

Ecological site R035XB251AZ

Mudstone/Sandstone Hills

6-10" p.z.

Warm

Accessed: 05/21/2026

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.

MLRA notes

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

This ecological site occurs in Common Resource Area 35.2 - the Colorado Plateau Shrub – Grasslands Elevations range from 3800-5800 feet and precipitation averages 6 to 10 inches per year. Vegetation includes shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. The soil temperature regime is mesic and the soil moisture regime is typic aridic. This unit occurs within the Colorado Plateau Physiographic Province and is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Sedimentary rock classes dominate the plateau with volcanic fields occurring for the most part near its margin.

Associated sites

R035XY133UT	<p>Desert Shallow Sandy Loam (Blackbrush)</p> <p>This site is found on flatter slopes adjacent to or in complex with.</p>
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Similar sites

R035XB226AZ	<p>Sandstone/Shale Upland 6-10" p.z. Warm</p> <p>This site occurs on the Shinarump member of the Chinle Formation and other similar coarse sandstone/conglomerate rock.</p>
R035XY133UT	<p>Desert Shallow Sandy Loam (Blackbrush)</p> <p>This site occurs on flatter slopes in association and complex with the site.</p>

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Coleogyne ramosissima</i> (2) <i>Ephedra torreyana</i>
Herbaceous	Not specified

Physiographic features

This ecological site is found in the lower elevations and warmer slopes in the common resource area that are preferred by blackbrush. The site occurs on hillslopes and breaks within the Moenkopi Formation and on toeslopes through summits of hills. Slopes generally range from 15 to 45 percent, but there can be steeper or flatter spots within the site.

Table 2. Representative physiographic features

Landforms	(1) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,160 – 1,770 m
Slope	20 – 50 %
Aspect	Aspect is not a significant factor

Climatic features

The 35.2 Colorado Plateau Cold Desert Shrub - Grassland common resource area has a very dry and windy climate that is hot in the summer and cold in the winter. The annual precipitation averages between 6 and 10 inches. The soil moisture regime is typical aridic and the soil temperature regime is mesic. A slight majority of the precipitation arrives during the late fall, winter, and early spring. This winter season moisture originates in the Pacific Ocean and arrives as rain, or sometimes snow, during widespread frontal storms of generally low intensity. The majority of the snow (average range of 1 to 17 inches) falls from December through February, but rarely lasts more than a few days. A seasonal drought occurs from late May through early July. Summer rains occur from July through September during brief intense local thunderstorms. The rain is sporadic in intensity and location. The moisture originates from the Gulf of Mexico in the early summer and the Gulf of California in the late summer/early fall. Windy conditions are common year round, but the winds are strongest and most frequent during the spring.

Table 3 Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	210 days
Precipitation total (average)	250 mm

Influencing water features

The soil moisture on this ecological site comes from precipitation. The site does not benefit significantly from run-on moisture. Shallow bedrock areas will concentrate water in deeper soil pockets, where most of the vegetation production occurs. Because of the shallow soils and steep slopes, larger rainfall events will not be entirely captured by the site. This site contributes runoff to other ecological sites.

Soil features

Soils correlated to this ecological site typically are shallow or very shallow (20") to mudstone or sandstone of the Moenkopi Formation. Typically highly fractured mudstone (or siltstone) is encountered from 7 to 12 inches in depth.

The soil surface textures typically ranges from fine sandy loam to sandy clay loam (very gravelly, very channery or very flaggy). Subsurface textures ranges from channery fine sandy loam to extremely channery loam, yellowish red to reddish brown in color.

Taxonomic classification of soils correlated to this site are: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Torriorthents.

Soil survey map unit components that have been correlated to this ecological site include

SSA 707 Little Colorado River Area 54-Shinume, 56-Torriorthents.

Table 4. Representative soil features

Parent material	(1) Residuum – mudstone
Surface texture	(1) Very channery very fine sandy loam (2) Extremely flaggy very fine sandy loam (3) Flaggy sandy clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to slow
Soil depth	20 – 50 cm
Surface fragment cover <=3"	60 – 70 %
Surface fragment cover >3"	10 – 40 %
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Soil reaction (1:1 water) (0-101.6cm)	7.8 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	30 – 80 %

Ecological dynamics

An ecological site is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. In all plant communities, variability is apparent in productivity and occurrence of individual species. Spatial boundaries of the communities; however, can be recognized by characteristic patterns of species composition, association, and community structure. The historic climax plant community for this ecological site has been described by sampling relict or relatively undisturbed sites and/or

reviewing historic records. The historic climax plant community is the plant community that evolved over time with the soil forming process and long term changes in climatic conditions of the area. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site.

Natural disturbances, such as drought, fire, grazing of native fauna, and insects, are inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the ecological site. Fluctuations in plant community structure and function caused by the effects of natural disturbances help establish the boundaries and characteristics of an ecological site. They are accounted for as part of the range of characteristics of the ecological site. Recognizable plant community phases are identified in the reference state of the ecological site. Some sites may have a small range of variation, while others have a large range. Some plant community phases may exist for long periods of time, while others may only occur for a couple of years after a disturbance.

