

Ecological site R040XA124AZ Loamy Bottom, Woodland 10"-13" 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.

MLRA notes

Major Land Resource Area (MLRA): 040X–Sonoran Basin and Range

Major Land Resource Area (MLRA) 40 is the portion of Sonoran Desert that extends from northwest Mexico into southwestern Arizona and southeastern California. This MLRA is hot desert characterized by bimodal precipitation coupled with hot summers and mild winters. These conditions give rise to a rich biological diversity visually dominated by columnar cactus (saguaro) and leguminous trees (palo verde). 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 basin sediments are combinations of fluvial, lacustrine, colluvial and alluvial deposits.

LRU notes

Land Resource Unit (LRU) 40-1, Upper Sonoran Desert, is characterized by desert scrub vegetation with no desert pavement present. Trees grow on uplands as well as in washes and on hillslopes. Elevations range from 2000 to 3800 feet, and precipitation averages 10 to 13 inches per year. Vegetation includes saguaro, palo verde, mesquite, creosotebush, triangle bursage, prickly pear, cholla, limberbush, wolfberry, bush muhly, threeawns, ocotillo, and globe mallow. The soil temperature regime is thermic and the soil moisture regime is typic aridic.

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 40 - Sonoran Basin and Range Land Resource Unit 1 - Upper Sonoran Desert Ecological Site Loamy Bottom, Woodland, 10"-13" p.z.

U.S. Environmental Protection Agency, Ecological Regions of North America: Level I, Region 10 North American Deserts Level II, 10.2 Warm Deserts Level III, Ecoregion 81, Sonoran Basin and Range Level IV, 81I, 81n, 81o

USDA-USFS Ecological Subregions: Sections of the Conterminous United States Section 322 American Semidesert and Desert Province Section 322B, Sonoran Desert

Ecological site concept

Loamy Bottom, Woodland, 10"-13" p.z., occurs in a bottom position, receiving both rainfall and run-on moisture. The water table is available to the plant community. Soils do not have redoximorphic features within 80" of surface.

Associated sites

R040XA125AZ	Sandy Bottom, Woodland 10"-13" p.z. adjacent water flow channel, soils with redox features
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R040XA112AZ	Loamy Swale 10"-13" p.z. non-saline bottom site without permanent, deep, water table; often associated adjacent opposite water channel
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Similar sites

F040XB214AZ	Loamy Bottom, Woodland 7"-10" p.z. Elevations 1,200' - 2,000', lower precipitation, soil hyperthermic
F040XC328AZ	Loamy Bottom, Woodland 3"-7" p.z. Elevations 300' - 1,200', lower precipitation, soil hyperthermic

Table 1. Dominant plant species

Tree	(1) <i>Prosopis velutina</i>
Shrub	Not specified
Herbaceous	(1) <i>Sporobolus wrightii</i>

Physiographic features

This site occurs on stream terraces of major drainageways. It does not experience regular overbank flooding. Some extra moisture may be received from valley side channel flooding. Water table depths are estimated to range from 10 to 50 feet. Stream channels are deeply entrenched.

Table 2. Representative physiographic features

Landforms	(1) Stream terrace
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	None to rare
Ponding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Ponding frequency	None to rare
Elevation	610–1,158 m
Slope	0–2%
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 10 to 13 inches in the southern part of this LRU, with elevations between 1900 and 3200 feet. Annual precipitation in the northern part ranges from 11 to 14 inches, with elevations between 2000 and 3800 feet. Rainfall ratios range from 40:60 (winter:summer) in the southern part, 50:50 in the central portion, and 60:40 in the northern part.

Overall, average annual rainfall is variable, but increases in variability from east to west across the region. For long-term precipitation data, the coefficient of variation, the ratio of the standard deviation to the mean expressed as a percentage, increases from 29% at Tucson (east) to 36% at Carefree (west).

Rainfall intensity differs between rainfall seasons. Winter frontal storms develop in the Pacific Ocean and Gulf of California, producing widespread, low-intensity and long duration precipitation events. Snowfall is rare and seldom last for more than a few hours. During summer months (July-September), atmospheric activity in the Gulf of Mexico produces convective thunderstorms of short duration, usually less than 30 minutes, but of moderate to heavy intensity. May and June are the driest months of the year. Humidity is generally very low.

Winter temperatures are mild, with only a few days of freezing temperatures overnight. Summer temperatures are warm to hot, with several days in June and July exceeding 105°F.

Spring and the summer growing seasons are equally important for perennial grass, forb and shrub growth. With

above average precipitation, cool and warm season annual forbs and grasses can be common in their respective seasons. Perennial forage species can remain green throughout the year with sufficient available moisture.

