, sand sagebrush, and ponderosa pine. 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. Sand sagebrush is toxic to horses, but not to other livestock and wildlife ruminants. This plant contains sesquiterpene lactones and monoterpenes, where toxic concentrations are greatest in the late fall and winter. Horses develop neurological signs and exhibit abnormal behavior, such as ataxia and the tendency to fall down, after eating sand sagebrush for several days. Ponderosa pine can occur on this site and is associated with rock outcrop and cliffs due to the extra water available from runoff in these landscape positions. The needles of this tree are toxic to cattle during the last trimester of pregnancy; when consumed isocupressic acid will cause premature parturition or abortion. Generally cattle will only consume pine needles when palatable forage is scarce.

Potentially toxic plants associated with this site include some buckwheat species and mountain and Wyoming big sagebrush. Some buckwheat species may accumulate selenium, but only when growing on selenium enriched soils. These plants, when consumed will cause alkali disease or chronic selenosis, which affects all classes of livestock (excluding goats). Typically animals consuming 5-50 ppm selenium will develop chronic selenosis and animals consuming greater than 50 ppm selenium will develop acute selenosis. Clinical signs include lameness, soughing of the hoof, hair loss, blindness, and aimless wondering. Horses tend to develop what is called a “bob” tail or “roached” main due to breakage of the long hairs. Mountain and 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.

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

--Invasive Plant Communities--

Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are 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.

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

The pinyon and Utah juniper communities in the Colorado Plateau are unique. These sites have a natural occurring fire regime, but this is not understood very well due to the difficulty in reconstructing fire histories in these ecosystems. The difficulty results from a lack of living fire-scarred trees in this area. These trees can support stand-replacing fires, though historically, fires were likely a mixture of surface and crown fires with intensities and frequencies dependent on site productivity. Most research agrees that historic fire return intervals are at a minimum

100 years, indicating that fire may have not played an important role in community dynamics. Fires are more common when trees are stressed or dead due to drought and/or beetle infestations. Pinyon-juniper stands reestablish either by seeds dispersed from adjacent unburned patches or by unburned seeds found at the burn site. Continuous (every 20-40 years) burning of these ecological sites can result in shrub dominated communities, due to the relatively fast recovery of shrubs when compared to trees. If invasive annual grasses are allowed to establish fires may become more frequent, inhibiting the site's ability to recover.

--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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Other references

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Contributors

Susanne Mayne

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), Randy Beckstrand (BLM), Dana Truman (NRCS), Paul Curtis (BLM), Shane A. Green (NRCS)
Contact for lead author	shane.green@ut.usda.gov
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:** A. On more gentle slopes (< 10 %): Rare to Common and occur most likely to form below adjacent exposed bedrock or water flow patterns where sufficient water accumulates to cause erosion. Rills may be 10 or more feet in length. Sides of rills may be up to 4 inches high. B. On steeper slopes (> 20 %): Common. Occur throughout the site. Rills may extend down entire slope. Rills increase immediately following episodic storm events, and they heal rapidly due to the coarse soil textures.

2. **Presence of water flow patterns:** Frequent and occur throughout area on gentle slopes (<10 %). Interspaces between well developed biological soil crusts appear to be depression water storage areas but can serve as somewhat stable water flow patterns across areas covered with biological soil crust during episodic precipitation events. Flow patterns become more visible on steeper slopes

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3. **Number and height of erosional pedestals or terracettes:** Few. Pedestals form at base of plants that occur on the edge of rills or water flow patterns. On steep slopes (>20 %), gullies may remove soil from base of trees exposing roots that resemble pedestals. Interspaces between well developed biological soil crusts resemble pedestals and may be up to 3 inches high. Terracettes are common. Debris dams of small to medium sized litter (up to 2 inches in diameter) may form in water flow patterns, rills, and gullies. These debris dams may accumulate smaller litter (leaves, grass and forb stems).

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 25 – 35 %. 0 to 5% rock fragments. Most bare ground is associated with water flow patterns, rills, and gullies. Areas with well developed biological soil crusts should not be counted as bare ground. Areas with poorly developed biological soil crusts that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground. Ground cover is based on first raindrop impact, and bare ground is the opposite of ground cover.

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5. **Number of gullies and erosion associated with gullies:** None to few on gentle slopes (< 10 %). On steeper 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, but they are often limited in depth by shallow bedrock.

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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 are usually 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 an erosion rating of 3 or 4 under the plant canopies, and a rating of 2 to 3 in the interspaces. The average should be a 3. Surface texture is loamy fine sand. Vegetation cover, litter accumulation and biological soil crusts 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 horizon is approximately 2 inches deep. Structure is single grain. Color is very pale brown (10YR7\4). The A horizon does not differ between interspaces and underneath plant canopies. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Spatial distribution of plants and well developed biological soil crusts (where present) intercept raindrops preventing splash erosion and provide areas of surface detention to store water allowing additional time for infiltration. Crowns of trees and accumulating litter at base of trees appear to create a micro-topography that may enhance development of water flow patterns below the drip line of the canopy. Significant increases in Pinyon-juniper canopy reduces understory vegetation with 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: Trees (pinion=juniper) > Sprouting shrubs = Non-sprouting shrubs > Cool season perennial grasses

    Sub-dominant: Warm season perennial grasses = Forbs

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

    Additional: Disturbance regime includes drought, insects, and very infrequent fire. Following a recent disturbance such as fire or drought 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, Pinyon and Juniper may continue to increase crowding out the perennial herbaceous understory species. In either case, these conditions could reflect a functional community phase within the reference state.
    Dominants—Mountain big sagebrush, Utah Juniper, Pinyon Pine (two needle), Indian ricegrass. Sub Dominants—Mormontea, manzanita, Blue grama, Needleandthread. This site can have scattered ponderosa pine on it when this site is associated with rock outcrops and cliffs from the extra runoff it would receive from being in these landscape positions. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Community is made up of young, mid, and old aged juniper and pinyon trees. 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 conditions with age class expression reduced under below average conditions, or on sites with high (usually 65% or greater) 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):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 300-400 lbs/ac

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:** Annual forbs and grasses are most likely to invade this site.

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years. Low green rabbitbrush sprouts vigorously following fire.