Ecological site F039XA139AZ
Limestone/Sandstone Upland 17-22"

Last updated: 4/03/2020
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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): 039X–Mogollon Transition North

MLRA CHARACTERISTICS-THESE ARE GENERAL STATEMENTS
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.

SITE FEATURES
This site occurs in MLRA 39.1. The type location is near Flagstaff, Arizona on the Walnut Canyon National Monument. This site is dominated by Ponderosa Pine and Gambel Oak. The geology of this site is dominated by limestone with pockets of sandstone.

Associated sites

R035XG723AZ	**Limestone/Sandstone Upland (Pinyon-Juniper) 14-18" p.z.**
R035XG724AZ	**Semi-Riparian Canyon Bottom 14-18" p.z.**
R039XA140AZ	**Canyon Bottom (Riparian) 18-22" p.z.**

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa*
Shrub	(1) *Quercus gambelii*
Herbaceous	Not specified

Physiographic features

This area is dominated by heavily treed limestone benches. There are lesser areas of north-facing limestone escarpments on this site and small areas of sandstone intermixed on the limestone structural benches. The areas of sandstone are dominated by junipers whereas the surrounding limestone areas are dominated by Ponderosa pines.

**Table 2. Representative physiographic features**

Landforms	(1) Structural bench (2) Escarpment
Flooding frequency	None
Elevation	1,829–2,286 m
Slope	2–8%
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)	120 days
Freeze-free period (average)	
Precipitation total (average)	559 mm
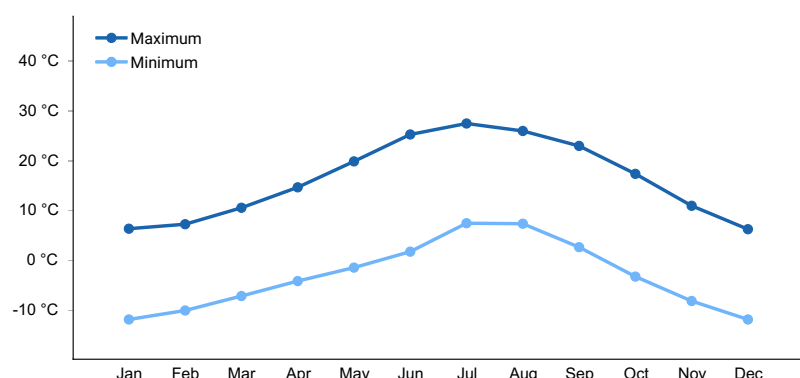
Figure 1. Monthly average minimum and maximum temperature

Influencing water features

No water features on this site

Soil features

Soil map units correlated for this site are on Walnut Canyon National Monument.

Map Units:
31 Chilson-Wilcoxin complex, 2 to 8 percent slopes, very rocky
32 Cosnino-Rock outcrop complex, 5 to 25 percent slopes
33 Cosnino-Rock outcrop complex, 25 to 70 percent slopes

Table 4. Representative soil features

Parent material	(1) Residuum–limestone and sandstone
Surface texture	(1) Loam
Drainage class	Well drained
Permeability class	Very slow to moderate
Soil depth	38 cm

Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	4.83 cm
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site is dominated by Ponderosa Pine with a Gambel Oak understory. Most of the site is greater than 25% tree canopy cover, with a mix of both cool and warm season grasses. Within the site, there are pockets of reddish sandstone, in which the vegetation changes to pinyon-juniper dominated with warm season grasses as understory. These are minor inclusions, and as mapping continues at a finer (larger) scale, this site may be able to be separated out on its own. At the scale of mapping, north-facing limestone escarpments have also been included in this site description. These escarpments may differ slightly in vegetation and have douglas-fir as a major tree component, with ponderosa pine and gambel oak as lesser (but still sub-dominant) components. These sites are dominantly north-facing and tend to be cooler with mixed cool and warm season grasses.