Deterioration of the plant community, hydrology, or soil site stability on an ecological site can result in crossing a threshold or potentially irreversible boundary to another state, or equilibrium. This can occur as a result of the loss of soil surface through erosion, the loss of the stability of the site due to disturbances that cause active erosion on the site, increases in the amounts and/or patterns or runoff from rainstorms, changes in availability of surface and subsurface water, significant changes in plant structural and functional types, or the introduction of non-native species. When these thresholds are crossed, the potential of the ecological site to return to the historic climax plant community can be lost, or restoration will require significant inputs. There may be multiple states possible for an ecological site, determined by the type and or severity of disturbance.

The known states and transition pathways for this ecological site are described in the state and transition model. Within each state, there may be one or more known plant community phases. These community phases describe the different plant community that can be recognized and mapped across this ecological site. The state and transition model is intended to help land users recognize the current plant community on the ecological site, and the management options for improving the plant community to the desired plant community.

Plant production information in this site description is standardized to the annual production on an air-dry weight basis in near normal rainfall years.

State and transition model

Figure 3. 352 MudstoneSandstoneHillsWarm S&T

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Perennial Warm Season Grasses			4-8	
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	4-8	–
	burrograss	SCBR2	<i>Scleropogon brevifolius</i>	0-1	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	0-1	–
2	Cool Season Perennial Grasses			0-1	
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0-1	–
Forb					
3	Warm Season Annual Forbs			2-6	
	flatcrown buckwheat	ERDE6	<i>Eriogonum deflexum</i>	1-3	–
	spurge	EUPHO	<i>Euphorbia</i>	0-1	–
	blazingstar	MENTZ	<i>Mentzelia</i>	0-1	–
	Forb, annual	2FA	<i>Forb, annual</i>	0-1	–
	windmills	ALLIO	<i>Allionia</i>	0-1	–
4	Cool Season Annual Forbs			0-1	
	phacelia	PHACE	<i>Phacelia</i>	0-1	–
5	Perennial Fobs			1-6	
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0-3	–
	globemallow	SPHAE	<i>Sphaeralcea</i>	0-2	–

	Forb, perennial	2FP	<i>Forb, perennial</i>	0-2	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-2	-
	little rose	CHER	<i>Chamaerhodos erecta</i>	0-1	-
	golden tickseed	COTIT	<i>Coreopsis tinctoria var. tinctoria</i>	0-1	-
	Wright's deervetch	LOWR	<i>Lotus wrightii</i>	0-1	-
	brownfoot	ACWR5	<i>Acourtia wrightii</i>	0-1	-
Shrub/Vine					
6	Shrubs			146-163	
	blackbrush	CORA	<i>Coleogyne ramosissima</i>	50-62	-
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	11-22	-
	water jacket	LYAN	<i>Lycium andersonii</i>	11-22	-
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	6-11	-
	sulphur-flower buckwheat	ERUM	<i>Eriogonum umbellatum</i>	6-11	-
	mormon tea	EPVI	<i>Ephedra viridis</i>	0-6	-
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	2-6	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	1-4	-
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	0-3	-
	blue sage	SAPA5	<i>Salvia pachyphylla</i>	0-3	-
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	0-2	-
	banana yucca	YUBA	<i>Yucca baccata</i>	0-2	-
	turpentinebroom	THMO	<i>Thamnosma montana</i>	0-1	-
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0-1	-
	Fremont's mahonia	MAFR3	<i>Mahonia fremontii</i>	0-1	-
	Apache plume	FAPA	<i>Fallugia paradoxa</i>	0-1	-
	ash	FRAXI	<i>Fraxinus</i>	0-1	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-1	-
	desert lavender	HYEM	<i>Hyptis emoryi</i>	0-1	-
	cottontop cactus	ECPOX	<i>Echinocactus polycephalus var. xeranthemoides</i>	0-1	-
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	0-1	-
Tree					
7	Trees			0-1	
	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	0-1	-
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0-1	-

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Perennial Warm Season Grasses			4-8	
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	4-8	-
	burrograss	SCBR2	<i>Scleropogon brevifolius</i>	0-1	-
	black grama	BOER4	<i>Bouteloua eriopoda</i>	0-1	-
2	Cool Season Perennial Grasses			0-1	
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0-1	-
Forb					
3	Warm Season Annual Fobs			2-6	
	flatcrown buckwheat	ERDE6	<i>Eriogonum deflexum</i>	1-3	-

