

Ecological site R041XC310AZ

Loamy Bottom, Woodland 12-16" p.z.

Last updated: 4/12/2021

Accessed: 05/11/2024

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): 041X–Madrean Archipelago

AZ 41.3 – Chihuahuan – Sonoran Semidesert Grasslands

Elevations range from 3200 to 5000 feet and precipitation ranges from 12 to 16 inches per year. Vegetation includes mesquite, catclaw acacia, netleaf hackberry, palo verde, false mesquite, range ratany, fourwing saltbush, tarbush, littleleaf sumac, sideoats grama, black grama, plains lovegrass, cane beardgrass, tobosa, vine mesquite, threeawns, Arizona cottontop and bush muhly. The soil temperature regime is thermic and the soil moisture regime is ustic aridic. This unit occurs within the Basin and Range Physiographic Province and is characterized by numerous mountain ranges that rise abruptly from broad, plain-like valleys and basins. Igneous and metamorphic rock classes dominate the mountain ranges and sediments filling the basins represent combinations of fluvial, lacustrine, colluvial and alluvial deposits.

Associated sites

R041XC312AZ	Loamy Bottom 12-16" p.z.
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Table 1. Dominant plant species

Tree	(1) <i>Prosopis velutina</i> (2) <i>Prosopis glandulosa</i> var. <i>torreyana</i>
Shrub	Not specified
Herbaceous	(1) <i>Sporobolus wrightii</i>

## Physiographic features

This site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on stream terraces of major drainage-ways. It does not benefit regularly from over-bank flooding. Some extra moisture may be received from the valley-side drainages. Shallow water tables exist at depths of 20-50 feet. Stream channels are deeply entrenched.

**Table 2. Representative physiographic features**

Landforms	(1) Stream terrace (2) Terrace
Flooding frequency	None to rare
Ponding frequency	None to rare
Elevation	975–1,524 m
Slope	0–3%
Aspect	Aspect is not a significant factor

## Climatic features

Precipitation in this common resource area ranges from 12-16 inches yearly in the eastern part with elevations from 3600-5000 feet, and 13-17 inches in the western part where elevations are 3300-4500 feet. Winter-Summer rainfall ratios are 40-60% in the west and 30-70% in the east. Summer rains fall July-September, originate in the Gulf of Mexico and are convective, usually brief, intense thunderstorms. Cool season moisture tends to be frontal, originates in the Pacific and Gulf of California, and falls in widespread storms with long duration and low intensity. Snow rarely lasts more than one day. May and June are the driest months of the year. Humidity is generally very low.

Temperatures are mild. Freezing temperatures are common at night from December-April; however temperatures during the day are frequently above 50 F. Occasionally in December-February, brief 0 F temperatures may be experienced some nights. During June, July and August, some days may exceed 100 F.

Cool season plants start growth in early spring and mature in early summer. Warm season plants take advantage of summer rains and are growing and nutritious July-September. Warm season grasses may remain green throughout the year.

**Table 3. Representative climatic features**

Frost-free period (average)	220 days
Freeze-free period (average)	
Precipitation total (average)	406 mm

## Influencing water features

There are no water features associated with this site.

## Soil features

These soils are young and have formed in loamy or silty alluvium of mixed origin. Plant-soil moisture relationships are excellent for deep-rooted trees due to the presence of shallow ground water. Soil may be calcareous or even slightly saline.

Soil series mapped on this site include: SSA-669 Pima county E part MU 68 Riveroad; SSA-675 San Carlos IR area MU 65 Ubik.

**Table 4. Representative soil features**

Surface texture	(1) Fine sandy loam (2) Loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately slow
Soil depth	152 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	27.43–32 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–6 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–5%
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 fire, grazing, or drought.

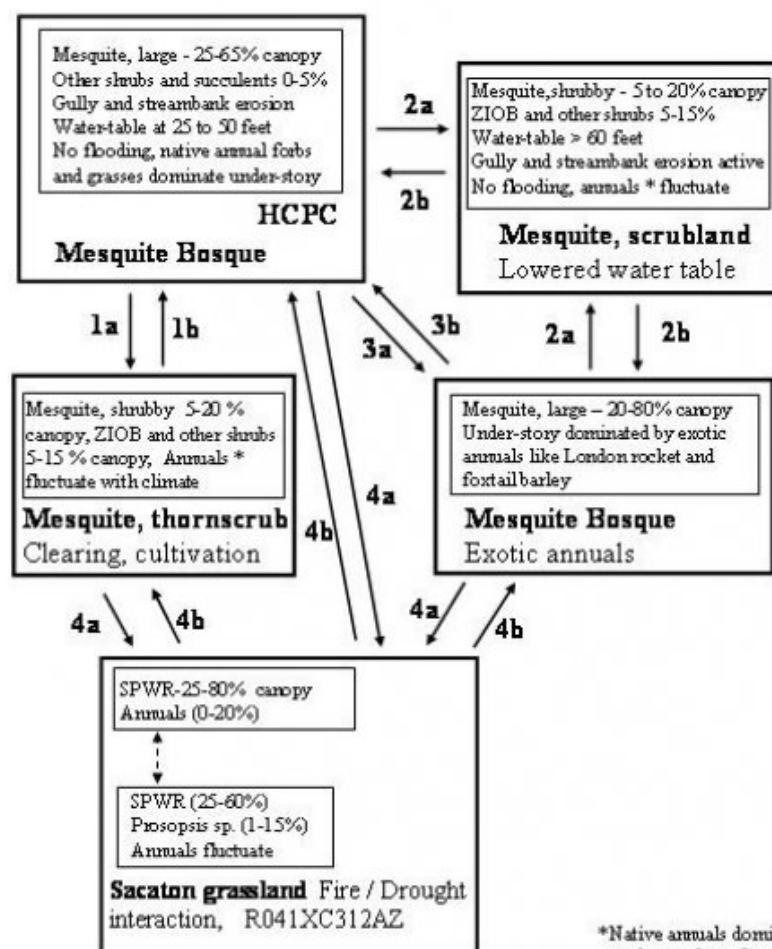
Production data provided in this site description is standardized to air dry weight at the end of the summer growing season. The plant communities described in this site description are based on near normal rainfall years.

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 amount shown for each group. Divide the resulting total by the total normal year production shown in the plant community description. If the 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

### MLRA 41-3 (12-16"), Loamy Bottom, PROSOPIS



- 1a. Mesquite clearing for either wood harvest or cultivation, Irrigation abandoned, ZIOB, other shrubs with shrubby mesquite form a scrubland. Water table intact.  
1b. 50 to 100 years with no further mesquite harvest or control to go back to mature mesquite trees rooted 50 foot deep.  
2a. Water-table depleted by groundwater pumping to greater than 60 feet. Mature mesquites die back to a shrubby growth that rainfall can support. No return, if pumping is associated with urban areas or development.  
2b. Cessation of groundwater pumping may allow water tables to rise over time to within 50 feet of the surface. Time depends on depth of depletion and amount of pumping reduced. This will not occur in urban or developing areas.  
3a. Introduction of a seed source for non native annuals like London rocket, foxtail barley, red brome and rescue brome  
3b. Unknown, possible herbicide control of exotic annuals.  
4a. Sedimentation of main stream system will cause water-tables to rise, eventually drowning out mesquite. Water tables are within rooting depth (20 feet) of sacaton. Gullies and stream channels fill with sediment and flooding resumes. Site returns to sacaton potential w/ PG/NG, see site description R041XC312AZ.  
4b. Gully and stream erosion deepen channels and lower water-table to more than 20 feet from the surface. Sacaton thins out, mesquite increases and slowly forms a mature bosque.

\*Native annuals dominant, may be patches of some non-natives

CHG - continuous heavy grazing  
PG/NG - proper grazing, no grazing  
ZIOB-greythorn, SPWR - sacaton

## State 1 Historic Climax Plant Community

### Community 1.1 Historic Climax Plant Community



Figure 4. Loamy Bottom, PROSOP 12-16" pz. HCPC

This site has a mixed plant community with an over-story of mesquite and an under-story of perennial grasses, shrubs and annuals. Other tree species usually occur in clumps or along the banks of stream channels. Mesquite leafs out in mid-to-late spring after the last frost, flowers in early summer, and has mature fruits ready to drop by early July. The trees lose their leaves with the first hard freeze in the fall. The aspect is deciduous woodland. The site is very susceptible to channel and stream bank erosion. Drainage-ways are deeply entrenched and, if streamside vegetation is disturbed, bank cutting becomes a serious problem. If the over-story of mesquite is reduced, plants such as greythorn and wait-a-bit bush can quickly increase to dominate the plant community. Herbaceous under-story varies greatly with different percent canopy cover. Excessive groundwater pumping can, over time, lower water tables beyond the reach of tree roots and cause extensive loss of trees. Tree species present on the site are vigorous sprouters after fire or woodcutting. Natural fire may have been important in maintaining herbaceous under-stories. Salt cedar can invade and become a minor component of the plant community, usually growing on or near the banks of the stream channel. Bermuda and Johnson grasses are introduced species commonly found on this site.

**Forest overstory.** The over-story part of the plant community is dominated by velvet mesquite and / or western honey mesquite. Overstory canopy cover varies from 25 to 65% in mature stands of trees. Trees reach maximum size on this site (40-50 feet). Note; The percent composition in the following table is percent by canopy cover (not frequency).

