

## Ecological site R041XA108AZ Loamy Upland 16-20" p.z.

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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.

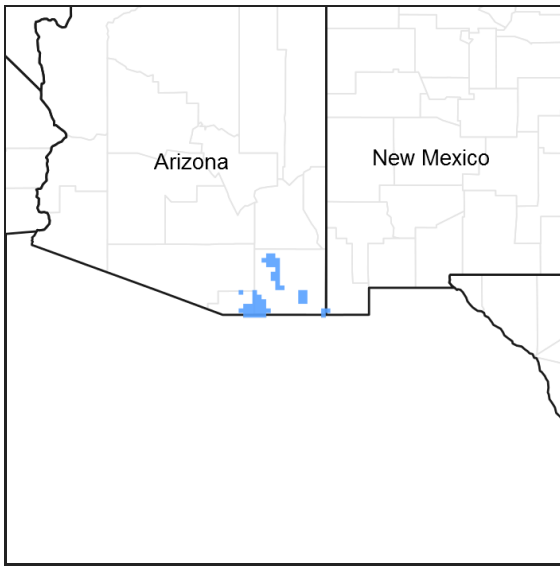


Figure 1. Mapped extent

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): 041X–Madrean Archipelago

Major Land Resource Area (MLRA) 41 represents the most northern extent of the Sierra Madre Occidental, or in English, the “mother mountains of the west.” The Sierra Madre Occidental is a massive, rugged mountain system that runs northwest from the Rio Grande de Santiago, in the state of Jalisco, Mexico, through the states of Sonora and Chihuahua, and ending in Arizona and New Mexico. Through Mexico, this mountain system runs parallel to the Pacific coast and, as it crosses into the United States and confronts the tectonic folding and rifting of the Basin and Range Physiographic Province, the land mass geographically breaks into smaller, isolated mountain ranges, called “sky islands.” The centralizing theme for this MLRA can be summed up as a series of inland islands extending from their mainland, the Sierra Madre Occidental, surrounded by a sea of desert grassland. To the west, the Madrean Archipelago bounds the Sonoran Basin and Range where several sky islands in southern Arizona grade into Sonoran Desert basins; to the north it bounds the contiguous mountains and geology of the Mogollon Transition area; and to the east, in New Mexico, it bounds the geology of the Rio Grande Rift. MLRA 41 is primarily a rangeland subdivision with small amounts of irrigated cropland. It encompasses approximately 13M acres.

### LRU notes

Land Resource Unit 41-1, Mexican Oak-Pine Forest and Oak Savannah. Elevations range from 4500 to 5500 feet and precipitation ranges from 16 to 20 inches. Vegetation includes Emory oak, Mexican blue oak, Arizona white oak,

one-seed juniper, alligator juniper, sacahuista, California bricklebrush, skunkbush sumac, Arizona rosewood, wait-a-bit mimosa, sideoats grama, blue grama, purple grama, wooly bunchgrass, plains lovegrass, squirreltail, and pinyon ricegrass. The soil temperature regime is thermic; the soil moisture regime is aridic ustic.

### Classification relationships

USDA-NRCS Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin: Western Range and Irrigated Region D; Major Land Resource Area 41, Southeastern Arizona Basin and Range; Land Resource Unit 41-1, Madrean Oak Savanna; Ecological Site Loamy Upland, 16-20" p.z.

U.S. Environmental Protection Agency, Ecological Regions of North America: Level I, Region 12, Southern Semi-Arid Highlands; Level II, 12.1 Western Sierra Madre Piedmont, Level III, Ecoregion 79 Madrean Archipelago, 79a, Apachian Valleys and Low Hills.

USDA-USFS Ecological Subregions: Sections of the Conterminous United States: Section 321 Basin and Range; Section 321A, Basin and Range Section.

### Ecological site concept

Loamy Upland, 16"-20" p.z., is found on upland landscapes with deep soils with an argillic horizon underlying loam textured soil or, when the soil above the argillic is sandy loam textured, it is less than 4" thick.

### Associated sites

R041XA104AZ	Limy Slopes 16-20" p.z.
R041XA107AZ	Loamy Slopes 16-20" p.z.
R041XA109AZ	Clay Loam Upland 16-20" p.z.
R041XA114AZ	Loamy Bottom 16-20" p.z.
R041XA115AZ	Loamy Swale 16-20" p.z.

### Similar sites

R041XC313AZ	Loamy Upland 12"-16" p.z.
R041XA110AZ	Sandy Loam Upland 16-20" p.z.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>baccharis pteronioides</i> (2) <i>agave palmeri</i>
Herbaceous	(1) <i>bouteloua gracilis</i> (2) <i>eragrostis intermedia</i>

### Physiographic features

This site occurs in the upper elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on fan terraces and gentle hillslopes.

Table 2. Representative physiographic features

Landforms	(1) Fan piedmont (2) Plain
Flooding frequency	None
Ponding frequency	None

Elevation	4,700–5,500 ft
Slope	1–15%
Aspect	Aspect is not a significant factor

## Climatic features

Precipitation in this zone of the common resource area ranges from 16-20 inches per year with elevations from 4700-5500 feet. Approximately 40% of this moisture comes as gentle rain or snow during the winter-spring (Oct-Apr) season; originates in the north Pacific and Gulf of California and comes as frontal storms with long duration and low intensity. The remaining 60% falls in the summer season (May-Sep); originates in the Gulf of Mexico and are convective, usually brief, intense thunderstorms. Snow is common Dec-Mar, averaging 5-15 inches per year, but rarely lasts more than a week. May and June are the driest months. Humidity is low.

Temperatures are mild. Freezing temperatures are common at night from Oct-May, but daytime temperatures are almost always over 40 F. Below 0 F temperatures can occur Dec-Feb. Daytime summer highs rarely exceed 95 F.

Species like plains lovegrass, wooly bunchgrass, false mesquite, shrubby buckwheat and ratany begin growth in late March to April. Warm season grasses begin growth in July or August with receipt of the first summer rains.

**Table 3. Representative climatic features**

Frost-free period (average)	200 days
Freeze-free period (average)	
Precipitation total (average)	20 in

## Influencing water features

There are no water features associated with this site.

## Soil features

These are deep soils which have formed in old alluvium of mixed origin. Surface textures range from very gravelly sandy loam to gravelly loam. Sandy loam surfaces can be no thicker than 4 inches (eight inches for CBV-SL). These soils all have clayey (argillic) horizons near the surface. They are non calcareous in the upper 20 inches. Soil surfaces are dark colored. Plant-soil moisture relationships are good. Although several soil series are correlated in map unit components to this ecological site, Cherrycow soil series is most representative of Loamy Upland, 16-20" p.z..

**Table 4. Representative soil features**

Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow
Soil depth	60 in
Surface fragment cover <=3"	10–25%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	8.4–9.6 in
Calcium carbonate equivalent (0-40in)	0–5%
Electrical conductivity (0-40in)	0–2 mmhos/cm

Sodium adsorption ratio (0-40in)	0-2
Soil reaction (1:1 water) (0-40in)	6.1-7.8
Subsurface fragment volume <=3" (Depth not specified)	3-10%
Subsurface fragment volume >3" (Depth not specified)	0-5%

## Ecological dynamics

### State and transition model

#### 41.1 Loamy Upland 16-20" p.z. (R041XA108AZ)

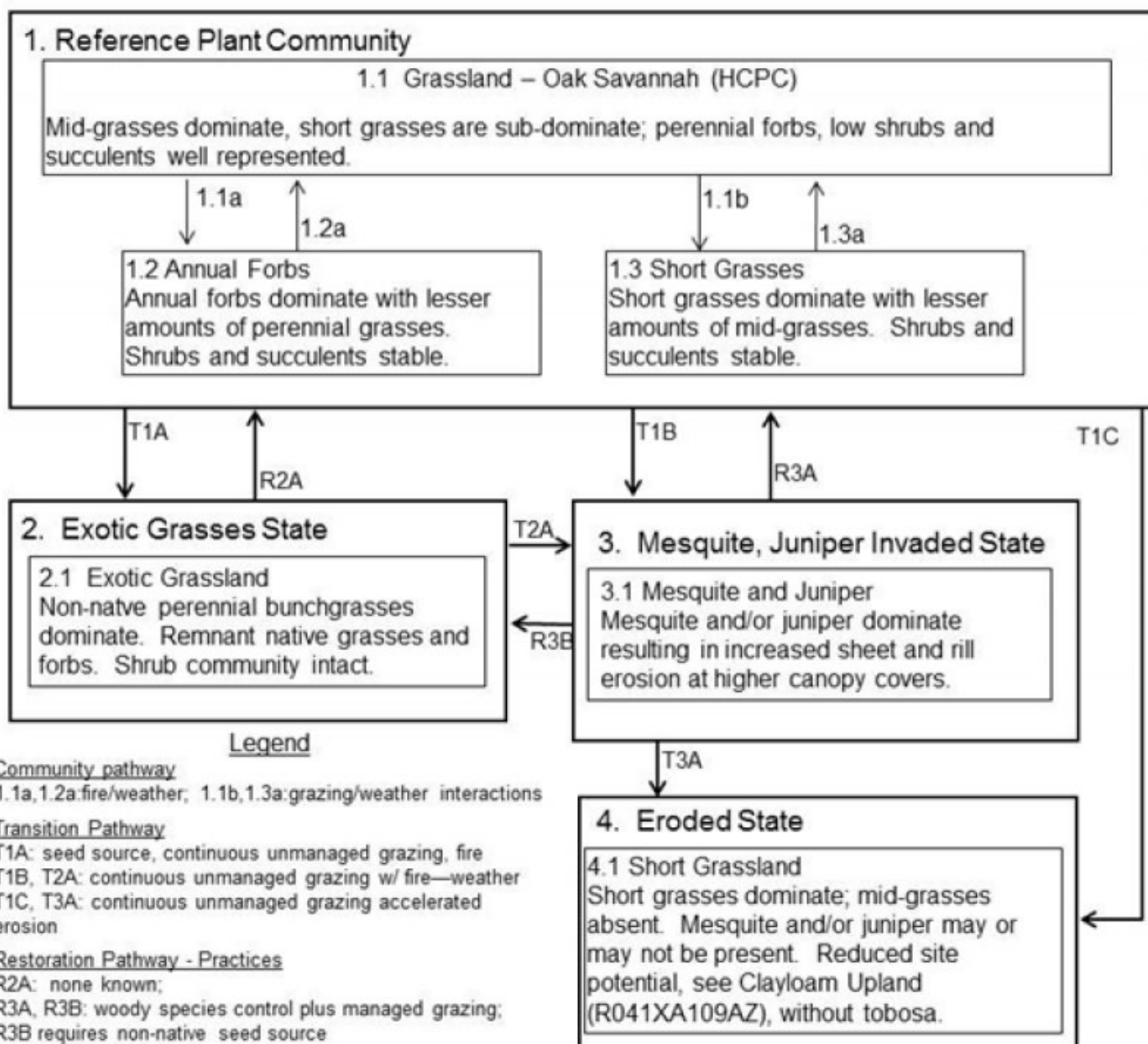


Figure 4. Loamy Upland 41-1 STM diagram

## State 1

### Reference State

## Community 1.1 Grassland-Oak Savannah (HCPC)



Figure 5. Empire Ranch, West Pasture enclosure, KA 17&18

The historic native state includes the native plant communities that occur on the site, including the historic climax plant community. The state includes other plant communities that naturally occupy the site following fire, drought, flooding, herbivores and other natural disturbances. The historic plant community represents the natural climax community that eventually reoccupies the site with proper management. The potential plant community on this site is dominated by warm season perennial midgrasses. The major perennial species are well dispersed throughout the plant community. Perennial forbs, several species of low shrubs and succulents are well represented in the plant community. The aspect is open grassland to oak-grass savannah. Mesquite and Lehmann lovegrass are both pushing the upper limits of their elevations in this MLRA subdivision and can invade areas of this site. They may be able to dominate the native plant community, especially with climatic warming. Species like one seed and alligator juniper can invade and increase to dominate the site. Naturally occurring fires in June-August are an important factor shaping this plant community. Fire-free intervals range from 10-20 years. With thin coarse textured soil surfaces, any soil loss due to erosion can reduce the site's ability to effectively use intense summer rainfall. This site recovers moderately well from drought due to the favorable climate prevailing in this sub-resource area.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	520	1200	1600
Forb	11	45	245
Shrub/Vine	11	35	85
Tree	0	5	25
<b>Total</b>	<b>542</b>	<b>1285</b>	<b>1955</b>

Table 6. Soil surface cover

Tree basal cover	0-1%
Shrub/vine/liana basal cover	0-2%
Grass/grasslike basal cover	7-20%
Forb basal cover	0-1%
Non-vascular plants	0-1%
Biological crusts	1-10%
Litter	20-65%
Surface fragments >0.25" and <=3"	10-25%
Surface fragments >3"	0-5%

Bedrock	0%
Water	0%
Bare ground	10-50%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	1-5%	5-15%	1-5%
>0.5 <= 1	–	1-5%	10-20%	1-5%
>1 <= 2	–	1-2%	15-30%	0-15%
>2 <= 4.5	–	0-1%	0-10%	0-2%
>4.5 <= 13	0-1%	–	–	–
>13 <= 40	0-5%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 7. Plant community growth curve (percent production by month). AZ4111, 41.1 16-30. Growth begins in the spring, semi-dormancy occurs during the June drought, most growth occurs during the summer rainy season..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	0	15	45	20	5	0	0

## Community 1.2 Annual Forbs

In "El Nino" years and without disturbance like grazing or fire, forbs like camphorweed, gumweed and annual goldeneye will increase to dominate the plant community as perennial grass cover diminishes from drought in the preceding years. Periodic drought can occur in this CRA and cause significant grass mortality. Droughts in the early 30s, mid-50s, 1975-76, 1988-89, 1995-96 and 2002 resulted in the loss of much of the grass cover on this site. Mortality is highest in areas where the soil surface is very thin. There is a strong relationship between grass mortality and surface thickness/micro relief on this site. This site recovers moderately well from drought due to the favorable climate prevailing in this sub-resource area.

## Community 1.3 Short Grasses

With continuous, heavy grazing, midgrasses like sideoats grama, cane beardgrass and plains lovegrass are removed from the plant community and often times replaced by a continuous sod of blue grama. The absence of mid-grasses reduces fire fuel load resulting in increased half-shrub and succulent shrubs. With severe deterioration, shrubby species like yerba-de-pasmo and wooly groundsel can increase to dominate the plant community.

## Pathway 1.1a Community 1.1 to 1.2

Extended periods with no disturbance (fire or grazing) allow the build-up of perennial grass biomass that result in plant decadence. Periodic drought also causes significant grass mortality. Droughts in the early 30s, mid 50s, 1975-1976, 88-89, 95-96 and 2002 resulted in the loss of much of the grass cover on this site.

## Conservation practices

Prescribed Burning
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Fence
Firebreak
Livestock Pipeline
Pumping Plant
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

**Pathway 1.1b  
Community 1.1 to 1.3**

Continuous, unmanaged, grazing with heavy to severe utilization impacts perennial mid-grasses and affects natural fire cycles.

**Conservation practices**

Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Pumping Plant
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

**Pathway 1.2a  
Community 1.2 to 1.1**

With managed grazing, this site recovers moderately well from drought due to the favorable climate prevailing in this sub-resource area.

**Conservation practices**

Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Pumping Plant
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

**Pathway 1.3a**  
**Community 1.3 to 1.1**

With managed grazing, native mid-grasses will be able to regain their dominance in the plant community.

**Conservation practices**

Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Pumping Plant
Range Planting
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

**State 2**  
**Exotic Grasses State**

**Community 2.1**  
**Exotic Grassland**





**Figure 8. Loamy Upland 16-20" pz, Boer lovegrass**

This state occurs where African lovegrass species have either invaded from established stands or from direct seedings of these areas. Lehmann, Boer, weeping lovegrass and in some places yellow or King Ranch bluestems are dominant and native perennial grasses and forbs exist only in minor amounts. Cover and production of these species is very high and site stability and hydrologic function are good.

### **State 3 Shrub Invaded State**

#### **Community 3.1 Mesquite and Juniper**



**Figure 9. Loamy Upland 16-20" pz. juniper invasion**

With continuous grazing, a nearby seed source and in the absence of fire for long periods of time; velvet mesquite and / or western honey mesquite and one seed or alligator juniper can invade and increase to dominate the site. Canopy cover can be from 2 to 25%. Sheet and rill erosion can begin to accelerate at the higher canopy levels.

### **State 4 Eroded State**

#### **Community 4.1 Eroded Short-Grassland**



Figure 10. Loamy Upland 16-20" pz, alligator juniper, erosion

This state occurs where accelerated sheet and / or rill erosion has removed most of the surface (A) horizon. With one inch of surface soil left the site has lost its ability to grow mid-grasses. The new potential is for short grammas with lower basal cover and less production. To see the new potential see ecological site # R041XA109AZ, Clayloam Upland 16-20"pz, without tobosa.

### **Transition T1A**

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

Non-native bunchgrass seed is purposely or inadvertently introduced into the plant community (wind-blown or mechanical transport). Disturbances such as fire or drought can disrupt the native perennials allowing the non-native grasses an opportunity to expand their range from disturbed or planted areas. Long term events such as continuous unmanaged grazing or community phase pathway 1.1a (shift to the Annual Forbs community phase 1.2) allow non-native bunchgrasses a competitive advantage over natives.

### **Transition T1B**

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

Continuous unmanaged grazing with heavy to severe utilization results in persistently low perennial grass cover and extended fire free periods. Mesquite and juniper increase in size and number. Remnant native perennial grasses cannot re-colonize areas with shrub competition.

### **Transition T1C**

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

Long-term, continuous, unmanaged grazing with heavy to severe utilization affects soil site stability and hydrologic functioning. Reduced soil cover, compaction, and A Horizon loss compound the effect of plant community changes (increased shrub/decreased perennial grass community) to increase surface water run-off rather than infiltration. Drought conditions accelerate this transition. Persistent reduced infiltration severely limits perennial grass

recruitment.

## **Restoration pathway R2A State 2 to 1**

No restoration pathway known at this time. Perhaps future development of herbicide or biological treatment to remove perennial exotics will occur.

### **Conservation practices**

Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

## **Transition T2A State 2 to 3**

Continuous, unmanaged, grazing with heavy to severe utilization results in persistently low perennial grass cover and extended fire free periods. Mesquite and juniper increase in size and number. Remnant native perennial grasses cannot re-colonize areas with shrub competition.

## **Restoration pathway R3A State 3 to 1**

Woody species control, native species seeding (as needed) supported by managed grazing. Shrub control maintained with herbicide and/or prescribed burning.

### **Conservation practices**

Brush Management
Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Pumping Plant
Range Planting
Watering Facility
Water Well

Upland Wildlife Habitat Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

**Restoration pathway R3B  
State 3 to 2**

Restoration activities conducted when a non-native seed bank is present on site (African lovegrasses or other non-natives present along trails, roads or in disturbed areas) can result in an exotic grassland community. Native species seeding may enhance the native grass component. Restoration practices are woody species control and native species seeding (as needed) supported by managed grazing. Shrub control maintained with herbicide may favor the native grasses while prescribed burning may favor non-natives. Burning the mixed shrub community with a non-native grass seed source present can result in an exotic grassland co-dominant with shrubs.

**Conservation practices**

Brush Management
Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Pumping Plant
Grazing Land Mechanical Treatment
Range Planting
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

**Transition T3A  
State 3 to 4**

Long-term, continuous, unmanaged grazing with heavy to severe utilization affects soil site stability and hydrologic functioning. Reduced soil cover, compaction, and A Horizon loss compound the effect of plant community changes (increased shrub/decreased perennial grass community) to increase surface water run-off rather than infiltration. Drought conditions accelerate this transition. Persistent reduced infiltration severely limits perennial grass recruitment.

**Additional community tables**

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Dominant mid grasses</b>			400–900	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	150–500	–
	plains lovegrass	ERIN	<i>Eragrostis intermedia</i>	150–500	–
	spiked crinkleawn	TRSP12	<i>Trachypogon spicatus</i>	0–150	–
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	50–150	–
	green sprangletop	LEDU	<i>Leptochloa dubia</i>	0–100	–
2	<b>Dominant short grasses</b>			200–450	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	100–300	–
	sprucetop grama	BOCH	<i>Bouteloua chondrosioides</i>	25–200	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	25–100	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–100	–
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	0–50	–
3	<b>Cool season grasses</b>			10–40	
	pinyon ricegrass	PIFI	<i>Piptochaetium fimbriatum</i>	0–15	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–10	–
	densetuft hairsedge	BUCA2	<i>Bulbostylis capillaris</i>	0–5	–
	sedge	CAREX	<i>Carex</i>	0–5	–
	flatsedge	CYPER	<i>Cyperus</i>	0–5	–
4	<b>Miscellaneous perennial grasses</b>			5–100	
	curly-mesquite	HIBE	<i>Hilaria belangeri</i>	1–15	–
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	0–15	–
	woolyspike balsamscale	ELBA	<i>Elionurus barbiculmis</i>	0–10	–
	Hall's panicgrass	PAHA	<i>Panicum hallii</i>	0–10	–
	vine mesquite	PAOB	<i>Panicum obtusum</i>	0–10	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–10	–
	poverty threeawn	ARDI5	<i>Aristida divaricata</i>	1–10	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	1–10	–
	Orcutt's threeawn	ARSCO	<i>Aristida schiedeana</i> var. <i>orcuttiana</i>	0–10	–
	spidergrass	ARTE3	<i>Aristida ternipes</i>	1–10	–
	purple grama	BORA	<i>Bouteloua radicata</i>	0–10	–
	Rothrock's grama	BORO2	<i>Bouteloua rothrockii</i>	0–10	–
	bullgrass	MUEM	<i>Muhlenbergia emersleyi</i>	0–10	–
	purple muhly	MURI3	<i>Muhlenbergia rigida</i>	0–5	–
	silver bluestem	BOSA	<i>Bothriochloa saccharoides</i>	0–5	–
	slender grama	BORE2	<i>Bouteloua repens</i>	0–5	–
	spidergrass	ARTEG	<i>Aristida ternipes</i> var. <i>gentilis</i>	0–5	–
	tobosagrass	PLMU3	<i>Pleuraphis mutica</i>	0–5	–
	Texas bluestem	SCCI2	<i>Schizachyrium cirratum</i>	0–5	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	0–5	–
	Arizona muhly	MUAR3	<i>Muhlenbergia arizonica</i>	0–5	–

	tanglehead	HECO10	<i>Heteropogon contortus</i>	0–5	–
	nineawn pappusgrass	ENDE	<i>Enneapogon desvauxii</i>	0–1	–
	blue threeawn	ARPUN	<i>Aristida purpurea</i> var. <i>nealleyi</i>	0–1	–
	Wright's threeawn	ARPUW	<i>Aristida purpurea</i> var. <i>wrightii</i>	0–1	–
	Havard's threeawn	ARHA3	<i>Aristida havardii</i>	0–1	–
	Wooton's threeawn	ARPA9	<i>Aristida pansa</i>	0–1	–
5	<b>Annual grasses</b>			1–100	
	Mexican panicgrass	PAHI5	<i>Panicum hirticaule</i>	0–25	–
	Arizona signalgrass	URAR	<i>Urochloa arizonica</i>	0–15	–
	Mexican sprangletop	LEFUU	<i>Leptochloa fusca</i> ssp. <i>uninervia</i>	0–10	–
	mucronate sprangletop	LEPAB	<i>Leptochloa panicea</i> ssp. <i>brachiata</i>	0–10	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–5	–
	tufted lovegrass	ERPEP2	<i>Eragrostis pectinacea</i> var. <i>pectinacea</i>	0–5	–
	pitscale grass	HAGR3	<i>Hackelochloa granularis</i>	0–5	–
	feather fingergrass	CHVI4	<i>Chloris virgata</i>	0–5	–
	tapertip cupgrass	ERACA	<i>Eriochloa acuminata</i> var. <i>acuminata</i>	0–5	–
	sixweeks threeawn	ARAD	<i>Aristida adscensionis</i>	0–5	–
	prairie threeawn	AROL	<i>Aristida oligantha</i>	0–5	–
	needle grama	BOAR	<i>Bouteloua aristidoides</i>	0–5	–
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	0–5	–
	Mexican lovegrass	ERME	<i>Eragrostis mexicana</i>	0–2	–
	desert lovegrass	ERPEM	<i>Eragrostis pectinacea</i> var. <i>miserrima</i>	0–2	–
	poverty dropseed	SPVA	<i>Sporobolus vaginiflorus</i>	0–2	–
	prairie false oat	TRIN5	<i>Trisetum interruptum</i>	0–2	–
	sticky sprangletop	LEVI5	<i>Leptochloa viscida</i>	0–2	–
	delicate muhly	MUFR	<i>Muhlenbergia fragilis</i>	0–2	–
	littleseed muhly	MUMI	<i>Muhlenbergia microsperma</i>	0–2	–
	witchgrass	PACA6	<i>Panicum capillare</i>	0–2	–
	matted grama	BOSI2	<i>Bouteloua simplex</i>	0–1	–
<b>Forb</b>					
6	<b>Perennial forbs</b>			10–45	
	Cooley's bundleflower	DECO2	<i>Desmanthus cooleyi</i>	1–10	–
	bluedicks	DICA14	<i>Dichelostemma capitatum</i>	1–10	–
	orange fameflower	PHAU13	<i>Phemeranthus aurantiacus</i>	0–10	–
	wild dwarf morning-glory	EVAR	<i>Evolvulus arizonicus</i>	0–5	–
	spreading snakeherb	DYSCD	<i>Dyschoriste schiedeana</i> var. <i>decumbens</i>	0–5	–
	leatherweed	CRPO5	<i>Croton pottsii</i>	0–5	–
	rose heath	CHER2	<i>Chaetopappa ericoides</i>	0–5	–
	Texas snoutbean	RHSET	<i>Rhynchosia senna</i> var. <i>texana</i>	0–5	–
	shrubby purslane	POSU3	<i>Portulaca suffrutescens</i>	0–2	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0–2	–
	brownplume wirelettuce	STPA4	<i>Stephanomeria pauciflora</i>	0–2	–
	Rocky Mountain zinnia	ZIGR	<i>Zinnia grandiflora</i>	0–2	–
	largeflower onion	AI MA4	<i>Allium macropetalum</i>	0–2	–

weakleaf bur ragweed	AMCO3	<i>Ambrosia confertiflora</i>	1-2	-
white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0-2	-
tuber anemone	ANTU	<i>Anemone tuberosa</i>	0-2	-
spreading fleabane	ERDI4	<i>Erigeron divergens</i>	0-2	-
trailing fleabane	ERFL	<i>Erigeron flagellaris</i>	0-2	-
small matweed	GUDE	<i>Guilleminea densa</i>	0-2	-
tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0-2	-
silver dwarf morning-glory	EVSE	<i>Evolvulus sericeus</i>	0-2	-
Wright's deervetch	LOWR	<i>Lotus wrightii</i>	0-2	-
lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0-2	-
Mexican star	MIBI2	<i>Milla biflora</i>	0-1	-
lemon beebalm	MOCIA	<i>Monarda citriodora ssp. austromontana</i>	0-1	-
variableleaf bushbean	MAGI2	<i>Macroptilium gibbosifolium</i>	0-1	-
Arizona snakecotton	FRAR2	<i>Froelichia arizonica</i>	0-1	-
scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0-1	-
pearly globe amaranth	GONI	<i>Gomphrena nitida</i>	0-1	-
locoweed	OXYTR	<i>Oxytropis</i>	0-1	-
beardlip penstemon	PEBA2	<i>Penstemon barbatus</i>	0-1	-
Cochise beardtongue	PEDA	<i>Penstemon dasyphyllus</i>	0-1	-
longstalk chinchweed	PELO	<i>Pectis longipes</i>	0-1	-
Parry's beardtongue	PEPA24	<i>Penstemon parryi</i>	0-1	-
slimleaf bean	PHAN3	<i>Phaseolus angustissimus</i>	0-1	-
ivyleaf groundcherry	PHHE4	<i>Physalis hederifolia</i>	0-1	-
white milkwort	POAL4	<i>Polygala alba</i>	0-1	-
velvetseed milkwort	POOB	<i>Polygala obscura</i>	0-1	-
Indian rushpea	HOGL2	<i>Hoffmannseggia glauca</i>	0-1	-
red bluet	HORU	<i>Houstonia rubra</i>	0-1	-
babyslippers	HYVE	<i>Hybanthus verticillatus</i>	0-1	-
ragged nettlespurge	JAMA	<i>Jatropha macrorrhiza</i>	0-1	-
San Pedro daisy	LAPO4	<i>Lasianthaea podocephala</i>	0-1	-
Fendler's bladderpod	LEFE	<i>Lesquerella fendleri</i>	0-1	-
narrowleaf stoneseed	LIIN2	<i>Lithospermum incisum</i>	0-1	-
Lewis flax	LILE3	<i>Linum lewisii</i>	0-1	-
Greene's bird's-foot trefoil	LOGR4	<i>Lotus greenei</i>	0-1	-
Mexican fireplant	EUHE4	<i>Euphorbia heterophylla</i>	0-1	-
sun spurge	EUR2	<i>Euphorbia radians</i>	0-1	-
melon loco	APUN	<i>Apodanthera undulata</i>	0-1	-
shaggy dwarf morning-glory	EVNU	<i>Evolvulus nuttallianus</i>	0-1	-
perennial rockcress	ARPE2	<i>Arabis perennans</i>	0-1	-
Watson's dutchman's pipe	ARWA	<i>Aristolochia watsonii</i>	0-1	-
Arizona milkvetch	ASAR6	<i>Astragalus arizonicus</i>	0-1	-



	spider milkweed	ASAS	<i>Asclepias asperula</i>	0-1	-
	chaparral asphead	ASHI3	<i>Aspicarpa hirtella</i>	0-1	-
	broadleaf milkweed	ASLA4	<i>Asclepias latifolia</i>	0-1	-
	woolly locoweed	ASMOB	<i>Astragalus mollissimus var. bigelovii</i>	0-1	-
	sheep milkvetch	ASNO3	<i>Astragalus nothoxys</i>	0-1	-
	horsetail milkweed	ASSU2	<i>Asclepias subverticillata</i>	0-1	-
	dense ayenia	AYMI	<i>Ayenia microphylla</i>	0-1	-
	hairyseed bahia	BAAB	<i>Bahia absinthifolia</i>	0-1	-
	lyreleaf greeneyes	BELY	<i>Berlandiera lyrata</i>	0-1	-
	scarlet spiderling	BOCO	<i>Boerhavia coccinea</i>	0-1	-
	dwarf stickpea	CAHUR	<i>Calliandra humilis var. reticulata</i>	0-1	-
	wholeleaf Indian paintbrush	CAIN14	<i>Castilleja integra</i>	0-1	-
	desert mariposa lily	CAKE	<i>Calochortus kennedyi</i>	0-1	-
	sego lily	CANU3	<i>Calochortus nuttallii</i>	0-1	-
	Indian paintbrush	CASTI2	<i>Castilleja</i>	0-1	-
	whitemargin sandmat	CHAL11	<i>Chamaesyce albomarginata</i>	0-1	-
	Mexican yellowshow	AMPA3	<i>Amoreuxia palmatifida</i>	0-1	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0-1	-
	birdbill dayflower	CODI4	<i>Commelina dianthifolia</i>	0-1	-
	Texas bindweed	COEQ	<i>Convolvulus equitans</i>	0-1	-
	whitemouth dayflower	COER	<i>Commelina erecta</i>	0-1	-
	fingerleaf gourd	CUDI	<i>Cucurbita digitata</i>	0-1	-
	coyote gourd	CUPA	<i>Cucurbita palmata</i>	0-1	-
	whiteflower prairie clover	DAAL	<i>Dalea albiflora</i>	0-1	-
	James' prairie clover	DAJA	<i>Dalea jamesii</i>	0-1	-
	dwarf prairie clover	DANA	<i>Dalea nana</i>	0-1	-
	downy prairie clover	DANE	<i>Dalea neomexicana</i>	0-1	-
	Torrey's craglily	ECFL	<i>Echeandia flavescens</i>	0-1	-
	trailing windmills	ALIN	<i>Allionia incarnata</i>	0-1	-
	jewels of Opar	TAPA2	<i>Talinum paniculatum</i>	0-1	-
	Coulter's wrinklefruit	TECO	<i>Tetradlea coulteri</i>	0-1	-
	hairy fourwort	TENE	<i>Tetramerium nervosum</i>	0-1	-
	longstalk greenthread	THLO	<i>Thelesperma longipes</i>	0-1	-
	Hopi tea greenthread	THME	<i>Thelesperma megapotamicum</i>	0-1	-
	pinewoods spiderwort	TRPI	<i>Tradescantia pinetorum</i>	0-1	-
	branched noseburn	TRRA5	<i>Tragia ramosa</i>	0-1	-
	Fort Huachuca vervain	VEGR2	<i>Verbena gracilis</i>	0-1	-
	American vetch	VIAM	<i>Vicia americana</i>	0-1	-
	Louisiana vetch	VILUL2	<i>Vicia ludoviciana ssp. ludoviciana</i>	0-1	-
	copper zephyrlily	ZELO	<i>Zephyranthes longifolia</i>	0-1	-
	copper globemallow	SPAN3	<i>Sphaeralcea angustifolia</i>	0-1	-
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	0-1	-



	globemallow				
	slimflower scurfpea	PSTE5	<i>Psoralidium tenuiflorum</i>	0–1	–
	buffpetal	RHPH2	<i>Rhynchosida physocalyx</i>	0–1	–
	slimleaf plainsmustard	SCLI12	<i>Schoenocrambe linearifolia</i>	0–1	–
	twingleaf senna	SEBA3	<i>Senna bauhinioides</i>	0–1	–
	Lemmon's ragwort	SELE8	<i>Senecio lemmonii</i>	0–1	–
	salt spring checkerbloom	SINE3	<i>Sidalcea neomexicana</i>	0–1	–
	silverleaf nightshade	SOEL	<i>Solanum elaeagnifolium</i>	0–1	–
7	<b>Annual Forbs</b>			1–200	
	longleaf false goldeneye	HELOA2	<i>Helioomeris longifolia</i> var. <i>annua</i>	1–200	–
	camphorweed	HESU3	<i>Heterotheca subaxillaris</i>	0–25	–
	curlytop gumweed	GRNUA	<i>Grindelia nuda</i> var. <i>aphanactis</i>	0–20	–
	Wright's cudweed	PSCAC2	<i>Pseudognaphalium canescens</i> ssp. <i>canescens</i>	0–20	–
	slender goldenweed	MAGR10	<i>Machaeranthera gracilis</i>	0–20	–
	tanseyleaf tansyaster	MATA2	<i>Machaeranthera tanacetifolia</i>	0–20	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–10	–
	New Mexico thistle	CINE	<i>Cirsium neomexicanum</i>	0–10	–
	New Mexico goosefoot	CHNE3	<i>Chenopodium neomexicanum</i>	0–10	–
	sensitive partridge pea	CHNI2	<i>Chamaecrista nictitans</i>	0–10	–
	smallflowered milkvetch	ASNU4	<i>Astragalus nuttallianus</i>	0–10	–
	Thurber's milkvetch	ASTH	<i>Astragalus thurberi</i>	0–10	–
	pitseed goosefoot	CHBE4	<i>Chenopodium berlandieri</i>	0–10	–
	carelessweed	AMPA	<i>Amaranthus palmeri</i>	0–5	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	0–5	–
	Abert's buckwheat	ERAB2	<i>Eriogonum abertianum</i>	0–5	–
	sorrel buckwheat	ERPO4	<i>Eriogonum polycladon</i>	0–5	–
	Arizona poppy	KAGR	<i>Kallstroemia grandiflora</i>	0–5	–
	intermediate pepperweed	LEVIM	<i>Lepidium virginicum</i> var. <i>medium</i>	0–2	–
	sawtooth sage	SASU7	<i>Salvia subincisa</i>	0–2	–
	redstar	IPCO3	<i>Ipomoea coccinea</i>	0–2	–
	Thurber's morning-glory	IPTH	<i>Ipomoea thurberi</i>	0–2	–
	wedgeleaf draba	DRCU	<i>Draba cuneifolia</i>	0–2	–
	scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–2	–
	New Mexico copperleaf	ACNE	<i>Acalypha neomexicana</i>	0–2	–
	miner's lettuce	CLPEP	<i>Claytonia perfoliata</i> ssp. <i>perfoliata</i>	0–1	–
	threadstem sandmat	CHRE4	<i>Chamaesyce revoluta</i>	0–1	–
	thymeleaf sandmat	CHSE6	<i>Chamaesyce serpyllifolia</i>	0–1	–
	slimseed sandmat	CHST8	<i>Chamaesyce stictospora</i>	0–1	–
	cryptantha	CRYPT	<i>Cryptantha</i>	0–1	–
	Chihuahuan prairie clover	DAEX2	<i>Dalea exigua</i>	0–1	–
	American wild carrot	DAPU3	<i>Daucus pusillus</i>	0–1	–
	sacred thorn-apple	DAWR2	<i>Datura wrightii</i>	0–1	–

poorjoe	DITE2	<i>Diodia teres</i>	0-1	-
El Paso skyrocket	IPTH2	<i>Ipomopsis thurberi</i>	0-1	-
flaxflowered ipomopsis	IPLOL	<i>Ipomopsis longiflora</i> ssp. <i>longiflora</i>	0-1	-
miniature woollystar	ERDI2	<i>Eriastrum diffusum</i>	0-1	-
spreading fleabane	ERDI4	<i>Erigeron divergens</i>	0-1	-
crestrub morning-glory	IPCO2	<i>Ipomoea costellata</i>	0-1	-
California poppy	ESCAM	<i>Eschscholzia californica</i> ssp. <i>mexicana</i>	0-1	-
Arizona blanketflower	GAAR2	<i>Gaillardia arizonica</i>	0-1	-
red dome blanketflower	GAPI	<i>Gaillardia pinnatifida</i>	0-1	-
lesser yellowthroat gilia	GIFL	<i>Gilia flavocincta</i>	0-1	-
El Paso gilia	GIME	<i>Gilia mexicana</i>	0-1	-
Dakota mock vervain	GLBIB	<i>Glandularia bipinnatifida</i> var. <i>bipinnatifida</i>	0-1	-
crested anoda	ANCR2	<i>Anoda cristata</i>	0-1	-
southwestern pricklypoppy	ARPL3	<i>Argemone pleiacantha</i>	0-1	-
halfmoon milkvetch	ASAL6	<i>Astragalus allochrous</i>	0-1	-
royal sandmat	CHDI5	<i>Chamaesyce dioica</i>	0-1	-
pillpod sandmat	CHHI3	<i>Chamaesyce hirta</i>	0-1	-
hyssopleaf sandmat	CHHY3	<i>Chamaesyce hyssopifolia</i>	0-1	-
wheelscale saltbush	ATEL	<i>Atriplex elegans</i>	0-1	-
fewflower beggarticks	BILE	<i>Bidens leptcephala</i>	0-1	-
Coulter's spiderling	BOCO2	<i>Boerhavia coulteri</i>	0-1	-
erect spiderling	BOER	<i>Boerhavia erecta</i>	0-1	-
hoary bowlesia	BOIN3	<i>Bowlesia incana</i>	0-1	-
purple spiderling	BOPU	<i>Boerhavia purpurascens</i>	0-1	-
fringed redmaids	CACI2	<i>Calandrinia ciliata</i>	0-1	-
spreading fanpetals	SIAB	<i>Sida abutilifolia</i>	0-1	-
sleepy silene	SIAN2	<i>Silene antirrhina</i>	0-1	-
streptanthella	STREP	<i>Streptanthella</i>	0-1	-
golden crownbeard	VEEN	<i>Verbesina encelioides</i>	0-1	-
purslane	PORTU	<i>Portulaca</i>	0-1	-
yerba porosa	PORU6	<i>Porophyllum ruderale</i>	0-1	-
desert unicorn-plant	PRAL4	<i>Proboscidea althaeifolia</i>	0-1	-
doubleclaw	PRPA2	<i>Proboscidea parviflora</i>	0-1	-
Abert's creeping zinnia	SAAB	<i>Sanvitalia abertii</i>	0-1	-
plains flax	LIPU4	<i>Linum puberulum</i>	0-1	-
foothill deervetch	LOHU2	<i>Lotus humistratus</i>	0-1	-
coastal bird's-foot trefoil	LOSAB	<i>Lotus salsuginosus</i> var. <i>brevivexillus</i>	0-1	-
shortstem lupine	LUBR2	<i>Lupinus brevicaulis</i>	0-1	-
bajada lupine	LUCOC	<i>Lupinus concinnus</i> ssp. <i>concinnus</i>	0-1	-
Fendler's deserdandelion	MAFE	<i>Malacothrix fendleri</i>	0-1	-
warty caltrop	KAPA	<i>Kallstroemia parviflora</i>	0-1	-

	Coulter's horseweed	LACO13	<i>Laennecia coulteri</i>	0-1	-
	Gordon's bladderpod	LEGO	<i>Lesquerella gordonii</i>	0-1	-
	broadleaved pepperweed	LELA2	<i>Lepidium latifolium</i>	0-1	-
	whitestem blazingstar	MEAL6	<i>Mentzelia albicaulis</i>	0-1	-
	green carpetweed	MOVE	<i>Mollugo verticillata</i>	0-1	-
	desert evening primrose	OEPR	<i>Oenothera primiveris</i>	0-1	-
	Arizona phacelia	PHAR13	<i>Phacelia arizonica</i>	0-1	-
	Mangas Spring phacelia	PHBO4	<i>Phacelia bombycina</i>	0-1	-
	Arizona popcornflower	PLAR	<i>Plagiobothrys arizonicus</i>	0-1	-
<b>Shrub/Vine</b>					
8	<b>Dominant half shrubs</b>			10-60	
	fairyduster	CAER	<i>Calliandra eriophylla</i>	1-30	-
	bastardsage	ERWR	<i>Eriogonum wrightii</i>	0-20	-
	yerba de pasmo	BAPT	<i>Baccharis pteronioides</i>	1-20	-
	littleleaf ratany	KRER	<i>Krameria erecta</i>	0-10	-
	trailing krameria	KRLA	<i>Krameria lanceolata</i>	1-10	-
	prairie acacia	ACAN	<i>Acacia angustissima</i>	0-10	-
9	<b>Miscellaneous shrubs</b>			0-15	
	catclaw mimosa	MIACB	<i>Mimosa aculeaticarpa var. biuncifera</i>	0-5	-
	velvetpod mimosa	MIDY	<i>Mimosa dysocarpa</i>	0-5	-
	sacahuista	NOMI	<i>Nolina microcarpa</i>	0-2	-
	Pringle manzanita	ARPR	<i>Arctostaphylos pringlei</i>	0-2	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-1	-
	burroweed	ISTE2	<i>Isocoma tenuisecta</i>	0-1	-
	catclaw acacia	ACGR	<i>Acacia greggii</i>	0-1	-
	Sonoran scrub oak	QUTU2	<i>Quercus turbinella</i>	0-1	-
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0-1	-
	threadleaf ragwort	SEFLF	<i>Senecio flaccidus var. flaccidus</i>	0-1	-
10	<b>Succulents</b>			1-10	
	Palmer's century plant	AGPA3	<i>Agave palmeri</i>	1-5	-
	Parry's agave	AGPA4	<i>Agave parryi</i>	0-1	-
	walkingstick cactus	CYSP8	<i>Cylindropuntia spinosior</i>	0-1	-
	scarlet hedgehog cactus	ECCOC	<i>Echinocereus coccineus var. coccineus</i>	0-1	-
	pinkflower hedgehog cactus	ECFEF3	<i>Echinocereus fendleri ssp. fendleri</i>	0-1	-
	white fishhook cactus	ECIN2	<i>Echinomastus intertextus</i>	0-1	-
	rainbow cactus	ECPEP	<i>Echinocereus pectinatus var. pectinatus</i>	0-1	-
	spinystar	ESVI2	<i>Escobaria vivipara</i>	0-1	-
	Macdougal's nipple cactus	MAHEM	<i>Mammillaria heyderi var. macdougalii</i>	0-1	-
	cactus apple	OPEN3	<i>Opuntia engelmannii</i>	0-1	-
	twistspine pricklypear	OPMA2	<i>Opuntia macrorhiza</i>	0-1	-
	tulip pricklypear	OPPH	<i>Opuntia phaeacantha</i>	0-1	-
<b>Tree</b>					

11	<b>Trees</b>			0-25	
	Emory oak	QUEM	<i>Quercus emoryi</i>	0-25	-
	Arizona white oak	QUAR	<i>Quercus arizonica</i>	0-20	-
	alligator juniper	JUDE2	<i>Juniperus deppeana</i>	0-2	-
	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	0-2	-

## Animal community

The plant community on this site is suitable for grazing by all classes of livestock at any season. The plant community will be low in digestible protein in the winter. Phosphorous may be deficient throughout the year. Grazing should be managed to maintain good grass cover. This site can easily erode and is less effective in using intense summer rainfall when cover falls below the minimum needed to protect the soil surface. (5% cover - 2% slope, 10% cover - 6% slope). Poisonous shrubs like yerba-de-pasmo and wooly groundsel can cause problems in the spring unless cool season species like plains lovegrass, squirreltail and shrubs like false mesquite and shrubby buckwheat are in the plant community. Annual goldeneye can cause problems in the fall after unusually wet winter-spring seasons.

This site is a primary habitat for pronghorn antelope in southeastern Arizona. It provides a variety of their favored browses and perennial forbs, as well as tall grass for fawning cover. Being open grassland and rich in forb species, this site is home to a great variety of insect, bird, small mammal and reptile species. In areas adjacent to woodlands, this site is heavily used as a foraging are by both mule deer and whitetail deer. The lesser longnosed bat uses the abundant nectar in the flowers of the agave palmeri during its June-August flowering season. Natural water is lacking on this site and water developments are very important to large and small mammals and several species of birds that use the habitat.

## Hydrological functions

Thin, coarse textured soil surfaces help catch and hold intense summer rainfall and let it slowly infiltrate the clayey subsurface soil. The site is very sensitive to loss of the coarse textured surface (A) horizon. As the surface is reduced in thickness the ratio of runoff to infiltration increases. Natural rates of runoff on this site are as high as 30%. With loss of the A horizon runoff can increase to over 70% of annual rainfall.

## Recreational uses

Hunting, hiking, horseback riding, photography, birdwatching, camping

## Wood products

None unless the site is invaded by mesquite and / or juniper.

## Other products

Grass seed, medicinal herbs like yerba-de-pasmo

## Inventory data references

Range 417s include 5 in excellent condition, 6 in good condition and 4 in fair condition.

## Type locality

Location 1: Cochise County, AZ	
Township/Range/Section	T21S R19E S34
General legal description	Douglas FO - Ft. Huachuca - West Range N1/2 of section
Location 2: Pinal County, AZ	

Township/Range/Section	T21S R18E S31
General legal description	Tucson FO - Vaughn Enclosure SW 1/4 of section
Location 3: Cochise County, AZ	
Township/Range/Section	T18S R28E S12
General legal description	Willcox FO - Oak Ranch NE 1/2 of section (old contest site)
Location 4: Santa Cruz County, AZ	
Township/Range/Section	T21S R18E S21
General legal description	On Audubon Research Ranch, on flat area north of Post Canyon.

## Contributors

Dan Robinett  
 Larry D. Ellicott  
 Unknown

## Approval

Curtis Talbot, 4/09/2021

## 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)	Wilma Renken, Dan Robinett, Larry Humphrey, Scott Stratton, Linda Kennedy
Contact for lead author	USDA-NRCS Tucson MLRA Soil Survey Office
Date	04/30/2013
Approved by	Curtis Talbot
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** None

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2. **Presence of water flow patterns:** Common, short (<6 ft. in length), discontinuous

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3. **Number and height of erosional pedestals or terracettes:** Pedestals common on perennial grasses (1/2-1" height).  
 Terrecettes common, 1-3 ft. between with 1" elevation difference.

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

**bare ground):** Bare ground ranges from 20-40%, with higher values after fire. Non-vegetated areas are very small (<1 ft. diam). Gravel cover 10-20%.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter moving up approximately 1 ft. to upper margin of terrecettes.

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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):** Slake test values taken from under perennial grass and shrub cover were "5" and "6"; values from outside canopy ranged from "4" to "6".

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface horizon was gravelly loam, 0-2" depth, with granular structure. Color 5YR 3/3 moist.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial grass basal cover well-dispersed across site. Perennial mid-grass distribution clumped among short-grasses. In mid-grass clumps foliar cover is high (50-70% foliar cover), short-grass foliar cover was 30-50%.

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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):** No compaction. Clay horizon at 5" can act like compaction layer. Soil penetrometer depth averaged 6 cm, with values ranging from 4 cm - 9 cm.

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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: Perennial mid-grasses > perennial short-grasses

Sub-dominant: low shrubs > perennial forbs

Other: succulents

Additional: annual grasses and forbs fluctuate with rainfall

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mortality about 2-5%. Perennial mid-grasses express decadence as time since last fire increases.

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14. **Average percent litter cover (%) and depth ( in):** Litter cover ranges from 20-60%, increasing with time after burning.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 542 lbs/ac. in a below average year; 1285 lbs/ac. in an average year; 1955 lbs/ac. in an above average year.

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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:** Lehmann lovegrass, Boer lovegrass, yellow bluestem, mesquite, alligator juniper

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17. **Perennial plant reproductive capability:** Not impaired.

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