	spurge	EUPHO	<i>Euphorbia</i>	0-1	-
	blazingstar	MENTZ	<i>Mentzelia</i>	0-1	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-1	-
	windmills	ALLIO	<i>Allionia</i>	0-1	-
4	Cool Season Annual Forbs			0-1	
	phacelia	PHACE	<i>Phacelia</i>	0-1	-
5	Exotic Annual Forbs			0-1	
	redstem stork's bill	ERCI6	<i>Erodium cicutarium</i>	0-1	-
	Russian thistle	SAKA	<i>Salsola kali</i>	0-1	-
6	Perennial Forbs			1-6	
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0-3	-
	globemallow	SPHAE	<i>Sphaeralcea</i>	0-2	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-2	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-2	-
	brownfoot	ACWR5	<i>Acourtia wrightii</i>	0-1	-
	rose heath	CHER2	<i>Chaetopappa ericoides</i>	0-1	-
	golden tickseed	COTIT	<i>Coreopsis tinctoria var. tinctoria</i>	0-1	-
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	banana yucca	YUBA	<i>Yucca baccata</i>	0-2	-
	turpentinebroom	THMO	<i>Thamnosma montana</i>	0-1	-
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	Fremont's mahonia	MAFR3	<i>Mahonia fremontii</i>	0-1	-
	Apache plume	FAPA	<i>Fallugia paradoxa</i>	0-1	-
	ash	FRAXI	<i>Fraxinus</i>	0-1	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-1	-
	desert lavender	HYEM	<i>Hyptis emoryi</i>	0-1	-
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Tree					
8	Trees			0-1	
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Animal community

Wildlife Interpretations Landscape description-This is an area of moderately steep slopes (12-25%) dominated by blackbrush and jointfir. The slope limits use by livestock; the rock and shrub cover provides shelter for small species of reptiles and mammals. This is a fairly open area which limits the effectiveness of predators while allowing browsers to make use of the green blackbrush in the early spring along with palatable annual forbs and warm-season grasses throughout the summer. Area sensitive species-None Transitory/Migratory Animals-Aside from possible migratory birds, none Invasive Species (plants and animals)- No problems with invasive animal and plant species on this site. Aquatic elements or inclusions (mineral springs/seeps, riparian areas)- No aquatic or riparian areas on this site Livestock Interpretations This site is not extensively used by livestock

Hydrological functions

An increase in exotic annuals from the Historic Climax Plant Community(HCPC)will decrease the amount of available water for other shrubs and grasses due to increased water use earlier in the season by non-native annuals.

Recreational uses

Potential uses that the site can support Uses that may influence the management of a site- There are many scenic views at this site, with many opportunities for moderately difficult hiking. Special concerns that will maintain the recreational potential- The mudstone/sandstone areas are somewhat fragile, and limitations may need to be placed on access to these areas.

Wood products

No useful wood products on this site.

Other products

Small flagstones for landscaping may be obtained from this site.

Type locality

Location 1: Coconino County, AZ	
UTM zone	N
UTM northing	3976683
UTM easting	0443930

Other references

Updates and revisions for this ESD were conducted as part of a 2007-2012 Interagency Technical Assistance Agreement between the Bureau of Indian Affairs–Navajo Region and the NRCS-Arizona.

Contributors

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Rangeland health reference sheet

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

Author(s)/participant(s)	Steve Cassady
Contact for lead author	State Rangeland Management Specialist, NRCS-Arizona State Office, Phoenix, AZ
Date	12/29/2010
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills: Some rilling is expected, especially on the steeper slopes where rill intervals may be as close as 15 to 20 feet.

2. Presence of water flow patterns: Some water flow patterns are expected, especially on the steeper slopes where water flow pattern intervals may be as close as 20 to 25 feet.

3. Number and height of erosional pedestals or terracettes: Pedestalling and/or terracettes are rare.

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground): Although interspaces may appear bare the soil surface is covered with rock fragments. Bare ground is generally somewhere between 2 to 20 percent.

5. Number of gullies and erosion associated with gullies: Deeply incised water flow patterns do occur, especially on the steeper slopes.

6. Extent of wind scoured, blowouts and/or depositional areas: None.

7. Amount of litter movement (describe size and distance expected to travel): Litter in interspaces is easily moved. Litter under shrubs generally stays in place.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**
Expect an average soil surface stability value of 1.5 to 2. The average value under canopy should be 4 to 6. The average value on non-canopied areas is 1 to 2.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** SOM is naturally very low in soils associated with this ecological site. A-horizons may be very hard to distinguish even in reference state. Evidence of SOM loss is noticeable excessive sheet erosion, rills, water flow patterns, wind scouring, litter movement and/or reduced soil surface stability scores.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Expect shrubs to be randomly, but uniformly scattered across the ecological site. Interspaces are generally 15 to 20 feet.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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: Shrubs

Sub-dominant: Forbs

Other: Grasses

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
Expect up to 10 percent mortality on long-lived shrubs.

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
Expect in an average year 125 to 175 pounds per acre (air-dried).

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: Invasive plants expected in minor amounts are Russian thistle and filaree. The total annual production of these combined should never be more than one pound per**

acre.

17. Perennial plant reproductive capability: The only natural limitations to reproductive capability are weather related and natural disease or herbivory that reduces reproductive capability.
