USDA Natural Resources Conservation Service

Ecological site R041XA109AZ
Clay Loam Upland 16-20" p.z.

Last updated: 4/09/2021
Accessed: 05/12/2024

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

Land Resource Unit: 41-1AZ 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 bricklebush, 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. This unit occurs within the Basin and Range Physiographic Province. It 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 their sediments fill the basins with representive combinations of fluvial, lacustrine, colluvial and alluvial deposits.

Associated sites

R041XA104AZ	**Limy Slopes 16-20" p.z.**
R041XA107AZ	**Loamy Slopes 16-20" p.z.**
R041XA108AZ	**Loamy Upland 16-20" p.z.**

R041XA114AZ	**Loamy Bottom 16-20" p.z.**
R041XA115AZ	**Loamy Swale 16-20" p.z.**

Similar sites

R041XC305AZ	**Clay Loam Upland 12-16" p.z.**
R038XB203AZ	**Clay Loam Upland 16-20" p.z.**

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *bouteloua gracilis* (2) *hilaria belangeri*

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 valley plains.

Table 2. Representative physiographic features

Landforms	(1) Fan piedmont (2) Alluvial fan
Flooding frequency	None
Ponding frequency	None
Elevation	1,433–1,676 m
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.-March, 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.

Table 3. Representative climatic features

Frost-free period (average)	221 days
Freeze-free period (average)	255 days
Precipitation total (average)	508 mm

Influencing water features

There are no water features associated with this site.

Soil features

Clay loam upland soils are non-calcareous, moderately deep to deep, with an argillic horizon. Soil surfaces are sandy clay loam to clay loam. The argillic horizon generally occurs near the surface. The sub-surface clay horizon will exhibit some soil cracking when dry; however, these soils do not exhibit the vertic churning seen on the Clayey Upland Ecological Site (R041XA126AZ). Soil surfaces are dark colored and generally have formed from mixed fan alluvium of extrusive igneous origin. Plant-soil moisture relationships are good.

Characteristic soil series that have been correlated to this ecological site include Blacktail, Borderland, Fanno, and Luzena.

Table 4. Representative soil features

Parent material	(1) Alluvium–basalt
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow
Soil depth	76–152 cm
Surface fragment cover <=3"	5–35%
Surface fragment cover >3"	0–5%
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	3–10%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

The Reference Plant Community (RPC, see State and Transition Model below) of the Clay Loam Upland ecological site is dominated by patches of warm season perennial grasses with shrubs, half-shrubs and forbs well-distributed throughout. The aspect is grassland. Trees are only occasionally present. Seasonal rainfall amounts affect amounts and composition of plant productivity. After a wet winter, cool season plants (a mixture of perennial grasses, forbs, sub-shrubs and annuals) begin active growth in March. The months of May and June present a period of little to no active plant growth. Warm season species, mostly perennial grasses, begin active growth after the onset of the summer rainy season usually in July; peak annual production occurs in October. Fire, short-term drought and herbivory (insects and mammals) are recurring disturbances to this ecological site. These disturbances interact to shape the three plant community phases within the Reference State. Fires maintain the grassland aspect by reducing shrub cover and killing many seedling shrubs and trees. Natural fire-free periods are 15-30 years in length. Recurring or lengthy drought causes perennial grasses to become decadent, resulting in smaller patches of perennial vegetation and increased bare ground. When average rainfall resumes following a fire or drought, annual forbs and grasses tend to flourish for 2-3 years until perennial grasses regain dominance. Perennial bunchgrasses are more susceptible to damage from herbivory than short-grasses due to their exposed growing points; during a period of repeated herbivory, the bunchgrasses will be removed from the RPC leaving patches of short-grass sod. The extent of the sod patches and length of disturbance regime determines the resiliency of the perennial bunchgrasses to return the Short-Grass Community to the RPC.

The Reference State is resilient after disturbance. However, as disturbances increase in intensity, repetition and

duration, the effects they have on the site are compounded. The site's hydrology, biotic integrity and soil stability are impacted. The changes, especially to the plant community, can become long-lasting. If non-native perennial bunchgrass seed is present or brought onto this ecological site, any intense disturbance (fire or grazing) may result in a monoculture of non-native lovegrass (Exotic Grass State). The aspect is grassland; however, the Exotic Grassland Community does not offer wildlife adequate food and cover.

If a deleterious disturbance is not managed, the productivity of the site ultimately declines as hydrology, soil stability and the biotic community all function differently from that in the Reference State. Continuous, unmanaged grazing of either grassland state (Reference or Exotic Grass) removes fire fuel, compacts the clay loam soil and reduces perennial grass plant vigor. The resulting plant community is dominated by shrubs with less perennial grass cover (Shrub Dominated State). Run-off and erosion is much higher in this state than either grassland state.

Drought or fire, coupled with continuous, unmanaged grazing can severely impact soil and plant community functioning from the Reference or Shrub Dominated State. The resulting Eroded State has a severely limited perennial grass component, increased erosion, an abundance of annuals when rainfall permits, and a much lower plant productivity potential than the other States.

