USDA Natural Resources
Conservation Service

Ecological site R039XA106AZ
Stony Upland 17-22" p.z.

Accessed: 05/10/2025

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.

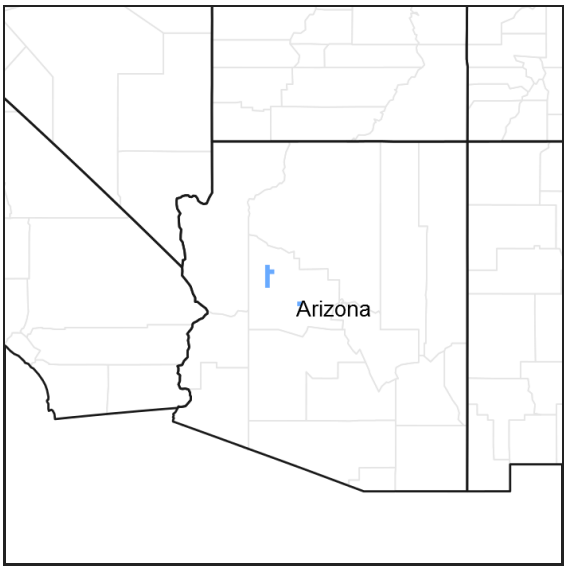

Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 039X–Mogollon Transition North

AZ 39.1 Mogollon Plateau Coniferous Forests

Elevations range from 7000 to 12,500 feet and precipitation averages 20 to 35 inches per year. Vegetation includes ponderosa pine, Gambel oak, Arizona walnut, sycamore, Douglas fir, blue spruce, Arizona fescue, sheep fescue, mountain muhly, muttongrass, junegrass, pine dropseed, and dryland sedges. The soil temperature regime ranges from mesic to frigid and the soil moisture regime ranges from typic ustic to udic ustic. 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.

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa* (2) *Juniperus deppeana*
Shrub	(1) *Chrysothamnus*
Herbaceous	(1) *Muhlenbergia montana* (2) *Poa fendleriana*

Physiographic features

This site occurs in an upland position as rocky ridges and plains. It neither benefits significantly from run-in moisture nor does it suffer from excessive loss from run-off, unless denuded of its vegetation. It can occur on all exposures.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Ridge
Elevation	6,500–7,600 ft
Slope	1–30%
Aspect	Aspect is not a significant factor

Climatic features

About 40% of the moisture in this Common Resource Area (CRA), or Land Resource Unit (LRU) comes as rain from June to September. The remainder comes from October to May as snow or light rain. Extreme temperatures of 97 and -37 degrees Fahrenheit have been recorded. Some moisture is usually received every month.

Table 3. Representative climatic features

Frost-free period (average)	168 days
Freeze-free period (average)	120 days
Precipitation total (average)	22 in

Influencing water features

Soil features

Soils on this site are moderately deep (20-40"), well drained and formed in material weathered from basic igneous rock. The surface layer texture is stony clay loam, cobbly silt loam, or cobbly clayloam, usually 2-5 inches thick. Subsurface textures include clay loam, stony clay or clay. Hazard of erosion is moderate and content of soluble salts is low.
Typical taxonomic units include: from SSA-637 Yavapai County Western Part MU's BsC & BsD Brolliar.

Table 4. Representative soil features

Surface texture	(1) Stony clay loam (2) Cobbly silt loam (3) Cobbly clay loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Slow to very slow
Soil depth	20–40 in
Surface fragment cover <=3"	5–40%
Soil reaction (1:1 water) (0-40in)	6.4–7

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.