**Forest understory.** The production of under-story plants can vary greatly with canopy cover. Open canopy areas will be dominated by shrubs and perennial grasses. Closed canopy areas will be dominated by annual forbs and grasses. Cool season annual forbs and grasses grow very well as mesquite is defoliated in the winter and spring. They can make tremendous production in El Nino years.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	3363	4483	6165
Forb	504	191	67
Grass/Grasslike	560	179	56
Shrub/Vine	387	163	39
<b>Total</b>	<b>4814</b>	<b>5016</b>	<b>6327</b>

Table 6. Soil surface cover

Tree basal cover	1%
Shrub/vine/liana basal cover	0-1%
Grass/grasslike basal cover	0-10%
Forb basal cover	0-10%
Non-vascular plants	0-1%
Biological crusts	0-15%
Litter	65-90%
Surface fragments >0.25" and <=3"	0-5%
Surface fragments >3"	0-1%
Bedrock	0%
Water	0%
Bare ground	0-30%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	0-5%	—
>0.15 <= 0.3	—	—	1-10%	1-10%
>0.3 <= 0.6	—	—	1-25%	1-30%
>0.6 <= 1.4	—	0-5%	1-20%	1-10%
>1.4 <= 4	0-5%	1-5%	0-5%	0-10%
>4 <= 12	25-60%	—	—	—
>12 <= 24	0-40%	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

## State 2

### Mesquite thorn-scrub

## Community 2.1

### Mesquite thorn-scrub



Figure 6. Loamy Bottom, PROSOP 12-16" pz. thornscrub

This state occurs where mesquite has been cleared for cultivation and subsequently abandoned; or where mesquite has been cut for fuel-wood. The water table is intact. Mesquite re-growth and / or sprouts form a thorn-scrub with a 25-50% canopy 15 years after wood harvest or clearing that leaves root systems alive. Mesquite will take much longer to re-colonize areas that have been cleared and cultivated. Mesquite seeds need to be introduced to these areas and new plants will take 15 to 20 years for roots to reach the water table. It will take from 50 to 100 years with no further mesquite harvest for trees to reach maturity on the site.

## State 3

### Mesquite scrub-land

## Community 3.1

### Mesquite scrub-land

This state occurs where groundwater pumping has lowered the water table beyond the reach of mesquite roots (60 ft.). Mature mesquites die back to a sparse canopy (10-20%) of shrubby trees (10-15 ft. tall) which rainfall can support. Other shrubs like greythorn, catclaw acacia, wolfberry and whitethorn can make up considerable part of the perennial plant community. Annual grasses and forbs dominate the herbaceous layer. If the pumping is associated with urban areas or other commercial development, this state is not reversible.

## **State 4**

### **Mesquite bosque, exotic annuals**

#### **Community 4.1**

##### **Mesquite bosque, exotic annuals**

This state occurs where the under-story has been invaded and dominated by non-native annual forbs and grasses. The mature mesquite bosque is unaffected by this change in the under-story vegetation. These species are mostly winter annuals like London rocket, foxtail barley, red brome, rescue brome that can produce tremendous amounts of herbage in wet winters. Other non-native annuals include tumbleweed, stinkgrass, barnyard grass, annual bristleglass, junglerice and horseweed. These annuals species can, over time, diminish the seed-bank of native annual species and may persist as the new under-story.

## **State 5**

### **Sacaton grassland, R041XC312AZ**

#### **Community 5.1**

##### **Sacaton grassland, R041XC312AZ**

This state occurs or forms when sedimentation of the stream system, over time, causes water tables to rise to within the root zone of giant sacaton (20 ft.). Also, sedimentation fills stream channels and valley side gullies allowing terraces to flood once again. As sacaton re-colonizes these areas, fires can burn with sufficient intensity to thin out mesquite. Mesquite can also die out due to rising water tables and increased flooding and / or ponding. The site reverts to sacaton grassland. See R041XC312AZ for details.

#### **Transition T1A**

##### **State 1 to 2**

Mesquite clearing for either wood harvest or cultivation. Irrigation abandoned, greythorn, other shrubs with shrubby mesquite form a scrubland. Water table intact.

#### **Transition T1B**

##### **State 1 to 3**

Water-table depleted by groundwater pumping to greater than 60 feet. Mature mesquites die back to a shrubby growth that rainfall can support. No return, if pumping is associated with urban areas or development.

#### **Transition T1C**

##### **State 1 to 4**

Introduction of a seed source for non native annuals like London rocket, foxtail barley, red brome and rescue brome.

#### **Transition T1D**

##### **State 1 to 5**

Sedimentation of main stream system will cause water-tables to rise, eventually drowning out mesquite. Water tables are within rooting depth (20 feet) of sacaton. Gullies and stream channels fill with sediment and flooding resumes. Site returns to sacaton potential with PG/NG, see site description R041XC312AZ.

#### **Restoration pathway R2A**

##### **State 2 to 1**

50 to 100 years with no further mesquite harvest or control to go back to mature mesquite trees rooted 50 foot deep.

