Ecological site R035XA118AZ
Sandy Upland
10-14" p.z.

Last updated: 5/20/2025
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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 35.1 - the Colorado Plateau Mixed Grass Plains Elevations range from 4800 to 6700 feet and precipitation averages 10 to 14 inches per year. Vegetation includes Stipa species, Indian ricegrass, galleta, and blue grama, fourwing saltbush, winterfat, and cliffrose. The soil temperature regime is mesic and the soil moisture regime is ustic 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.

Ecological site concept

This site occurs in an upland position as gently rolling plains and mesas. Soils on this site are deep and well-drained. The surface texture ranges from sand to course sandy loam. The substratum is loamy fine sand, loamy sand or sand. The soil ranges from neutral to moderately alkaline (pH 6.6 to 8.4).

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia filifolia* (2) *Atriplex canescens*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Hesperostipa comata ssp. comata*

Physiographic features

This site occurs in an upland position as gently rolling plains and mesas. It neither receives a significant amount of run-in moisture nor experiences an excess of runoff moisture.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Mesa
Flooding frequency	None

Elevation	1,460 – 1,920 m
Slope	0 – 20 %
Aspect	Aspect is not a significant factor

Climatic features

50-60% of moisture falls as rain Jul-Sept and is the most effective moisture for plant growth. The remaining moisture comes as snow during the winter.

Mean temperatures for the hottest month (Jul) is 72 degrees F; for the coldest month (Jan) is 32 degrees F. Extreme temperatures of 105 degrees F and -26 degrees F have been recorded. Long periods with little or no effective moisture are relatively common.

Cool season plants begin growth in early spring and mature in the early summer. Warm season plants take advantage of summer rains and grow from July through September.

Table 3 Representative climatic features

Frost-free period (average)	160 days
Freeze-free period (average)	180 days
Precipitation total (average)	330 mm

Influencing water features

This is an upland site, and is not associated with water features or wetlands. During heavy rain events, this site may receive run-on moisture from landforms above and contribute runoff to landforms below.

Soil features

Soils on this site are deep and well-drained with no plant root restricting layers. The surface texture ranges from sand to course sandy loam. The substratum is loamy fine sand, loamy sand or sand. The soil ranges from neutral to moderately alkaline (pH 6.6 to 8.4). Permeability is rapid and the soil can absorb all the moisture the climate supplies but has a very low available water capacity.

Typical taxonomic units include:

Coconino County Central (AZ631) Soil Map Units - 25-Mespun;
Navajo County Central (AZ633) Soil Map Unit - 45-Pensom;
Apache County Central (AZ635) Soil Map Units - ER2-Eroded Land, PSB-Sheppard, SMB-Sheppard;
Little Colorado River(AZ707)Soil Map Unit- 30-Mespun; 30-Mespun limy substratum; 31-Mido;49-Santrick;
Navajo Mountain(AZ711)Soil Map Units- 5-Pensom moderately deep; 22-Mespun, 21-Mespun 23-Mespun, 24-Mespun;24-Mespun limy substratum;21-Bispen;27-Mido, 65-Mido;23-Santrick, 48-Santrick; 55-Shoegame family;
Chinle(AZ713) Soil Map Units- 39-Pinavetes;
Fort Defiance Area (AZ715)Soil Map Units - 15-Pinavetes family,

Table 4. Representative soil features

Surface texture	(1) Coarse sand (2) Sand (3) Coarse sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	100 – 150 cm
Surface fragment cover <=3"	0 – 10 %
Available water capacity (0-101.6cm)	0 – 6.35 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %

Ecological dynamics

The plant communities found on an ecological site are naturally variable. Composition and production will vary with yearly conditions, location, aspect, and the natural variability of the soils. The historical climax plant community represents the natural potential plant communities found on relict or relatively undisturbed sites. Other plant communities described here represent plant communities that are known to occur when the site is disturbed by factors such as grazing, fire, or drought.

Production data provided in this site description is standardized to air-dry weight at the end of the summer growing season. The plant communities described in this site description are based on near normal rainfall years.