State and transition model

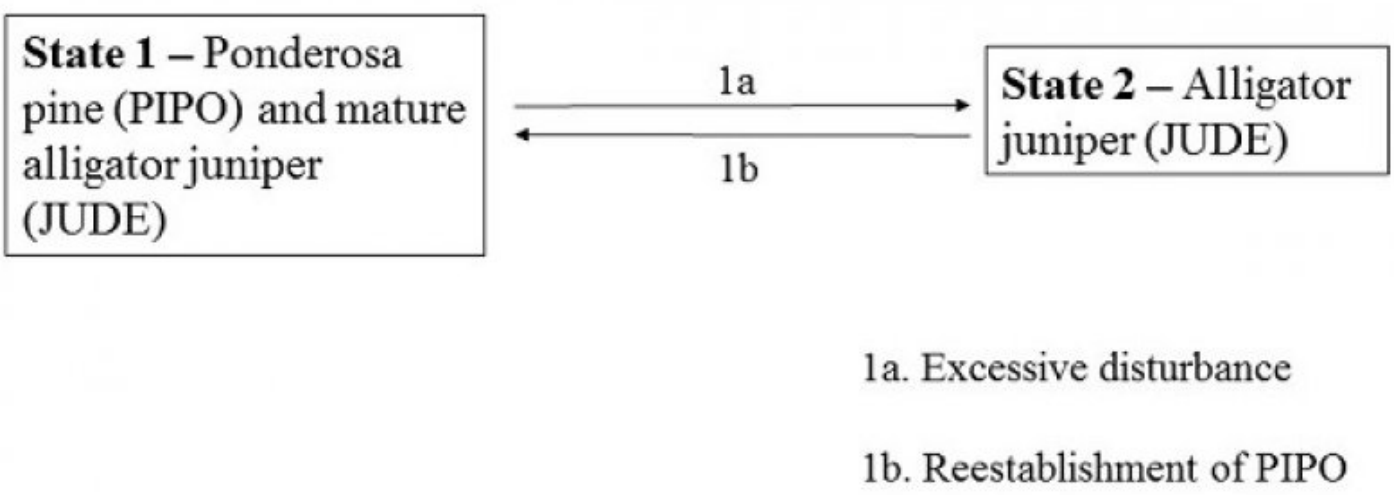

Figure 4. MLRA 39 (17-22"), Stony Upland

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

This site has a plant community made up primarily of mid and short grasses with a relatively small percentage of forbs, shrubs and trees. In the potential plant community there is a mixture of both cool and warm season grasses. Plant species most likely to invade or increase on the site following disturbance are rabbitbrush, alligator juniper, ponderosa pine and pingue. Continuous use during the spring period will decrease cool season grasses which are replaced by lower value forage plants.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	788	840	893
Forb	53	79	105
Tree	53	79	105
Shrub/Vine	11	32	53
Total	**905**	**1030**	**1156**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
0				53–105	
	alligator juniper	JUDE2	*Juniperus deppeana*	30–60	–
	ponderosa pine	PIPO	*Pinus ponderosa*	23–45	–
Shrub/Vine					
0				11–53	
	rabbitbrush	CHRYS9	*Chrysothamnus*	11–53	–
Grass/Grasslike					
0				788–893	
	mountain muhly	MUMO	*Muhlenbergia montana*	315–420	–
	muttongrass	POFE	*Poa fendleriana*	105–210	–
	pine dropseed	BLTR	*Blepharoneuron tricholepis*	53–105	–
	blue grama	BOGR2	*Bouteloua gracilis*	53–105	–
	Arizona fescue	FEAR2	*Festuca arizonica*	53–84	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	32–53	–
	black dropseed	SPIN5	*Sporobolus interruptus*	11–53	–
	spike muhly	MUWR	*Muhlenbergia wrightii*	11–53	–
	sedge	CAREX	*Carex*	0–21	–
Forb					
0				53–105	
	Forb, annual	2FA	*Forb, annual*	6–12	–
	yarrow	ACHIL	*Achillea*	5–12	–
	milkvetch	ASTRA	*Astragalus*	6–12	–
	buckwheat	ERIOG	*Eriogonum*	6–12	–
	lupine	LUPIN	*Lupinus*	6–12	–
	horehound	MAVU	*Marrubium vulgare*	5–10	–
	mullein	VERBA	*Verbascum*	5–10	–
	pingue rubberweed	HYRI	*Hymenoxys richardsonii*	5–10	–
	thistle	CIRSI	*Cirsium*	5–10	–
	pussytoes	ANTEN	*Antennaria*	5–10	–

Animal community

This site is suitable for grazing by all classes of livestock. The site is used primarily as late spring to early fall seasonal range. This site responds very well to Prescribed Grazing systems. The stony soil surface may impede livestock movement. Mechanical forms of brush management should be restricted to slopes less than 20 percent.

This site has relatively poor habitat diversity in the native plant community. It is primarily adapted to grassland wildlife species except at the edge of timber where it is utilized by many species. Large game animals are migratory onto the site primarily for summer use.

Recreational uses

This site has a variety of summer flowers. It has excellent aesthetic appeal because of the open grassland appearance, which is adjacent to a distinct timber edge.
Summers are cool and pleasant but winters are harsh and cold.
Hunting, camping, photography and wildlife observation are favorite activities.

Type locality

Location 1: Coconino County, AZ	
Township/Range/Section	T16N R8E S12
General legal description	On Forest Service Road #141, Coconino National Forest, west of Garland Prairie Road, about 0.3 miles south of Morgantank, Coconino County, AZ and about one mile northwest of Stoneman Lake Road, in the NWl/4SEl/4 sec. l2, T. l6 N., R. 8 E.

Contributors

Larry D. Ellicott
Steve Barker

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)	Karlynn Huling
Contact for lead author	NRCS Flagstaff Area Office
Date	05/22/2006
Approved by	S. Cassady
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Soil surfaces and plant communities on this site are variable. Rill formation is not likely on any of the soils when the site is well vegetated or covered with rock fragment armor. Soils with silt loam or loam surfaces ahve the potential to develop rills in the steeper areas, but these soils will generally support more forest cover. The tree cover is usually high enough to develop an O horizong or litter layer that protects the soil from raindrop impact, overland flow, and erosion. Soils with clay loam or silty clay loam surfaces have slow permeability, medium runoff, and may be susceptible to rill formation on steeper slopes. These soils generally support a rangeland plant community with less cover of trees. All soils have a significant amount of cobbles and stones on the surface or in the surface horizons

that protects it from rill formation.

---

2. **Presence of water flow patterns:** Water flow patterns are not common in the areas with a high surface cover of litter and/or rock fragments. They may be common in steeper rangeland areas without tree cover due to slow permeability, medium runoff, and lack of tree litter cover.

---

3. **Number and height of erosional pedestals or terracettes:** Pedestals and terracettes are not common in the areas with tree litter. They may occur in areas without tree litter, but they will be very short.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** This site has an average available water capacity of 5 inches, so it has a moderate potential for the production of plant cover. Drought may cause an increase in bare ground.

---

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 in areas without tree needle litter. Coarse woody litter will remain under shrub and tree canopioes. There will not be much litter movement in areas with a high cover of tree needle litter.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface textures range from silt loam and loam to clay loam and silty clay loam. Most soils have a significant cover of cobbles and stones. All soils have a significant amount of cobbles or stones in the surface horizons. Many soils are protected by a layer of tree needle litter. The soils have high shrink/swell properties, especially in the subsurface, but there are usually no surface cracks. This physical property could lead to low aggregate stability. When well vegetated or covered with a significant amount of rock fragments or tree needle litter, these soils have a moderate to high resistance to water erosion and a high resistance to wind erosion.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The mineral soil is generally 3 inches thick. Often there is a 2-inch thick O horizon or tree needle litter layer above the mineral soil. Color is variable depending on parent material.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** This site is characterized by a relatively even distribution of mostly grasses with some shrubs and forbs. There is usually a light canopy of trees, but there may be a thick canopy in areas where soil surfact texture changes to clay loam. Both plant cover values (canopy and basal) decrease during prolonged drought.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be**

mistaken for compaction on this site): These soils generally are not susceptible to compaction due to the high cover of rock fragment armor and the high volume of rock fragments in the profile. In the absence of rock fragments, the soils would be susceptible to compaction due to the loamy surface textures. Most soils have a naturally platy surface structure.

---

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: warm season bunchgrasses >>

    Sub-dominant: Cool season bunchgrasses >>

    Other: Minor: forbs > trees >
    Trace: shrubs > sedges

    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 survival in all years except during the most severe droughts. Severe winter droughts affect shrubs and trees the most. Severe summer droughts affect grasses the most.

---

14. **Average percent litter cover (%) and depth (in):** Mostly herbaceous litter with some woody litter. Litter amounts increase during the first few years of drought, then decrease in later years.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 900-975 pounds per acre (dry weight) in dry years, 975-1125 pounds per acre in median years, 1125 to 1200 pounds per acre in wet years.

---

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:** Pingue rubberweed, rubber rabbitbrush, alligator juniper, and ponderosa pine are native to the site, but they have the capacity to increase and dominate after heavy grazing and/or fire exclusion.

---

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 in most years except during the most severe droughts.