#### **Transition T2A**



## **State 2 to 5**

Sedimentation of main stream system will cause water-tables to rise, eventually drowning out mesquite. Water tables are within rooting depth (20 feet) of sacaton. Gullies and stream channels fill with sediment and flooding resumes. Site returns to sacaton potential with PG/NG, see site description R041XC312AZ.

## **Restoration pathway R3A**

### **State 3 to 1**

Cessation of groundwater pumping may allow water tables to rise over time to within 50 feet of the surface. Time depends on depth of depletion and amount of pumping reduced. This will not occur in urban or developing areas.

## **Restoration pathway R3A**

### **State 3 to 4**

Cessation of groundwater pumping may allow water tables to rise over time to within 50 feet of the surface. Time depends on depth of depletion and amount of pumping reduced. This will not occur in urban or developing areas.

## **Restoration pathway R4A**

### **State 4 to 1**

Unknown, possible herbicide control of exotic annuals.

## **Transition T4A**

### **State 4 to 3**

Water-table depleted by groundwater pumping to greater than 60 feet. Mature mesquites die back to a shrubby growth that rainfall can support. No return, if pumping is associated with urban areas or development.

## **Transition T4A**

### **State 4 to 5**

Sedimentation of main stream system will cause water-tables to rise, eventually drowning out mesquite. Water tables are within rooting depth (20 feet) of sacaton. Gullies and stream channels fill with sediment and flooding resumes. Site returns to sacaton potential with PG/NG, see site description R041XC312AZ.

## **Transition T5A**

### **State 5 to 1**

Gully and stream erosion deepen channels and lower water-table to more than 20 feet from the surface. Sacaton thins out, mesquite increases and slowly forms a mature bosque.

## **Transition T5B**

### **State 5 to 2**

Gully and stream erosion deepen channels and lower water-table to more than 20 feet from the surface. Sacaton thins out, mesquite increases and slowly forms a mature bosque.

## **Transition T5C**

### **State 5 to 4**

Gully and stream erosion deepen channels and lower water-table to more than 20 feet from the surface. Sacaton thins out, mesquite increases and slowly forms a mature bosque.

## **Additional community tables**

### **Animal community**



If mesquite bean crops are harvested with cattle in the summer growing season, care should be taken to prevent overgrazing the perennial grasses. Closed canopy areas of the site are useable by cattle when beans are available or in wet winters when annuals are abundant. Open canopy areas have enough perennial grass to be used throughout the year. Horses should not be grazed when dry beans are in the trees or on the ground. Dry beans (that are re-hydrated by rain), can cause compaction and death in horses.

This site, being well wooded and adjacent to free water in streambeds for part or all of the year, is extremely important to a wide variety of wildlife species.

## Hydrological functions

This site occurs on high stream terraces that no longer flood. Only in exceptional flood events (1983, 1993) will this site flood and contribute to water and sediment retention in the stream system.

## Recreational uses

Hunting, hiking, photography, bird-watching, picnicking

## Wood products

This site produces an abundance of mesquite for fire wood, posts and lumber. Fuel-wood harvest should not reduce the mature tree canopy to less than 25% to prevent increase of undesirable shrubs like greythorn and wolfberry. Tree limbing (pollarding) can yield good amounts of wood on a sustainable basis without removing the mature tree canopy. Coppice sprouts assume dominance quicker if stump heights are no less than 30 inches. Coppice production indicates cutting cycles of 30-50 years. Trees should not be cut near stream banks. There are no soil-site factors limiting wood production. A safe yield for large areas of this site is 0.13 cords per acre per year.

## Other products

Mesquite beans for animal feed and mesquite flour or meal.

Table 8. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
velvet mesquite	PRVE	35	50	8	20	—	—	—	

## Inventory data references

Range 417s include 2 in good condition.

## Type locality

Location 1: Cochise County, AZ	
Township/Range/Section	T19S R21E S34
General legal description	San Pedro River 1 mi. north of Fairbanks, Arizona
Location 2: Santa Cruz County, AZ	
Township/Range/Section	T23S R14E S17
General legal description	Santa Cruz River - Rio Rico
Location 3: Pima County, AZ	
Township/Range/Section	T16S R17E S34
General legal description	Cienega Creek - Marsh Station

Location 4: Pima County, AZ	
Township/Range/Section	T18S R17E S14
General legal description	In Rockhouse pasture on Empire ranch at KA #24. Las Cienegas National Conservation Area.

## Contributors

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## Approval

Curtis Talbot, 4/12/2021

## 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	05/11/2024
Approved by	Curtis Talbot
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

### 1. Number and extent of rills:

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### 2. Presence of water flow patterns:

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

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

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

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### 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:**
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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):**
- 
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:**
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17. **Perennial plant reproductive capability:**

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