State and transition model

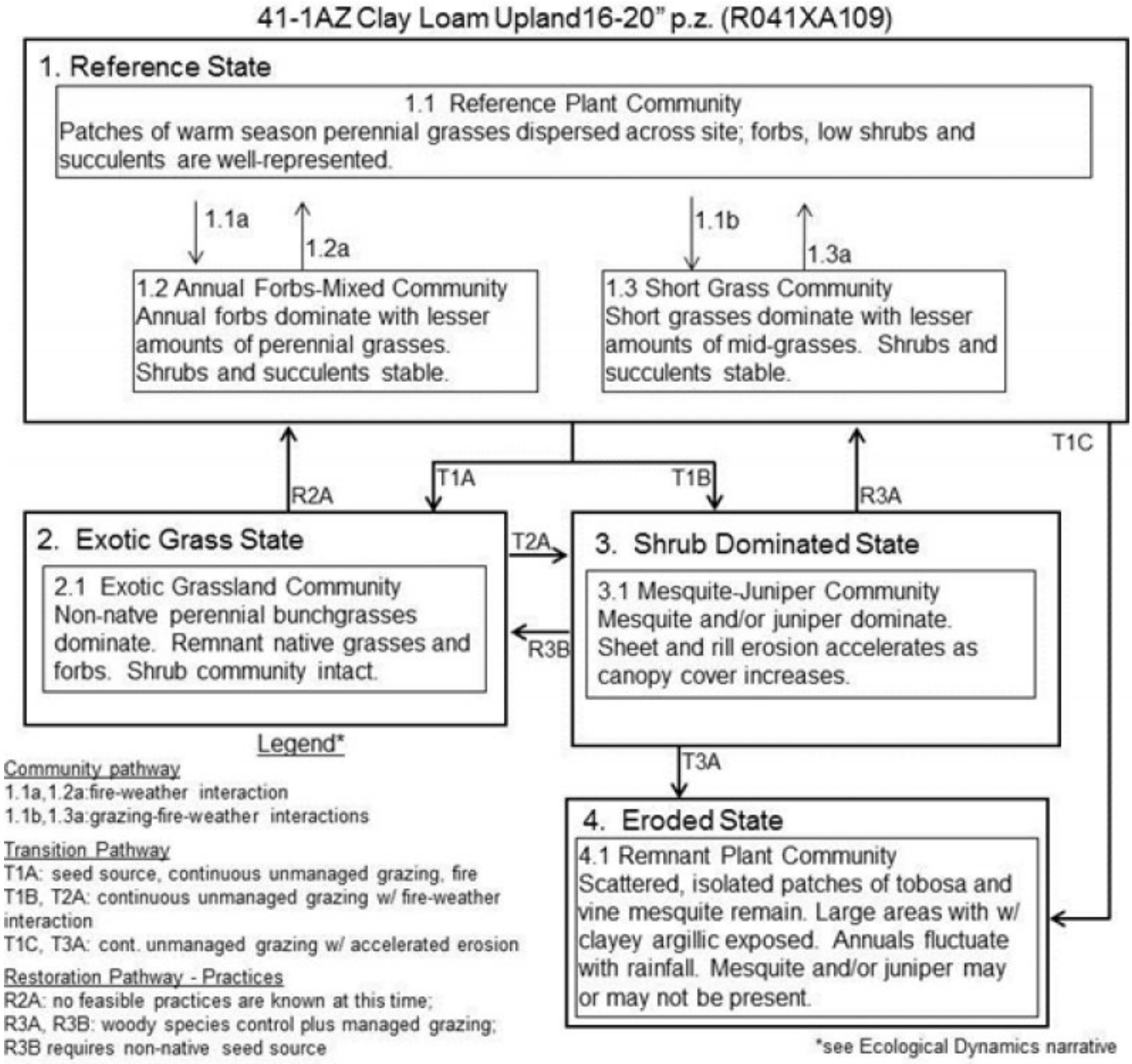

Figure 4. State and Transition Diagram

State 1
Reference State

Community 1.1
Reference Plant Community

Figure 5. Clayloam Upland 16-20" pz. Reference Plant Community

The potential plant community on this site is dominated by warm season perennial grasses. The major perennial species like tobosa, vine mesquite, and curly mesquite grow in patches on the site. These patches are well dispersed throughout the area of the site. Perennial and annual forbs, as well as several species of low shrubs and succulents, are well represented in the plant community. Species like plains lovegrass, bottlebrush squirreltail, false mesquite, and shrubby buckwheat begin growth in March. Warm season grasses begin growth in July or August, with the receipt of summer rains.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	483	1121	1390
Forb	12	45	213
Shrub/Vine	12	34	90
Tree	–	6	22
Total	**507**	**1206**	**1715**

Table 6. Soil surface cover

Tree basal cover	0-1%
Shrub/vine/liana basal cover	0-1%
Grass/grasslike basal cover	7-16%
Forb basal cover	0-1%
Non-vascular plants	0-1%
Biological crusts	1-15%
Litter	20-60%
Surface fragments >0.25" and <=3"	10-35%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	15-55%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	5-15%	1-5%
>0.15 <= 0.3	–	1-5%	15-30%	1-5%
>0.3 <= 0.6	–	1-2%	5-15%	0-15%
>0.6 <= 1.4	–	0-1%	0-5%	0-5%
>1.4 <= 4	0-1%	–	–	–
>4 <= 12	0-5%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

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

Annual forbs like goldeneye and gumweed dominate the plant community with marked reduction in blue grama and mid-grass canopies.