Table 3. Representative climatic features

Frost-free period (average)	265 days
Freeze-free period (average)	
Precipitation total (average)	330 mm

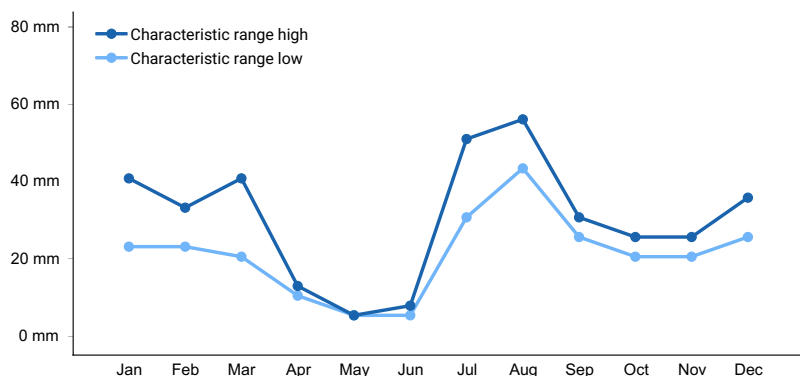


Figure 1. Monthly precipitation range

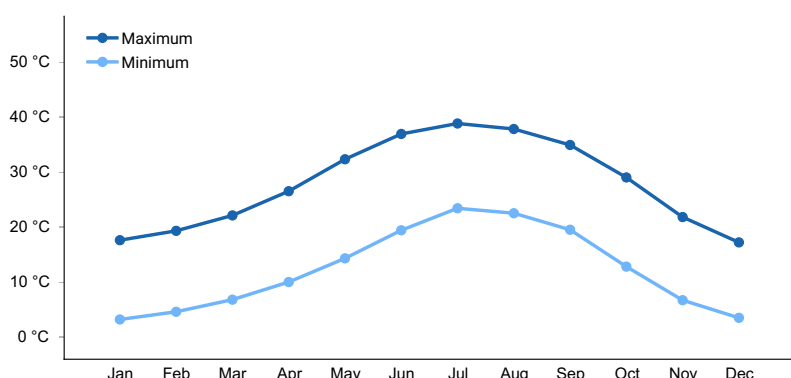


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no water features associated with this site.

Soil features

These are young soils formed in loamy or silty alluvium of mixed origin. Soils are deep, well drained and may be calcareous or slightly saline, and may contain 0%-5% gypsum. Plant-soil moisture relationships are excellent for deep rooted trees due to a deep ground water table.

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"	0–10%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	14.73–27.43 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–13
Soil reaction (1:1 water) (0-101.6cm)	7–8.2
Subsurface fragment volume <=3" (Depth not specified)	0–5%

Ecological dynamics

Loamy Bottom, Woodland, 10-13" p.z. supports a mixed plant community, with an overstory of mesquite and an understory of shrubs, perennial grasses and forbs. Leaf-out for mesquite occurs midspring, after the last frost, produces flowers in late spring or early summer, and mature fruits begin dropping by July. The trees lose their leaves with the first hard frost. The aspect is deciduous woodland.

The site is very susceptible to channel and streambank erosion. Drainageways are deeply entrenched and, if streamside vegetation is disturbed, bank cutting can greatly increase. If the mesquite overstory is reduced, shrub cover will readily expand and become dominant in the plant community. Herbaceous understory density varies with varying canopy cover. Mesquite canopy cover ranges from 30%–65%. Trees can reach maximum size and height on the site. Excessive groundwater pumping can, over time, lower water tables beyond the reach of tree roots and cause extensive tree loss. Tree species vigorously sprout after a fire or manual cutting. Natural fires may have been important in maintaining herbaceous understories. Saltcedar can invade and dominate following disturbance of the native tree cover. Bermudagrass, Johnson grass, foxtail barley and London rocket are introduced species commonly found on this site.

