Ecological site R038XC302AZ
Clayey Upland 20-24

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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.

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): 038X–Mogollon Transition South

AZ 38.3 – Upper Mogollon Transition

Elevations range from 5,100 to 7,000 feet and precipitation averages 20 to 27 inches per year. Vegetation includes Gambel oak, Arizona white oak, Emory oak, pinyon, alligator juniper, one-seed juniper, Arizona cypress, ponderosa pine, shrubby buckwheat, sacahuista, skunkbush sumac, Wright silktassle, blue grama, sideoats grama, muttongrass, western wheatgrass, and bottlebrush squirreltail. The soil temperature regime is mesic and the soil moisture regime is typic ustic. This MLRA occurs within the Transition Zone Physiographic Province and is characterized by canyons and structural troughs or valleys. Igneous, metamorphic, and sedimentary rock classes occur on rough mountainous terrain in association with less extensive sediment filled valleys exhibiting little integrated drainage.

Ecological site concept

These soils generally occur on linear to concave areas. The Clayey Upland ecological site occurs on stream terraces and fan terraces. Slopes range from 0 to 5 percent.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

These soils generally occur on linear to concave areas. The Clayey Upland ecological site occurs on stream terraces and fan terraces. Slopes range from 0 to 5 percent.

Table 2. Representative physiographic features

Landforms	(1) Stream terrace (2) Terrace
Elevation	5,100–7,000 ft
Slope	1–5%

Climatic features

Precipitation in this common resource area averages approximately 20 to 24 inches annually. Precipitation is lower and temperatures are cooler in the eastern part of the MLRA. The winter-summer rainfall ratio ranges from about 60/40% in the western part of the area to 45/55% in the eastern part. Summer rains fall July through September; and are from high-intensity convective thunderstorms. This moisture originates primarily from the Gulf of Mexico, but can come from the remnants of Pacific hurricanes in September. Winter moisture is frontal, originates in the north Pacific, and falls as rain or snow in widespread storms of low intensity and long duration. Snowfall ranges from 10 to 18 inches per year and can occur from November through April. May and June are the driest months of the year. Humidity is generally low all year.
Average annual air temperatures range from 50 to 57 degrees F (mesic temperature regime). Daytime temps in the summer are commonly in the mid 80's in the eastern portion of the MLRA and the low to mid 90's in the western portion. Freezing temperatures are common from October through April. The actual precipitation, available moisture and temperature varies, depending on, region, elevation, rain shadow effect and aspect.

Table 3. Representative climatic features

Frost-free period (average)	167 days
Freeze-free period (average)	188 days
Precipitation total (average)	24 in

Influencing water features

Soil features

The Bigprairie soil series consists of very deep well drained soils that formed in alluvium derived from volcanic and sedimentary rocks. These soils are on stream terraces and fan terraces. Slopes range from 0 to 5 percent.

Soils mapped on this site include: from SSA-675 San Carlos IR Area MU Bigprairie-78.

Table 4. Representative soil features

Parent material	(1) Alluvium–volcanic breccia
Surface texture	(1) Clay
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to slow

Soil depth	20–40 in
Surface fragment cover <=3"	0–25%
Calcium carbonate equivalent (0-40in)	0–15%
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	3–10%
Subsurface fragment volume >3" (Depth not specified)	0–1%

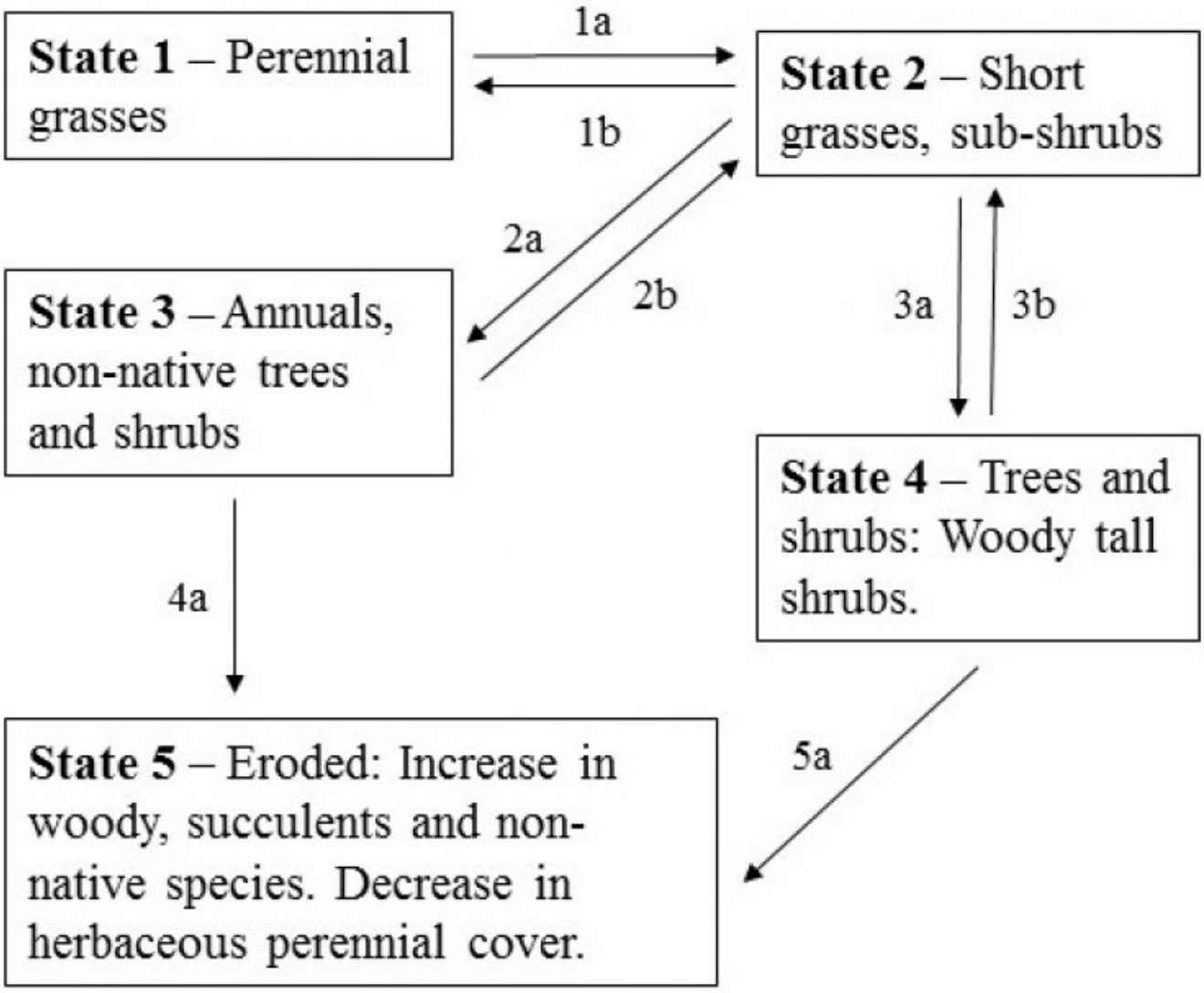
Ecological dynamics

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



1a. Fire, drought, CHG

2a. CHG, absence of fire

3a. Woody species increase due to absence of fire and CHG

4a. Accelerated soil erosion may occur where herbaceous plants are absent.

5a. Fire, drought, CHG. Loss of perennial herbaceous cover.

Figure 4. MLRA 38.3 (20-24"), Clayey Upland

State 1
Midgrass State

The historic climax plant community (HCPC) description was derived from a literature review and assessment of historic photos by The Nature Conservancy (Historical Range of Variation for Potential Natural Vegetation Types of

the Southwest. June 2007. TNC). The best potential natural vegetation for this ecological site was sampled for point data to describe the reference community. This reference plant community can be described as belonging to the vegetation grouping by TNC as the mixed native grass type of the semi-desert grassland grouping. Within this type, the species composition varies greatly with soil type and topography. Historically, this vegetation type was found to be an open grassland with low shrub canopy cover (<10%) occurring in an upland position (Gori and Enquist, 2003). According to the TNC, frequent fires maintained this grassland by killing young shrub and tree regeneration with fire return intervals of 2.5 to 0 years. Other studies have surmised that grasslands FRI corresponded to the surrounding woodland or forest. In the USFS-FEIS (Fire Effects Information System) the FRI for Pinyon-Juniper systems was less than 35 years, and for interior ponderosa pine was 2 to 46 years. Dan Robinett suggested a FRI of 10 to 15 years in the Clay Loam Upland Ecological Site Description. Fire return intervals are difficult to determine in non-woody plant communities, due to lack of tree ring evidence, but likely occurred frequently and maintained a grassland versus a shrubland. The TNC used photo interpretation to show that historically the semi-desert grassland area was in an open grassland state, with very little in the shrub or tree state. TNC did a current regional assessment and found that only 17% of extant and former grasslands within the region can now be classified as open (<10% shrub cover) native grasslands. It is thought that missed fire cycles, drought, and grazing have affected the rate of shrub increase, but the exact interactions are unclear (Brown and others, 1997; Cable, 1971; McPherson, 1995; Robinett, 1994). Fires within the southwest are mainly lightning ignitions, covered large areas and occurred in June and July (Swetnam and Betancourt, 1998). This timing occurred because of cool-season moisture allowing some greenup, and arid foresummer; providing dry conditions followed by pre-monsoonal lightening storms providing ignitions. The dominant shrubs in the semi-desert grasslands are easily killed by fire as seedlings or young plants and do not produce seeds until they are at least 10 years old. Therefore, frequent fires would avoid shrub invasion into grasslands. Many studies show large reductions in shrub cover, such as broom snakeweed and cacti after fires (Bock and Bock,1997; Humphrey, 1949; Reynolds and Bohning, 1956). Studies have also shown that most native perennial grasses show no negative effect after fire, recovering after one to two seasons, or with drought three to four seasons (Bock and Bock, 1992; Gosz and Gosz, 1996; Cable, 1972; Martin, 1983; Wright, 1980). Normal drought coupled with other disturbance events such as unmanaged grazing can decrease perennial grass cover and increase sub-shrub cover. This is because perennial grasses are generally intensive water exploiters that have a dense network of shallow roots that can easily exploit water found in the shallow soil layers. Therefore, they are able to extract water from these shallow layers during light seasonal rains, where precipitation penetrates most frequently. The sub-shrub, snakeweed, is also an intensive exploiter, and occupies the same soil layers and therefore competes with perennial grasses (Weaver, 1920; Campbell and Bomberger, 1934; Jameson, 1966). They differ in their shoot dieback during dormancy in that grasses usually dieback nearly to the surface whereas subshrubs only in part. This may allow subshrubs to dominate over perennial grass in areas with lower cover. The presence of broom snakeweed and shrubby buckwheat indicates a strong drought influence in the area. As well, Broom snakeweed increases due to lack of fire and has been shown to be an increaser species with grazing. Therefore, within the reference state there are two communities that can cycle naturally between each other. The TNC did an intense literature review of native perennial grassland succession and developed the following model. It is thought that 2 years post-burn, grass would regenerate with 0 to 5 percent shrub canopy cover and this community would be maintained for a couple of years. In the absence of a stand replacing fire, shrub canopy cover would increase to 6 to 10 percent and this would be stable for 3 to 40 years. This is based on the average frequency of low, moderate, and extreme wet winter precipitation events (every 20 years) and the time (about 20 years) it takes for shrubs to show large cover increases (3-fold) following these wet periods. Drought could also effectively maintain this community with low shrub covers, by killing young shrubs, for about 37 years. Prolonged drought has been shown to cause declines in shrub density and cover within these grasslands. They used moderate drought events (equal to 1950's drought) in the model to transition vegetation back to its starting conditions within the state, using the average historic moderate drought frequency (from 1,000 years of reconstructed winter precipitation data) (Ni and other, 2001;Bock and Bock, 1997; McClaren, 2003; Turner and other, 2003). Fire would return this community to one with 0 to 5 percent shrub cover. After 40 more years, shrub cover could increase to 11 to 30 percent cover, again maintained for about 37 years with drought cycles. Stand replacing fire would return this community to one with 6 to 11 percent shrub cover. With increasing grazing management intensity, each community can transition to the next with higher shrub cover. When drought conditions are followed by wet winters, shrub cover can be exponentially increased leading to an altered shrub state. The reference plant community for this ecological site is a western wheatgrass grassland.

Type locality

Location 1: Gila County, AZ

Township/Range/Section	T1N R25E S3
General legal description	Bigprairie soil location: 1,713 feet south and 1,374 feet west of northeast corner of Section 3, Township 1 N, Range 25 E

Contributors

Dan Robinett
Larry D. Ellicott

Approval

Scott Woodall, 9/05/2019

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	
Approved by	
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):**

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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):**

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

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

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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:

    Sub-dominant:

    Other:

    Additional:

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

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