NRCS uses a Similarity Index to compare existing plant communities to the plant communities described here. Similarity Index is determined by comparing the production and composition of a plant community to the production and composition of a plant community described in this site description. To determine Similarity Index, compare the production (air-dry weight) of each species to that shown in the plant community description. For each species, count no more than the maximum amount shown for the species, and for each group, count no more than the maximum shown for the group. Divide the resulting total by the total normal year production shown in the plant community description. If rainfall has been significantly above or below normal, use the total production shown for above or below normal years. If field data is not collected at the end of the summer growing season, then the field data must be corrected to the end of the year production before comparing it to the site description. The growth curve can be used as a guide for estimating production at the end of

the summer growing season.

The State and Transition model shows the most common occurring plant communities likely to be encountered on this ecological site. This model may not show every possible plant community, but only those that are most prevalent and observed through field inventory. As more data is collected and research is available, these plant communities may be revised, removed, and even added to reflect the ecological dynamics of this site.

State and transition model

Figure 3. 35.1 Sandy upland S&T model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Cool season dominant grasses**			118-291	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	56-146	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	28-62	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	28-56	–
2	**Warm season dominant grasses**			56-118	
	blue grama	BOGR2	*Bouteloua gracilis*	28-90	–
	black grama	BOER4	*Bouteloua eriopoda*	28-62	–
3	**Other grasses**			28-90	
	alkali sacaton	SPAI	*Sporobolus airoides*	17-56	–
	James' galleta	PLJA	*Pleuraphis jamesii*	11-39	–
4	**Misc. grasses**			28-62	
	spike dropseed	SPCO4	*Sporobolus contractus*	0-22	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0-22	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	0-22	–
	Grass, perennial	2GP	*Grass, perennial*	0-11	–
	threeawn	ARIST	*Aristida*	0-11	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0-11	–
	Grass, annual	2GA	*Grass, annual*	0-6	–
Forb					
5	**All forbs**			11-28	
	Forb, perennial	2FP	*Forb, perennial*	0-9	–
	globemallow	SPHAE	*Sphaeralcea*	4-8	–
	Forb, annual	2FA	*Forb, annual*	0-7	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	2-6	–
	pale evening primrose	OEPA	*Oenothera pallida*	0-6	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0-6	–
	cryptantha	CRYPT	*Cryptantha*	0-6	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	0-6	–
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0-6	–
	flatspine stickseed	LAOC3	*Lappula occidentalis*	0-2	–
	pepperweed	LEPID	*Lepidium*	0-2	–
	sanddune linanthus	LIAR2	*Linanthus arenicola*	0-2	–
	shortstem lupine	LUBR2	*Lupinus brevicaulis*	0-2	–

	sand verbena	ABRON	*Abronia*	0-2	–
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0-2	–
	rose heath	CHER2	*Chaetopappa ericoides*	0-2	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0-2	–
	touristplant	DIWI2	*Dimorphocarpa wislizeni*	0-2	–
	small wirelettuce	STEX	*Stephanomeria exigua*	0-2	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0-2	–
	annual Townsend daisy	TOAN	*Townsendia annua*	0-2	–
	phacelia	PHACE	*Phacelia*	0-2	–
	woolly plantain	PLPA2	*Plantago patagonica*	0-2	–
Shrub/Vine					
6	**Dominant shrubs**			28-78	
	fourwing saltbush	ATCA2	*Atriplex canescens*	8-34	–
	jointfir	EPHED	*Ephedra*	8-22	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	8-22	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	6-17	–
7	**Misc. shrubs**			28-56	
	rabbitbrush	CHRYS9	*Chrysothamnus*	0-17	–
	snakeweed	GUTIE	*Gutierrezia*	0-17	–
	pricklypear	OPUNT	*Opuntia*	0-11	–
	yucca	YUCCA	*Yucca*	0-11	–
	common dunebroom	PAFI4	*Parryella filifolia*	0-6	–
	broadbeard beardtongue	PEAN4	*Penstemon angustifolius*	0-6	–
	sand buckwheat	ERLE9	*Eriogonum leptocladon*	0-6	–
	rubber rabbitbrush	ERNAB2	*Ericameria nauseosa ssp. nauseosa var. bigelovii*	0-6	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0-6	–
Tree					
8	**Trees**			28-62	
	oneseed juniper	JUMO	*Juniperus monosperma*	0-28	–
	twoneedle pinyon	PIED	*Pinus edulis*	0-28	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 1.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 1.5 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 12. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

This site is favorable for grazing throughout most of the year except when snow cover restricts availability of forage. With unmanaged grazing during winter and spring, the relatively scarce cool season grasses are replaced by rabbit brush, snakeweed and lower value forbs and grasses. Planned grazing systems adapt well to use on this site. The potential plant community produced by this site provides food for those species of wildlife that utilize grass as a major portion of their diet. When vegetative retrogression occurs, unpalatable shrubby species increase and some wildlife species may be benefit.