Model 1, State 1 is the dominant State in the ecological site, and any Reference Plant Production and Cover data is in reference to this State and Model. As more acreage of the lesser sites are documented, models 2 and 3 will be separated out into separate Ecological sites. At the scale mapped in the Walnut Canyon National Monument Survey, these areas are too intermingled with the dominant state to be separated.
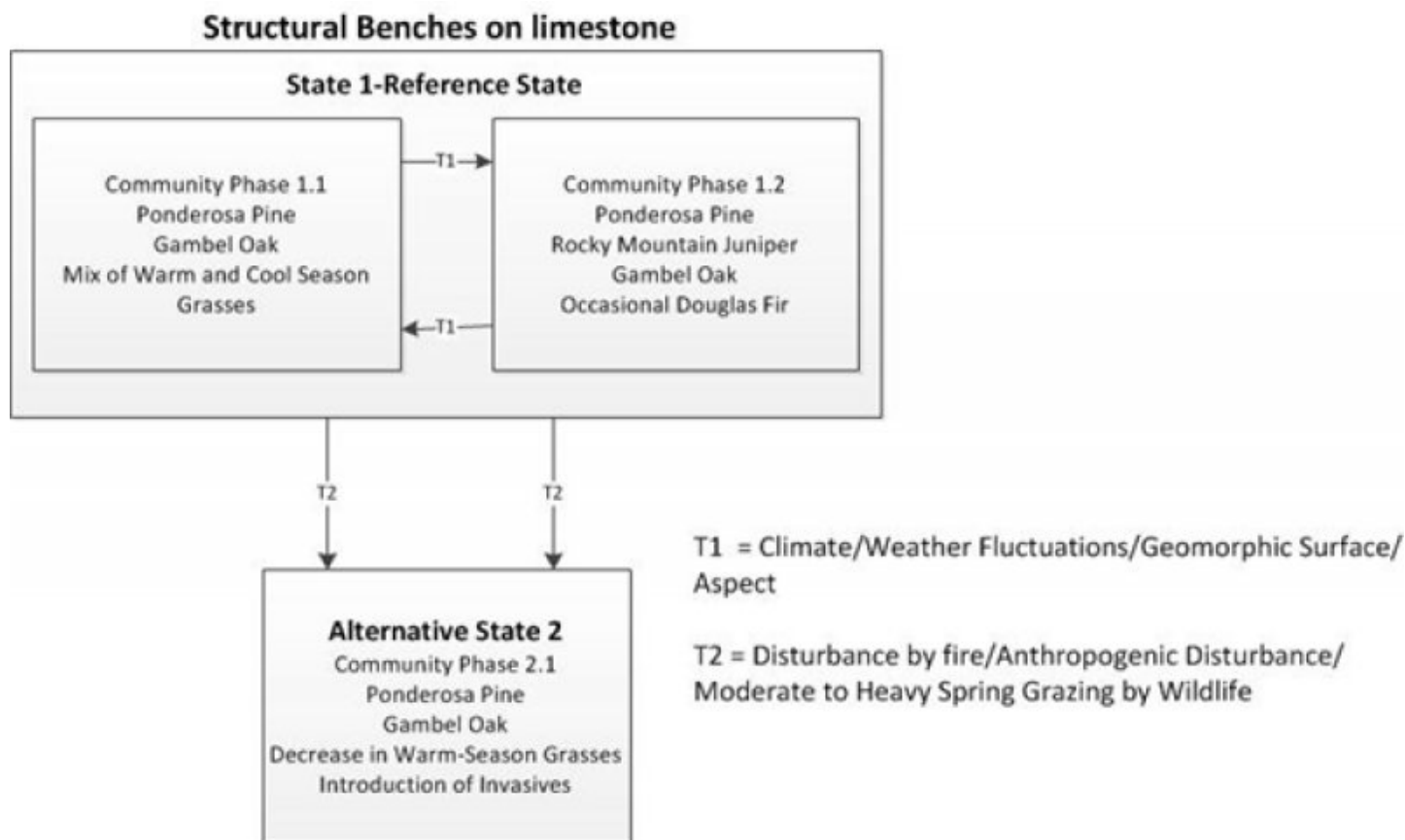
State and transition model

Figure 2. Model

State 1
Reference State

This state is dominated by ponderosa pine, gambel oak and a mixture of both warm and cool season grasses

Community 1.1
Ponderosa Pine-Gambel Oak

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	–	250	497
Grass/Grasslike	21	112	291
Forb	–	65	129
Shrub/Vine	1	7	12
Total	**22**	**434**	**929**

Table 6. Soil surface cover

Tree basal cover	0-30%
Shrub/vine/liana basal cover	30-56%
Grass/grasslike basal cover	30-56%
Forb basal cover	30-56%
Non-vascular plants	0%
Biological crusts	0%
Litter	82-90%
Surface fragments >0.25" and <=3"	0-8%
Surface fragments >3"	0-6%

Bedrock	0%
Water	0%
Bare ground	82-92%

Community 1.2
Ponderosa Pine-Rocky mountain Juniper

State 2
Alternative State

This site is dominated by ponderosa pine and gambel oak. This state has a decrease in native grasses due to disturbance and invasives may be here, such as Dalmation toadflax and locoweeds.

Community 2.1
Ponderosa Pine-Gambel Oak-Invasives

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
1	**Trees**			0–497	
	ponderosa pine	PIPO	*Pinus ponderosa*	4–497	–
	Gambel oak	QUGA	*Quercus gambelii*	72–196	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–106	–
	Douglas-fir	PSME	*Pseudotsuga menziesii*	0–7	–
Shrub/Vine					
2	**Shrubs**			0–17	
	Woods' rose	ROWOU	*Rosa woodsii var. ultramontana*	0–12	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–2	–
	buckwheat	ERIOG	*Eriogonum*	0–1	–
Forb					
3				0–560	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	0–129	–
Grass/Grasslike					
4	**Grass**			21–156	
	mountain muhly	MUMO	*Muhlenbergia montana*	0–156	–
	muttongrass	POFE	*Poa fendleriana*	21–80	–
	blue grama	BOGR2	*Bouteloua gracilis*	6–22	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–11	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–7	–
	squirreltail	ELELB2	*Elymus elymoides ssp. brevifolius*	0–6	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–3	–

Type locality

Location 1: Coconino County, AZ	
UTM zone	N
UTM northing	3890539
UTM easting	451162
General legal description	This Type Location is located on Walnut Canyon National Monument with restricted public access

Contributors

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Approval

Scott Woodall, 4/03/2020

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)	
Contact for lead author	
Date	05/13/2025
Approved by	Scott Woodall
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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

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:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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):**

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:**

17. **Perennial plant reproductive capability:**