

Ecological site R035XC307AZ

Clay Loam Upland

10-14" p.z.

Last updated: 5/20/2025
 Accessed: 05/11/2026

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 is found in Common Resource Area 35.3 - the Colorado Plateau Sagebrush – Grasslands. The Common Resource Area occurs within the Colorado Plateau Physiographic Province. It is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Elevations range from 4800 to 6700 feet and precipitation averages 10 to 14 inches. The elevation range is lower (about 4500 to 6000) on the western side of the Colorado Plateau along the Grand Canyon, and moves up about 500 to 800 feet higher on the eastern side in the areas of the Navajo and Hopi Indian Reservations due to rain shadow effects from the Kaibab Plateau and Mogollon Rim. Common vegetation in this region includes Wyoming big sagebrush, Utah juniper, Colorado pinyon - cliffrose, Mormon tea, fourwing saltbush, blackbrush Indian ricegrass, needle and thread, western wheatgrass Galleta, black grama, blue grama, and sand dropseed. Sedimentary rock classes dominate the plateau with volcanic fields occurring for the most part near its margin. The soil temperature regime is mesic and the soil moisture regime is ustic aridic.

Ecological site concept

This site occurs on relatively flat upland areas as including plateaus, valley floors and fans. Slopes range from 0 to 15 percent. The soils grouped into this range site are moderately deep or deep to any root-restricting layer. The surface textures range from sandy clay loam to clay. This ecological site does not include soils with cracking clay surfaces. Subsurface textures are clay loam to clay and can have rock fragments ranging from 10 to 35 percent.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata ssp. tridentata</i> (2) <i>Atriplex canescens</i>
Herbaceous	(1) <i>Bouteloua gracilis</i> (2) <i>Pascopyrum smithii</i>

Physiographic features

This site occurs on relatively flat upland areas as including plateaus, valley floors and fans. Slopes range from 0 to 15 percent but are mostly less than 10 percent. The soils are deep, and have a clay loam to clay surface texture.

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Valley floor (3) Fan
Flooding frequency	None
Ponding frequency	None
Elevation	1,460 – 2,040 m
Slope	0 – 20 %
Aspect	Aspect is not a significant factor

Climatic features

Winter summer moisture ratios range from 70:30 to 60:40. Late spring is usually the driest period, and early fall moisture can be sporadic. Summer rains fall from June through September; moisture originates in the Gulf of Mexico and creates convective, usually brief, intense thunderstorms. Cool season moisture from October through May tends to be frontal; it originates in the Pacific and the Gulf of California and falls in widespread storms with longer duration and lower intensity. Precipitation generally comes as snow from December through February. Accumulations above 12 inches are not common but can occur. Snow usually lasts for 3-4 days, but can persist much longer. Summer daytime temperatures are commonly 95 - 100 F and on occasion exceed 105 F. Winter air temperatures can regularly go below 10 F and have been recorded below - 20 F.

Table 3 Representative climatic features

Frost-free period (average)	170 days
Freeze-free period (average)	170 days
Precipitation total (average)	360 mm

Influencing water features

The soil moisture on this ecological site comes from precipitation. The site does not benefit significantly from run-on moisture. The clay loam to clay surface texture of the soil allows the site to capture moisture from snow and the gentle rain storms, but intense summer thunderstorms will produce runoff, reducing the amount of effective rainfall captured by this ecological site.

Soil features

The soils grouped into this range site are moderately deep or deep to any root-restricting layer. The surface textures range from sandy clay loam to clay. This ecological site does not include soils with cracking clay surfaces. The subsurface textures are clay loam to clay and can have rock fragments ranging from 10 to 35 percent. Permeability is slow. The soil reaction is slightly to moderately alkaline (pH 7.4 to 8.4). The water erosion hazard is moderate to high.

Soil survey map unit components correlated to this ecological site include:

SSA 623 Shivwits Area MU's 59-Padilla, 68-Sedillo;

SSA 625 Mohave County Area NE part MU's 29-Manikan, 48 & 49-Poley;

SSA 629 Coconino County N. Kaibab part MU's 20-Keeseha, 24-Manikan;

SSA-713 Chinle Area MU 54-Tsosie;

SSA 714 Hopi Area MU 26-Querencia;

SSA 715 Ft. Defiance Area MU 2-Gish family, 37-Gish family.

Table 4. Representative soil features

Parent material	(1) Alluvium – shale
Surface texture	(1) Sandy clay loam (2) Cobbly clay loam (3) Clay
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	100 – 200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	14.58 – 23.88 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Electrical conductivity (0-101.6cm)	Not specified

Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

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 data provided in this site description is standardized to the air-dry weight of one year's growth. The plant communities described in this site description are based on near normal rainfall years.