Community 1.3
Short grasses

With continuous, heavy grazing, midgrasses are removed from the plant community leaving patches of short grasses such as curly mesquite and blue grama. The absence of mid-grasses reduces fire fuel load resulting in an increase of half-shrubs such as yerba de pasmo.

Pathway 1.1a
Community 1.1 to 1.2

After summer drought and especially in "El Nino" years, annual forbs like goldeneye and gumweed can make tremendous production.

Conservation practices

Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Pumping Plant
Watering Facility
Water Well
Upland Wildlife Habitat Management
Early Successional Habitat Development/Management

Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Comprehensive Air Quality Management Plan - Written
Comprehensive Air Quality Management Plan - Applied
Conservation Plan Supporting Organic Transition - Written
Conservation Plan Supporting Organic Transition - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied
Agricultural Energy Management Plan, Landscape - Written
Agricultural Energy Management Plan, Landscape - 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
Early Successional Habitat Development/Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Comprehensive Air Quality Management Plan - Written
Comprehensive Air Quality Management Plan - Applied
Conservation Plan Supporting Organic Transition - Written
Conservation Plan Supporting Organic Transition - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied
Agricultural Energy Management Plan, Landscape - Written
Agricultural Energy Management Plan, Landscape - Applied

Pathway 1.2a
Community 1.2 to 1.1

This site recovers moderately well in 2 to 3 years with average rainfall.

Conservation practices

Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Pumping Plant
Watering Facility
Water Well
Upland Wildlife Habitat Management
Early Successional Habitat Development/Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Comprehensive Air Quality Management Plan - Written
Comprehensive Air Quality Management Plan - Applied
Conservation Plan Supporting Organic Transition - Written
Conservation Plan Supporting Organic Transition - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied
Dust Control on Unpaved Roads and Surfaces
Agricultural Energy Management Plan, Landscape - Written
Agricultural Energy Management Plan, Landscape - Applied

Pathway 1.3a
Community 1.3 to 1.1

Native mid-grasses will re-establish within the plant community if proper grazing use is applied; transition period may be lengthy depending upon density of short-grass sod and presence of bunchgrass seed source.

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
Comprehensive Air Quality Management Plan - Written
Comprehensive Air Quality Management Plan - Applied
Conservation Plan Supporting Organic Transition - Written
Conservation Plan Supporting Organic Transition - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied
Agricultural Energy Management Plan, Landscape - Written
Agricultural Energy Management Plan, Landscape - Applied

State 2
Exotic Grass State

Community 2.1
Exotic Grassland Community

This state occurs where yellow bluestem cultivars, Boer and / or weeping lovegrass have either moved in from established stands or been seeded into the area. These grasses become dominant and native perennial grasses and forbs exist only in remnant amounts. Cover and production of these species is very high and site stability and hydrologic function are very good; wildlife food and cover are impaired.

State 3
Shrub Dominated State

Community 3.1
Mesquite-Juniper Community

Mesquite (velvet or western honey) or juniper (alligator or one seed) dominate the plant community. This shrub encroachment happens in the absence of fire for long periods of time and in the presence of a seed source for either of the two species. Occasionally, fine fuel loads may increase to carry a fire; the shrub canopy will be removed but little shrub mortality will result. At higher shrub canopy levels (>25%) erosion can accelerate and the soil becomes unstable.

State 4
Eroded State

Community 4.1
Remnant Plant Community

This state occurs where accelerated sheet and rill erosion has removed the surface (A) horizon and left clayey sub-soils exposed at the surface. The exposed clayey areas will be largely barren. The herbaceous plant community is limited to tobosa, vine mesquite and annuals; site potential is permanently reduced. Seedling recruitment of other perennial grasses is not likely. Mesquite and/or juniper presence depends largely upon the transitional path. Gullies may form in severe situations.

Transition T1A
State 1 to 2

Non-native bunchgrass seed is purposely seeded 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 drought can 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 non-native perennial grasses will occur.

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
Comprehensive Air Quality Management Plan - Written
Comprehensive Air Quality Management Plan - Applied
Conservation Plan Supporting Organic Transition - Written
Conservation Plan Supporting Organic Transition - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied
Agricultural Energy Management Plan, Landscape - Written
Agricultural Energy Management Plan, Landscape - 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 either using mechanical or chemical treatment methods, native species seeding (as needed). Any restoration treatment needs to be supported by managed grazing. Shrub control can be maintained with either chemical treatment methods and/or prescribed burning. When selecting a shrub control method, consideration needs to be made regarding size/maturity the shrubs. Fire is not effective in killing larger shrubs.

Conservation practices

Brush Management
Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Pumping Plant
Grazing Land Mechanical Treatment
Range Planting
Watering Facility
Water Well
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Restoration and Management of Natural Ecosystems
Prescribed Grazing
TA Planning
TA Design
TA Application
TA Check-Out
Fuel Break
Invasive Plant Species Control
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Comprehensive Air Quality Management Plan - Written
Comprehensive Air Quality Management Plan - Applied
Conservation Plan Supporting Organic Transition - Written
Conservation Plan Supporting Organic Transition - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

Agricultural Energy Management Plan, Landscape - Written
Agricultural Energy Management Plan, Landscape - Applied

Restoration pathway R3B
State 3 to 2

Restoration activities conducted when a non-native seed bank is present on site (African lovegrasses or yellow bluestem 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
Grade Stabilization Structure
Livestock Pipeline
Pumping Plant
Grazing Land Mechanical Treatment
Range Planting
Watering Facility
Water Well
Upland Wildlife Habitat Management
Early Successional Habitat Development/Management
Prescribed Grazing
Existing Practice Payment
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Comprehensive Air Quality Management Plan - Written
Comprehensive Air Quality Management Plan - Applied
Conservation Plan Supporting Organic Transition - Written
Conservation Plan Supporting Organic Transition - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied
Agricultural Energy Management Plan, Landscape - Written
Agricultural Energy Management Plan, Landscape - Applied

Transition T3A
State 3 to 4

Long-term, continuous, unmanaged grazing with heavy to severe utilization permanently reduces soil site stability and hydrologic functioning. Several factors interact resulting in increased surface water run-off rather than infiltration and reduced site productivity. These factors include decreased soil cover, increased compaction, A Horizon loss, impaired biotic integrity (increased shrub/decreased perennial grass community), and altered site hydrology. As erosion become more severe, more rainfall is lost from the site and the ability of perennial grasses to grow from seed becomes limited. Drought conditions accelerate this transition.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant perennial grasses**			392–897	
	blue grama	BOGR2	*Bouteloua gracilis*	336–785	–
	sprucetop grama	BOCH	*Bouteloua chondrosioides*	28–224	–
	black grama	BOER4	*Bouteloua eriopoda*	28–112	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–112	–
	purple grama	BORA	*Bouteloua radicosa*	0–112	–
	curly-mesquite	HIBE	*Hilaria belangeri*	6–56	–
2	**Subdominant perennial grasses**			78–224	
	tobosagrass	PLMU3	*Pleuraphis mutica*	0–168	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	56–112	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	11–112	–
	vine mesquite	PAOB	*Panicum obtusum*	6–56	–
	spiked crinkleawn	TRSP12	*Trachypogon spicatus*	0–56	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	6–56	–
3	**Perennial threeawns**			6–45	
	poverty threeawn	ARDI5	*Aristida divaricata*	1–28	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	1–28	–
	spidergrass	ARTE3	*Aristida ternipes*	2–22	–
	spidergrass	ARTEG	*Aristida ternipes var. gentilis*	0–11	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–11	–
	Orcutt's threeawn	ARSCO	*Aristida schiedeana var. orcuttiana*	0–6	–
	Havard's threeawn	ARHA3	*Aristida havardii*	0–6	–
	Wooton's threeawn	ARPA9	*Aristida pansa*	0–6	–
4	**Miscellaneous perennial grasses**			6–112	
	green sprangletop	LEDU	*Leptochloa dubia*	0–56	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–28	–
	silver bluestem	BOSA	*Bothriochloa saccharoides*	0–28	–
	squirreltail	ELEL5	*Elymus elymoides*	0–17	–
	Arizona muhly	MUAR3	*Muhlenbergia arizonica*	1–17	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	0–11	–
	purple muhly	MURI3	*Muhlenbergia rigida*	0–11	–
	woolyspike balsamscale	ELBA	*Elionurus barbiculmis*	0–11	–
	Texas bluestem	SCCI2	*Schizachyrium cirratum*	0–11	–