Recreational uses

Site is located on gently rolling plains and mesa tops which lend themselves to activities such as horseback riding, wildlife observation and hunting. Following good winter moisture a variety of spring and summer flowers which are particularly noticeable. It has good aesthetic appeal when not severely disturbed. Winters are cold, however, relatively mild spring, fall and summer months are attractive to recreationists.

Other products

Personal firewood cutting when the tree canopy exceeds 15%.

Type locality

Location 1: Navajo County, AZ	
General legal description	Petrified Forest, Painted Desert National Park.
Location 2: Apache County, AZ	
General legal description	LDS Stake Ranch near St Johns(top of mesa).

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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Approval

Kendra Moseley, 5/20/2025

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)	Ken Gishi, Dean Schlichting, Dan Carroll
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Date	11/13/2008
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills: None. The sandy surface textures and well drained nature of the soils should preclude the presence of rills.**

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2. **Presence of water flow patterns: A very few scattered water flow patterns may be present on steepest slopes. Water Flow patterns on these soils are commonly 1 to 2 meters long, generally occupying < 5% of the ground cover.**

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3. **Number and height of erosional pedestals or terracettes: Uncommon. If present pedestals typically less than 1" in height often associated with deposition areas and water flow patterns. Terracettes are absent. This site has potential for significant developement of biological crust. Well developed biological crust should bot be confused with pedastals.**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground): Bare ground averages 35-55%. Drought may cause an increase in bare ground.**

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5. **Number of gullies and erosion associated with gullies: None.**

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6. **Extent of wind scoured, blowouts and/or depositional areas: Wind scoured areas, blowouts, and/or depositional areas are mostly uncommon in well vegetated herbaceous plant communities(1.1 & 1.2). However, in certain plant communities (1.3 & 1.4) some deposition and wind scour may occur, especially during droughts, due to high wind erosion hazard of the soil. Sites dominated by sand sage and juniper are most likely to suffer from excessive blowouts and depositions**

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7. **Amount of litter movement (describe size and distance expected to travel):** Most herbaceous and fine woody litter will be transported by wind and in water flow pathways, while a small percentage stays in place. Coarse woody litter and duff will accumulate under shrub and tree canopies.

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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):** Expected soil aggregate stability ranges from 2 to 4. Under canopies the range is 3 to 4 and 2 to 3 in the interspaces. When well vegetated, these soils have a moderate to high resistance to water erosion, but only a low resistance to wind erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is loose granular, with a weak physical crust. Surface thickness range from 3-6 inches. Color is variable depending on parent material.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** This grassland community consists of about 70 percent grasses, 25 percent shrubs and 5 percent composition of forbs and promotes infiltration and reduces 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.

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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: cool season grasses (35-45%) > warm season grasses (30-40%)

    Sub-dominant: shrubs (15-25%)

    Other: Forbs (5-10%) > Trees (1-5%)

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** In a normal year up to 10% of grasses and shrubs die off. During and after drought years there can be from 10 to 20% die off of shrubs and grasses. Severe winter droughts affect shrubs, trees and cool season grasses the most. Severe summer droughts affect the warm season grasses the most.

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14. **Average percent litter cover (%) and depth (in):** Within plant interspaces litter ranges from 10 to 20% cover, while under shrub and tree canopies it ranges from 25 to 60% cover with depths from 1/8 to 1/4 inch thick.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 250-350 pounds per acre (dry weight) in drought years, 450-550 pounds per acre in normal years, 600-700 pounds per acre in wet years.

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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: Mormon tea, Broom snakeweed, sand sagebrush and rabbitbrush are all native to the site, but have the ability to increase and dominate the area after disturbance. Oneseed juniper (JUMO) is native to the site, but has the ability to increase and dominate the site after unmanaged grazing and/or fire exclusion. Introduced annuals that have the ability to increase and dominate the site after unmanaged grazing and/or ground disturbance include cheatgrass and Russian thistle**

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17. **Perennial plant reproductive capability: All plants native to this site are adapted to the climate and are capable of producing seeds, stolons and rhizomes except during the most severe droughts.**