The plant community changes that take place with site deterioration on this ecological site are decreased perennial grasses, shrubs increase (fourwing saltbush, Wyoming big sagebrush, snakeweed, rabbitbrush). Annual grasses and forbs increase and can dominate. Juniper trees can invade from the adjoining uplands. Non-native plants that are introduced on this site and can increase enough to have a significant impact are Russian thistle and cheatgrass.

State and transition 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	Native Grasses			280-448	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	73-112	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	73-112	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	34-112	–
	muttongrass	POFE	<i>Poa fendleriana</i>	34-101	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	34-101	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	34-73	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34-73	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	6-34	–
	spike muhly	MUWR	<i>Muhlenbergia wrightii</i>	6-34	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	6-34	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	6-34	–
	threawn	ARIST	<i>Aristida</i>	0-22	–
Forb					
2	Native Forbs			11-67	
	Forb, annual	2FA	<i>Forb, annual</i>	6-34	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	6-34	–
	buckwheat	ERIOG	<i>Eriogonum</i>	6-34	–
	globemallow	SPHAE	<i>Sphaeralcea</i>	6-34	–
Shrub/Vine					
3	Native Shrubs			90-280	
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	56-112	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	56-112	–
	jointfir	EPHED	<i>Ephedra</i>	11-22	–
	snakeweed	GUTIE	<i>Gutierrezia</i>	11-22	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	11-22	–
	Fremont's mahonia	MAFR3	<i>Mahonia fremontii</i>	0-22	–
	pricklypear	OPUNT	<i>Opuntia</i>	0-22	–
	rabbitbrush	CHRYS9	<i>Chrysothamnus</i>	0-11	–
Tree					
4	Native Trees			0-78	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	0-56	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0-56	–

Table 6. Community 1.2 plant community composition

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

Table 7. Community 2.1 plant community composition

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

Table 8. Community 2.2 plant community composition

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

Animal community

This site is suitable for grazing for all classes of livestock. Snow cover during winter months may cover forage plants for short periods of time. The site responds readily to planned grazing systems.

Recreational uses

The site occurs as undulating plains and rolling hills. The mixture of vegetative life forms may add to the pleasing nature of the site. Winters are cold and spring is often very windy and dry. Late spring, summer and fall provide pleasant recreation weather. Sport hunting is the primary recreational activity on the site. Incidental activities include photography and wildlife observation.

Inventory data 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.

Other references

Information and updates collected during 2009-2010 for the ESD was conducted as part of an Interagency Technical Assistance Agreement between the Bureau of Indian Affairs—Navajo Region and the NRCS—Arizona.

Contributors

Ken Gishi
 Larry D. Ellicott
 Steve Barker

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)	Dan Carroll
Contact for lead author	State Rangeland Management Specialist - NRCS State Office - Phoenix, AZ
Date	08/27/2012
Approved by	
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production
--	-------------------

Indicators

1. **Number and extent of rills:** None to very few. A few rills may form on the steeper slopes.

2. **Presence of water flow patterns:** Some water flow patterns can be present. They should be short and discontinuous and most will be associated with steeper slopes.

3. **Number and height of erosional pedestals or terracettes:** Some pedestals and terracettes may be apparent near long lived perennial plants that are associated with water flow patterns

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** The average available water capacity is a moderate 7.5 inches gives the site the ability to produce a moderate amount of plant cover. Bare ground will be <50%.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous and fine woody litter will be transported in water flow pathways during storm events. Coarse woody litter will stay in place and most litter stays under the canopies of shrubs and trees.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface textures are gravelly sandy loam, very gravelly loam, sandy clay loam, silty clay loam and clay loam. These soils have a water erosion hazard of slight or moderate. There is high resistance to wind erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The top soil horizon is 2" to 4" in depth. The structure is weak fine granular to moderate thin platy. Color is variable depending on parent material. There are some soils with gravelly surface textures.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** A fairly even distribution of grasses with scattered shrubs and a minor component of forbs make this site

moderately effective at capturing and storing precipitation.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. The platy structure of some soils surface horizon might falsely appear to be a compaction layer.

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 > warm season grasses

Sub-dominant: Large shrubs > half shrubs

Other: Forbs > trees > cacti

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All plant functional groups are adapted to survive in all years except during the most severe droughts. Severe winter droughts affect shrubs, trees and cool season grasses the most. Severe summer droughts affect warm season grasses the most.

14. **Average percent litter cover (%) and depth (in):** This site is dominated by herbaceous litter with some woody litter present. Litter amounts increase in the first years of drought and decrease in the later years of a drought.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** The median annual production for a year with average precipitation for this site ranges from 550 to 650 pounds per acre.

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: With heavy grazing use shrubs will increase (snakeweed, rabbitbrush, fourwing saltbush and Wyoming big sagebrush). That heavy use can open up the site to juniper trees moving in. Common non-native plant species that invade and can have a significant impact on the site are cheatgrass and Russian thistle. There may be other annual forbs that become present on this site (ex. Goosefoot).**

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