	Texas bluestem	SCCI2	*Schizachyrium cirratum*	0–11	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	0–11	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–6	–
	big sacaton	SPWR2	*Sporobolus wrightii*	0–6	–
	tanglehead	HECO10	*Heteropogon contortus*	0–6	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–6	–
	bulb panicgrass	PABU	*Panicum bulbosum*	0–6	–
	Hall's panicgrass	PAHA	*Panicum hallii*	0–6	–
	pinyon ricegrass	PIFI	*Piptochaetium fimbriatum*	0–6	–
	slender grama	BORE2	*Bouteloua repens*	0–6	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–6	–
	densetuft hairsedge	BUCA2	*Bulbostylis capillaris*	0–2	–
	sedge	CAREX	*Carex*	0–2	–
	flatsedge	CYPER	*Cyperus*	0–2	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–2	–
	burrograss	SCBR2	*Scleropogon brevifolius*	0–2	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	0–1	–
5	**Annual grasses**			1–112	
	Mexican panicgrass	PAHI5	*Panicum hirticaule*	0–28	–
	sixweeks threeawn	ARAD	*Aristida adscensionis*	1–28	–
	prairie threeawn	AROL	*Aristida oligantha*	0–28	–
	little barley	HOPU	*Hordeum pusillum*	0–22	–
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	0–22	–
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	0–22	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–22	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–11	–
	pitscale grass	HAGR3	*Hackelochloa granularis*	0–11	–
	sticky sprangletop	LEVI5	*Leptochloa viscida*	0–11	–
	feather fingergrass	CHVI4	*Chloris virgata*	0–11	–
	tapertip cupgrass	ERACA	*Eriochloa acuminata var. acuminata*	0–11	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–11	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–6	–
	Mexican lovegrass	ERME	*Eragrostis mexicana*	0–6	–
	tufted lovegrass	ERPEP2	*Eragrostis pectinacea var. pectinacea*	0–6	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–2	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–2	–
	witchgrass	PACA6	*Panicum capillare*	0–2	–
	matted grama	BOSI2	*Bouteloua simplex*	0–2	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–2	–
	fragilegrass	AETE	*Aegopogon tenellus*	0–2	–
	poverty dropseed	SPVA	*Sporobolus vaginiflorus*	0–2	–
	prairie false oat	TRIN5	*Trisetum interruptum*	0–2	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–2	–
	Pacific fescue	VUMIP	*Vulpia microstachys var. pauciflora*	0–2	–

Forb					
6	**Perennial forbs**			11–45	
	spreading fleabane	ERDI4	*Erigeron divergens*	0–11	–
	trailing fleabane	ERFL	*Erigeron flagellaris*	0–11	–
	bluedicks	DICA14	*Dichelostemma capitatum*	1–11	–
	spreading snakeherb	DYSCD	*Dyschoriste schiedeana var. decumbens*	1–6	–
	orange fameflower	PHAU13	*Phemeranthus aurantiacus*	0–6	–
	largeflower onion	ALMA4	*Allium macropetalum*	0–6	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	1–6	–
	sheep milkvetch	ASNO3	*Astragalus nothoxys*	0–6	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–6	–
	Louisiana vetch	VILUL2	*Vicia ludoviciana ssp. ludoviciana*	0–6	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–3	–
	chaparral asphead	ASHI3	*Aspicarpa hirtella*	0–3	–
	rose heath	CHER2	*Chaetopappa ericoides*	1–3	–
	fingerleaf gourd	CUDI	*Cucurbita digitata*	0–3	–
	Cooley's bundleflower	DECO2	*Desmanthus cooleyi*	1–3	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–3	–
	wild dwarf morning-glory	EVAR	*Evolvulus arizonicus*	1–3	–
	pearly globe amaranth	GONI	*Gomphrena nitida*	0–2	–
	small matweed	GUDED	*Guilleminea densa var. densa*	1–2	–
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	0–2	–
	Wright's deervetch	LOWR	*Lotus wrightii*	1–2	–
	variableleaf bushbean	MAGI2	*Macroptilium gibbosifolium*	0–2	–
	dwarf prairie clover	DANA	*Dalea nana*	0–2	–
	whiteflower prairie clover	DAAL	*Dalea albiflora*	0–2	–
	Texas bindweed	COEQ	*Convolvulus equitans*	0–2	–
	whitemouth dayflower	COER	*Commelina erecta*	0–2	–
	leatherweed	CRPO5	*Croton pottsii*	0–2	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–2	–
	winged buckwheat	ERAL4	*Eriogonum alatum*	0–2	–
	American vetch	VIAM	*Vicia americana*	0–2	–
	Texas snoutbean	RHSET	*Rhynchosia senna var. texana*	0–2	–
	slimleaf plainsmustard	SCLI12	*Schoenocrambe linearifolia*	0–1	–
	twinleaf senna	SEBA3	*Senna bauhinioides*	0–1	–
	Lemmon's ragwort	SELE8	*Senecio lemmonii*	0–1	–
	New Mexico fanpetals	SINE	*Sida neomexicana*	0–1	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–1	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–1	–
	copper globemallow	SPAN3	*Sphaeralcea angustifolia*	0–1	–
	white prairie aster	SYFAC	*Symphyotrichum falcatum var. commutatum*	0–1	–