State and transition model

40-1 Loamy Bottom, woodland 10- 13" p.z. (R040XB124AZ) – DRAFT

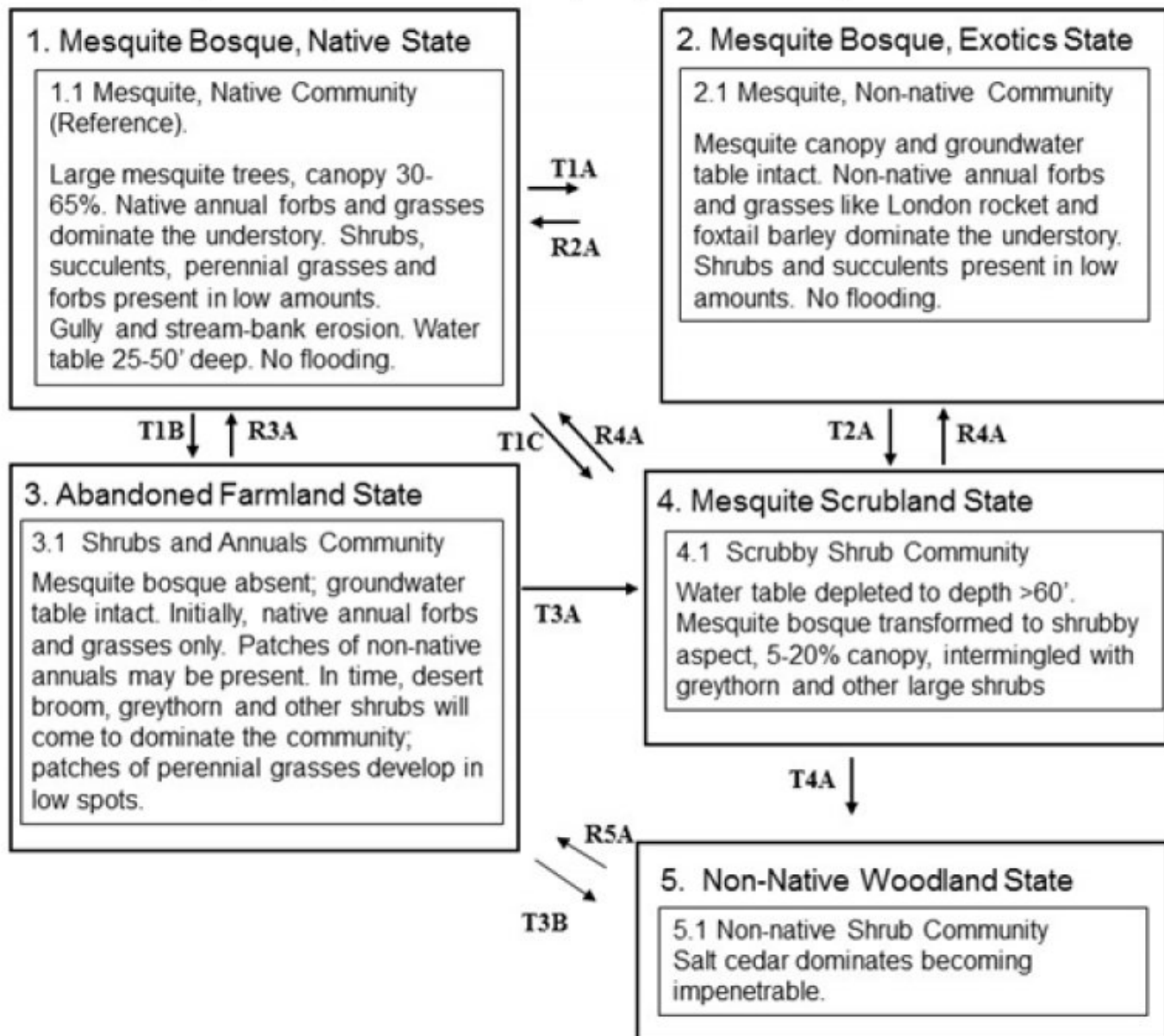


Figure 3. Loamy Bottom, Woodland STM

Transition Pathways

T1A. Continuous heavy grazing, introduction of a seed for non-native annuals like London rocket, foxtail barley, red brome and rescue brome

T1B. Mesquite clearing for cultivation and subsequent abandonment. Annuals with desert broom and other shrubs form a scrubland. Water table intact at 25 to 50 ft.

T1C, T2A, T3A. Water-table depleted by groundwater pumping to greater than 60 feet. Mature mesquites die back to a shrubby growth that rainfall can support.

T3B. Introduction of salt cedar.

Restoration Pathways

R2A. Unknown, possible herbicide control of exotic annuals. Prescribed grazing may allow restoration of some native perennial grasses

R3A. 50 to 100 years with introduction of mesquite seeds or plants to go back to mature mesquite trees rooted 50 foot deep.

R4A. Re-clearing or grading

R5A. 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. Groundwater recharge will not occur in urban or developing areas.

Figure 4. Loamy Bottom, woodland, 10-13" p.z. STM Legend

State 1

Mesquite Bosque, