USDA Natural Resources
Conservation Service

Ecological site R035XY115UT
Desert Sand (Sand Sagebrush)

Accessed: 05/12/2025

General information

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

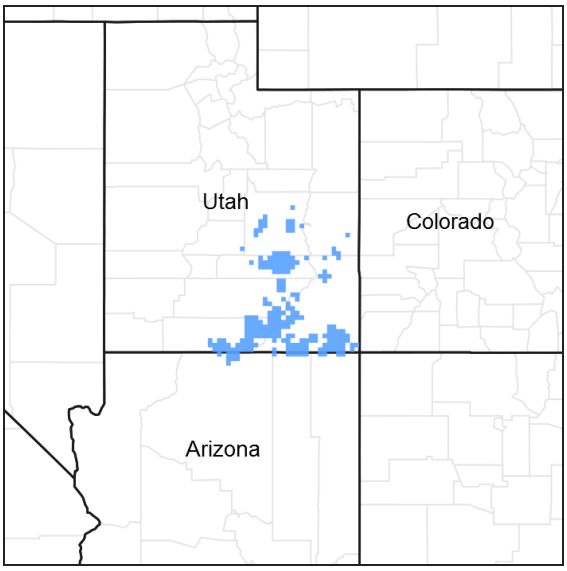

Figure 1. Mapped extent

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

Associated sites

R035XY018UT	**Talus Slope (Blackbrush-Shadscale)**
R035XY121UT	**Desert Sandy Loam (Blackbrush)**
R035XY130UT	**Desert Shallow Sandy Loam (Shadscale)**
R035XY133UT	**Desert Shallow Sandy Loam (Blackbrush)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia filifolia*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

This site is found at elevations between 3700 and 5700 feet, and occurs mostly on hummocky sand dunes on top of structural benches and plateaus. Slopes are typically between 2 and 15 percent, but may be as high as 30 percent in some areas. This site is not influenced by a heightened water table, flooding or ponding.

Table 2. Representative physiographic features

Landforms	(1) Dune (2) Structural bench (3) Plateau
Flooding frequency	None
Ponding frequency	None
Elevation	1,128–1,737 m
Slope	0–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is characterized by hot summers and cold winters. Average annual precipitation is 6 to 9.5 inches. On the average June is the driest month and August, September, and October are the wettest months. Approximately 40-45 percent of the annual precipitation occurs as rain from July through October.

The average freeze-free period is 177 to 201 days and frost free period is 152 to 176 days. Precipitation is extremely variable from month to month and from year to year. Much of the summer precipitation occurs as monsoonal thunderstorms. In average years, plants begin growth around February 20 and end growth around October 30.

Table 3. Representative climatic features

Frost-free period (average)	176 days
Freeze-free period (average)	201 days
Precipitation total (average)	254 mm

Influencing water features

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

Soil features

The characteristic soils in this site are deep sands that formed in aeolian deposits derived mainly from sandstone parent materials. Typically there are no rock framgments on the surface or throughout the profile. Soils are torripsamments with a water holding capacity is 2 to 3.1 inches. They are subject to blowing and drifting when dry and bare. Much of this site is stabilized sand dunes.

Soil moisture regime is typic aridic and the soil temperature regime is mesic.

This site occurs most commonly on the Sheppard soil. It also occurs on the following soils and soil survey areas:

UT623-Mido, Sandbench
UT631-Sheppard, Trail
UT633-Sheppard
UT638-Sheppard
UT642-Denazar, Sheppard
UT643-Sheppard
UT686-Peekaboo, Sheppard
UT689-Denazar, Sheppard

Table 4. Representative soil features

Parent material	(1) Eolian deposits–sandstone
Surface texture	(1) Fine sand (2) Loamy fine sand (3) Sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Rapid to very rapid
Soil depth	152 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–7.87 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
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)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

When this site is disturbed, either naturally through drought and wind, or by overgrazing or mechanical disturbance the following successional seral communities can occur.

Active Dunes POIN3 ACHY
QUHA3 ARFI2
EPVIV2 Climax
ACHY

As ecological condition deteriorates due to overgrazing, Indian ricegrass, needleandthread, dropseed, and fourwing saltbush decrease while sandhill muhly, annual forbs, sand sagebrush, broom snakeweed, and low rabbitbrush increase. Russian thistle, other annual forbs, and rush pea are most likely to invade this site.

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities

1.1. Reference State

State 1
Reference State

Community 1.1
Reference State

The dominant aspect of the plant community is Indian ricegrass and sand sagebrush. The composition by air-dry weight is approximately 55 percent perennial grasses, 15 percent forbs and 30 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	114	238	428
Forb	31	65	117
Shrub/Vine	21	44	78
Total	**166**	**347**	**623**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			63–112	
	sand sagebrush	ARFI2	*Artemisia filifolia*	22–45	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	13–22	–
	Cutler's jointfir	EPCU	*Ephedra cutleri*	13–22	–
	sand buckwheat	ERLE9	*Eriogonum leptocladon*	13–22	–
3	**Sub-Dominant Shrubs**			85–233	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	22–45	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	4–13	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	4–13	–
	mormon tea	EPVI	*Ephedra viridis*	4–13	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	4–13	–
	rubber rabbitbrush	ERNAA3	*Ericameria nauseosa ssp. consimilis var. arenaria*	4–13	–

	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	4–13	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	4–13	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	4–13	–
	frosted mint	POIN3	*Poliomintha incana*	4–13	–
	Fremont's dalea	PSFR	*Psorothamnus fremontii*	4–13	–
	Thompson's dalea	PSTH	*Psorothamnus thompsoniae*	4–13	–
	Havard oak	QUHA3	*Quercus havardii*	4–13	–
	pillar false gumweed	VAST3	*Vanclevea stylosa*	4–13	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	4–13	–
Grass/Grasslike					
0	**Dominant Grasses**			148–193	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90–135	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	45	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	13	–
1	**Sub-Dominant Grasses**			72–170	
	Grass, annual	2GA	*Grass, annual*	22–45	–
	Grass, perennial	2GP	*Grass, perennial*	22–45	–
	purple threeawn	ARPU9	*Aristida purpurea*	4–13	–
	needle and thread	HECO26	*Hesperostipa comata*	4–13	–
	spike dropseed	SPCO4	*Sporobolus contractus*	4–13	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	4–13	–
Forb					
0	**Dominant Forbs**			40–67	
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	13–22	–
	James' buckwheat	ERJA	*Eriogonum jamesii*	9–13	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	9–13	–
	painted milkvetch	ASCE	*Astragalus ceramicus*	4–9	–
	rusty lupine	LUPU	*Lupinus pusillus*	4–9	–
2	**Sub-Dominant Forbs**			27–90	
	Forb, annual	2FA	*Forb, annual*	13–22	–
	Forb, perennial	2FP	*Forb, perennial*	13–22	–
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–4	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	0–4	–
	woolly bluestar	AMTO2	*Amsonia tomentosa*	0–4	–
	Paria spurge	EUNE2	*Euphorbia nephradenia*	0–4	–
	flatspine stickseed	LAOC3	*Lappula occidentalis*	0–4	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–4	–
	Utah penstemon	PEUT	*Penstemon utahensis*	0–4	–
	veiny dock	RUVE2	*Rumex venosus*	0–4	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	0–4	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–4	–

Animal community

--Livestock and Wildlife Grazing--

This site provides fair/good grazing for livestock and wildlife during fall, winter, and spring due to accessibility; however this site may have sparse vegetation cover. This site also may lack natural perennial water sources, which can influence the suitability for livestock and wildlife grazing. The suitability for re-seeding or restoring this site is poor due to severe wind erosion, extreme temperatures and variability in time and amount of precipitation, and thus care should be taken to maintain the natural plant communities. This site may occur in pronghorn antelope and desert bighorn sheep ranges; yet in many places the populations will be small and have little grazing impact on the site.

The plant community is primarily grasses, including Indian ricegrass, sand dropseed, and sandhill muhly. These grasses, if in abundance, provide desirable grazing conditions for all classes of livestock and wildlife. The presence of shrubs, including sand sagebrush, fourwing saltbush, and mormontea provide good winter browse for cattle, sheep, goats, bighorn sheep, and pronghorn antelope. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. However, forb composition should be monitored for species diversity, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation must be made.

--References--

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

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

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

Hydrological functions

The soil is in hydrologic group a. The hydrologic curve numbers are 39 to 68 depending on the watershed condition

Recreational uses

Recreation activities are hiking and hunting.

Wood products

None

Other information

--Poisonous/Toxic Plant Communities--

Toxic plants associated with this site include sand sagebrush, wavy leaf (shinnery) oak, and broom snakeweed. 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. Wavy leaf oak is thought to contain tannins that can be detrimental to cattle, sheep, and occasionally horses if grazed as more than 50% of the diet. Oak is highly toxic during the budding stage, leafing stage, and when acorns are available. Symptoms include lack of appetite, weakness, excessive thirst, edema, reluctance to follow the herd, and emaciation. 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 generally only graze broom snakeweed when other forage is unavailable, typically in winter when toxicity levels are at their lowest.

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

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

--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 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 possible.

Cheatgrass and Russian thistle are common invaders to this site, especially in lower areas that concentrate nutrients and moisture. The severe wind erosion associated with the site may inhibit invasive annual establishment; however if growing conditions are conducive to invaders and the disturbance is not removed, these plants can create dense mono cultures that can alter the nutrient cycling, erosion rates and the fire regime of the area.

--Fire Ecology--

The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content. Due to sparse vegetative cover, fire does not carry well through this site. When the site is degraded by the presence of invasive annuals, the ability for fire to carry through the site may be increased and the increased fire interval may be sufficient to suppress the native plant community reestablishment. Sand sagebrush is top killed by fire and will readily resprout after a fire. Not much is known about the fire regimes of sand sagebrush dominated plants and thus fire regimes are based upon adjacent vegetation stands.

--References--

Knight, A. P. and R. G. Walter. 2001. A guide to plant poisoning of animals in North America. Jackson, WY: Teton NewMedia. 367p.

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

Other references

Modal Soil: Sheppard FS, LFS, S — mixed, mesic Typic Torripsamments

Type Location: Goosenecks, Junction of 276 and 95

Contributors

George Cook

Rangeland health reference sheet

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

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

Indicators

1. **Number and extent of rills:** Very minor rill development, increasing as slope steepens. Rill development will increase following large storm events, but rills heal within a few months due to the very sandy soil textures

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2. **Presence of water flow patterns:** Very rare due to extreme drainage and high infiltration that prevents overland flow in all but the most extreme precipitation events

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3. **Number and height of erosional pedestals or terracettes:** Rare. Herbaceous plants may show little pedestalling. Pedestals may be up to 2 inches for shrubs. Terracettes should be absent or few. Pedestals that occur are usually associated with natural wind erosion.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 40 – 50% bare ground. Ground cover is based on the first raindrop impact, and bare ground is the opposite of ground cover. Any well developed biological crusts present should not be recorded 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.

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5. **Number of gullies and erosion associated with gullies:** None to very few. Some gullies may be present in landscape

settings where increased runoff may accumulate (such as areas below exposed bedrock). Such gully development is expected to be limited to steeper slopes and be adjacent to sites where runoff accumulation occurs. Any gullies present should show little sign of accelerated erosion and should be stabilized with perennial vegetation.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Some wind generated soil movement is normal. This site has the appearance of dunes that have been healed over. Wind caused blowouts and deposition are mostly stable or have healed over. Coppice mounding around perennial vegetation is common. Increased wind generated soil movement can occur during severe wind events.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place (under plant canopies) with some redistribution caused by wind and water movement. Very minor fine litter removal may occur in flow patterns or rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody litter is not likely to move.

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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 average soil stability rating of 3 to 4 throughout the site. Surface texture is fine sand.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A horizons is not present. The C1 horizon/Soil surface is typically 2 inches deep. Structure is typically weak thick platy. Color is typically reddish yellow (5YR6/6). 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:** Vascular plants will break some raindrop impact and splash erosion, but not eliminate it. Interspaces between plants may serve as water flow patterns during extreme runoff events, with natural erosion expected in severe storms. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.

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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.

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

    Dominant: Perennial cool season bunchgrasses (Indian ricegrasses) > sprouting shrubs (Sand sagebrush)

    Sub-dominant: Perennial warm season grasses (Sand dropseed, Sand muhly) > non-sprouting shrubs (Fourwing saltbush) > forbs (globemallow, buckwheat, primrose).

    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. Siberian wheatgrass, Forage kochia, etc.)
    Biological soil crust typically does not occur on this site and is measured as a component of ground cover.

Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

Additional: Temporal variability is caused by drought, insects, large precipitation events, and infrequent fire. Spatial variability is cause by differences in soil texture and proximity to runoff producing sites, etc.
Following a recent disturbance such as fire or drought that removes the woody vegetation, forbs and perennial grasses (herbaceous species), and sprouting/rhizomatous shrubs may dominate the community. This site is never without disturbance. Soil movement by wind is always burying or unburying shrubs, so the community gains and loses sand sage and it typically doesn't naturally become dominant to the exclusion of the understory. These conditions reflect community phases 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 either the shrubs or grasses. Some mortality of bunchgrass and other shrubs may occur during very severe (long term) droughts.

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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 1/2" under canopies. Litter cover may increase to 5-10% on some years due to increased plant production.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 370 - 400 #/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:** Russian thistle, other annual forbs, and rush pea are most likely to invade this site.

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