	jewels of Opar	TAPA2	*Talinum paniculatum*	0–1	–
	Coulter's wrinklefruit	TECO	*Tetraclea coulteri*	0–1	–
	hairy fournwort	TENE	*Tetramerium nervosum*	0–1	–
	longstalk greenthread	THLO	*Thelesperma longipes*	0–1	–
	Hopi tea greenthread	THME	*Thelesperma megapotamicum*	0–1	–
	pinewoods spiderwort	TRPI	*Tradescantia pinetorum*	0–1	–
	branched noseburn	TRRA5	*Tragia ramosa*	0–1	–
	Fort Huachuca vervain	VEGR2	*Verbena gracilis*	0–1	–
	copper zephyrlily	ZELO	*Zephyranthes longifolia*	0–1	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	0–1	–
	Watson's dutchman's pipe	ARWA	*Aristolochia watsonii*	0–1	–
	Arizona milkvetch	ASAR6	*Astragalus arizonicus*	0–1	–
	spider milkweed	ASAS	*Asclepias asperula*	0–1	–
	Mexican yellowshow	AMPA3	*Amoreuxia palmatifida*	0–1	–
	tuber anemone	ANTU	*Anemone tuberosa*	0–1	–
	melon loco	APUN	*Apodanthera undulata*	0–1	–
	horsetail milkweed	ASSU2	*Asclepias subverticillata*	0–1	–
	dense ayenia	AYMI	*Ayenia microphylla*	0–1	–
	lyreleaf greeneyes	BELY	*Berlandiera lyrata*	0–1	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–1	–
	dwarf stickpea	CAHUR	*Calliandra humilis var. reticulata*	0–1	–
	desert mariposa lily	CAKE	*Calochortus kennedyi*	0–1	–
	sego lily	CANU3	*Calochortus nuttallii*	0–1	–
	Indian paintbrush	CASTI2	*Castilleja*	0–1	–
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0–1	–
	birdbill dayflower	CODI4	*Commelina dianthifolia*	0–1	–
	dwarf milkweed	ASIN14	*Asclepias involucrata*	0–1	–
	broadleaf milkweed	ASLA4	*Asclepias latifolia*	0–1	–
	Lemmon's milkweed	ASLE13	*Asclepias lemmonii*	0–1	–
	woolly locoweed	ASMOB	*Astragalus mollissimus var. bigelovii*	0–1	–
	James' prairie clover	DAJA	*Dalea jamesii*	0–1	–
	coyote gourd	CUPA	*Cucurbita palmata*	0–1	–
	downy prairie clover	DANE	*Dalea neomexicana*	0–1	–
	trailing windmills	ALIN	*Allionia incarnata*	0–1	–
	Torrey's craglily	ECFL	*Echeandia flavescens*	0–1	–
	ivyleaf groundcherry	PHHE4	*Physalis hederifolia*	0–1	–
	white milkwort	POAL4	*Polygala alba*	0–1	–
	velvetseed milkwort	POOB	*Polygala obscura*	0–1	–
	shrubby purslane	POSU3	*Portulaca suffrutescens*	0–1	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–1	–
	buffpetal	RHPH2	*Rhynchosida physocalyx*	0–1	–
	lemon beebalm	MOCIA	*Monarda citriodora ssp. austromontana*	0–1	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–1	–

	beardlip penstemon	PEBA2	*Penstemon barbatus*	0–1	–
	Cochise beardtongue	PEDA	*Penstemon dasyphyllus*	0–1	–
	longstalk chinchweed	PELO	*Pectis longipes*	0–1	–
	Parry's beardtongue	PEPA24	*Penstemon parryi*	0–1	–
	slimleaf bean	PHAN3	*Phaseolus angustissimus*	0–1	–
	red bluet	HORU	*Houstonia rubra*	0–1	–
	babyslippers	HYVE	*Hybanthus verticillatus*	0–1	–
	ragged nettlespurge	JAMA	*Jatropha macrorhiza*	0–1	–
	San Pedro daisy	LAPO4	*Lasianthaea podocephala*	0–1	–
	Fendler's bladderpod	LEFE	*Lesquerella fendleri*	0–1	–
	narrowleaf stoneseed	LIIN2	*Lithospermum incisum*	0–1	–
	Lewis flax	LILE3	*Linum lewisii*	0–1	–
	Greene's bird's-foot trefoil	LOGR4	*Lotus greenei*	0–1	–
	shaggy dwarf morning-glory	EVNU	*Evolvulus nuttallianus*	0–1	–
	silver dwarf morning-glory	EVSE	*Evolvulus sericeus*	0–1	–
	Arizona snakecotton	FRAR2	*Froelichia arizonica*	0–1	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–1	–
	Mexican fireplant	EUHE4	*Euphorbia heterophylla*	0–1	–
	sun spurge	EURA2	*Euphorbia radians*	0–1	–
7	**Annual Forbs**			1–168	
	longleaf false goldeneye	HELOA2	*Heliomeris longifolia var. annua*	1–168	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	0–28	–
	curlytop gumweed	GRNUA	*Grindelia nuda var. aphanactis*	0–22	–
	Wright's cudweed	PSCAC2	*Pseudognaphalium canescens ssp. canescens*	0–22	–
	slender goldenweed	MAGR10	*Machaeranthera gracilis*	0–22	–
	tanseyleaf tansyaster	MATA2	*Machaeranthera tanacetifolia*	0–22	–
	bitter rubberweed	HYOD	*Hymenoxys odorata*	0–17	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	0–11	–
	pitseed goosefoot	CHBE4	*Chenopodium berlandieri*	0–11	–
	New Mexico goosefoot	CHNE3	*Chenopodium neomexicanum*	0–11	–
	sensitive partridge pea	CHNI2	*Chamaecrista nictitans*	0–11	–
	smallflowered milkvetch	ASNU4	*Astragalus nuttallianus*	0–11	–
	Thurber's milkvetch	ASTH	*Astragalus thurberi*	0–11	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–11	–
	Abert's buckwheat	ERAB2	*Eriogonum abertianum*	0–6	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	0–6	–
	carelessweed	AMPA	*Amaranthus palmeri*	0–6	–
	western tansymustard	DEPI	*Descurainia pinnata*	0–6	–
	sorrel buckwheat	ERPO4	*Eriogonum polycladon*	0–6	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–2	–

	scrambled eggs	COAU2	*Corydalis aurea*	0–2	–
	New Mexico copperleaf	ACNE	*Acalypha neomexicana*	0–2	–
	intermediate pepperweed	LEVIM	*Lepidium virginicum var. medium*	0–2	–
	sawtooth sage	SASU7	*Salvia subincisa*	0–2	–
	spreading fanpetals	SIAB	*Sida abutifolia*	0–1	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–1	–
	streptanthella	STREP	*Streptanthella*	0–1	–
	golden crownbeard	VEEN	*Verbesina encelioides*	0–1	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–1	–
	Abert's creeping zinnia	SAAB	*Sanvitalia abertii*	0–1	–
	purslane	PORTU	*Portulaca*	0–1	–
	yerba porosa	PORU6	*Porophyllum ruderale*	0–1	–
	desert unicorn-plant	PRAL4	*Proboscidea althaeifolia*	0–1	–
	doubleclaw	PRPA2	*Proboscidea parviflora*	0–1	–
	plains flax	LIPU4	*Linum puberulum*	0–1	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–1	–
	coastal bird's-foot trefoil	LOSAB	*Lotus salsuginosus var. brevivexillus*	0–1	–
	shortstem lupine	LUBR2	*Lupinus brevicaulis*	0–1	–
	bajada lupine	LUCOC	*Lupinus concinnus ssp. concinnus*	0–1	–
	Fendler's desertdandelion	MAFE	*Malacothrix fendleri*	0–1	–
	warty caltrop	KAPA	*Kallstroemia parviflora*	0–1	–
	Coulter's horseweed	LACO13	*Laennecia coulteri*	0–1	–
	Gordon's bladderpod	LEGO	*Lesquerella gordonii*	0–1	–
	broadleaved pepperweed	LELA2	*Lepidium latifolium*	0–1	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–1	–
	green carpetweed	MOVE	*Mollugo verticillata*	0–1	–
	desert evening primrose	OEPR	*Oenothera primiveris*	0–1	–
	Arizona phacelia	PHAR13	*Phacelia arizonica*	0–1	–
	Mangas Spring phacelia	PHBO4	*Phacelia bombycina*	0–1	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–1	–
	crested anoda	ANCR2	*Anoda cristata*	0–1	–
	southwestern pricklypoppy	ARPL3	*Argemone pleiacantha*	0–1	–
	halfmoon milkvetch	ASAL6	*Astragalus allochrous*	0–1	–
	wheelscale saltbush	ATEL	*Atriplex elegans*	0–1	–
	fewflower beggarticks	BILE	*Bidens leptocephala*	0–1	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–1	–
	erect spiderling	BOER	*Boerhavia erecta*	0–1	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–1	–
	purple spiderling	BOPU	*Boerhavia purpurascens*	0–1	–

	fringed redmaids	CACI2	*Calandrinia ciliata*	0–1	–
	cryptantha	CRYPT	*Cryptantha*	0–1	–
	Chihuahuan prairie clover	DAEX2	*Dalea exigua*	0–1	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–1	–
	sacred thorn-apple	DAWR2	*Datura wrightii*	0–1	–
	miner's lettuce	CLPEP	*Claytonia perfoliata ssp. perfoliata*	0–1	–
	threadstem sandmat	CHRE4	*Chamaesyce revoluta*	0–1	–
	thymeleaf sandmat	CHSE6	*Chamaesyce serpyllifolia*	0–1	–
	slimseed sandmat	CHST8	*Chamaesyce stictospora*	0–1	–
	royal sandmat	CHDI5	*Chamaesyce dioica*	0–1	–
	pillpod sandmat	CHHI3	*Chamaesyce hirta*	0–1	–
	hyssopleaf sandmat	CHHY3	*Chamaesyce hyssopifolia*	0–1	–
	poorjoe	DITE2	*Diodia teres*	0–1	–
	crestrib morning-glory	IPCO2	*Ipomoea costellata*	0–1	–
	flaxflowered ipomopsis	IPLOL	*Ipomopsis longiflora ssp. longiflora*	0–1	–
	El Paso skyrocket	IPTH2	*Ipomopsis thurberi*	0–1	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–1	–
	Arizona blanketflower	GAAR2	*Gaillardia arizonica*	0–1	–
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0–1	–
	lesser yellowthroat gilia	GIFL	*Gilia flavocincta*	0–1	–
	El Paso gilia	GIME	*Gilia mexicana*	0–1	–
	Dakota mock vervain	GLBIB	*Glandularia bipinnatifida var. bipinnatifida*	0–1	–
Shrub/Vine					
8	**Dominant half shrubs**			11–56	
	fairyduster	CAER	*Calliandra eriophylla*	1–17	–
	bastardsage	ERWR	*Eriogonum wrightii*	1–17	–
	littleleaf ratany	KRER	*Krameria erecta*	0–6	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–6	–
	prairie acacia	ACAN	*Acacia angustissima*	0–6	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	1–6	–
9	**Miscellaneous shrubs**			0–17	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–6	–
	burroweed	ISTE2	*Isocoma tenuisecta*	0–2	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	0–2	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	0–2	–
	velvetpod mimosa	MIDY	*Mimosa dysocarpa*	0–2	–
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–1	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–1	–
	threadleaf ragwort	SEFLF	*Senecio flaccidus var. flaccidus*	0–1	–
	catclaw acacia	ACGR	*Acacia greggii*	0–1	–
	Pringle manzanita	ARPR	*Arctostaphylos pringlei*	0–1	–
	pale desert-thorn	LYPA	*Lycium pallidum*	0–1	–
10	**Succulents**			1–17	

10	**Succulents**			1–17	
	sacahuista	NOMI	*Nolina microcarpa*	0–6	–
	Palmer's century plant	AGPA3	*Agave palmeri*	1–6	–
	walkingstick cactus	CYSP8	*Cylindropuntia spinosior*	0–2	–
	rainbow hedgehog cactus	ECRI3	*Echinocereus rigidissimus*	1–2	–
	spinystar	ESVI2	*Escobaria vivipara*	0–1	–
	Graham's nipple cactus	MAGR9	*Mammillaria grahamii*	0–1	–
	Macdougal's nipple cactus	MAHEM	*Mammillaria heyderi var. macdougalii*	0–1	–
	scarlet hedgehog cactus	ECCOC	*Echinocereus coccineus var. coccineus*	0–1	–
	pinkflower hedgehog cactus	ECFEF3	*Echinocereus fendleri ssp. fendleri*	0–1	–
	white fishhook cactus	ECIN2	*Echinomastus intertextus*	0–1	–
	cactus apple	OPEN3	*Opuntia engelmannii*	0–1	–
	twistspine pricklypear	OPMA2	*Opuntia macrorhiza*	0–1	–
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	0–1	–
	banana yucca	YUBA	*Yucca baccata*	0–1	–
	soaptree yucca	YUEL	*Yucca elata*	0–1	–
	Parry's agave	AGPA4	*Agave parryi*	0–1	–
Tree					
11	**Trees**			0–22	
	Arizona white oak	QUAR	*Quercus arizonica*	0–17	–
	Emory oak	QUEM	*Quercus emoryi*	0–17	–
	alligator juniper	JUDE2	*Juniperus deppeana*	0–6	–
	oneseed juniper	JUMO	*Juniperus monosperma*	0–6	–

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 an effective herbaceous cover. This site can erode easily if perennial grass cover is depleted, because the soil surface is heavy textured and rainfall is high. Annual goldeneye can cause poisoning problems after flowering in El Nino years following summer drought. Filaree and a few other winter annuals can cause nitrate poisoning problems in the spring during wet winters at these elevations. Perennial locoweeds can be a serious problem in years with dry springs following a wet fall season.

This site is a primary habitat for pronghorn antelope in southeastern Arizona. Water developments are very important to both large and small wildlife species on this site. Being open grassland and rich in grass and forb species, this site is home to a great variety of insect, bird, small mammal and reptile species. In areas adjacent to wooded bottoms or hill-sites, this site is used as a forage area by mule and Coues whitetail deer and javalina. The lesser long-nosed bat uses the nectar of the flowers of Agave Palmeri during its Jun-Aug flowering season.

Hydrological functions

This site has heavy (sandy clayloam to clayloam) soil textures at the surface. Natural rates of runoff are higher than most other upland sites in this PZ.

Recreational uses

Hunting, hiking, horseback riding, photography, bird watching, camping.

Wood products

None, unless in areas where mesquite or juniper has invaded and increased.

Other products

Grass seed, medicinal herbs like yerba de pasmo, agave for making mescal.

Inventory data references

Range 417s include 2 in good condition.

Type locality

Location 1: Santa Cruz County, AZ	
Township/Range/Section	T23S R17E S35
General legal description	San Rafael Ranch
Location 2: Pima County, AZ	
Township/Range/Section	T22S R17E S25
General legal description	Little Outfit Ranch - Tucson
Location 3: Cochise County, AZ	
Township/Range/Section	T11S R21E S35
General legal description	Broken Dipper Ranch - Willcox
Location 4: Graham County, AZ	
Township/Range/Section	T9S R21E S19
General legal description	Eureka Ranch - Safford

Other references

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Contributors

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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)	
Contact for lead author	
Date	05/12/2024
Approved by	Curtis Talbot
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:**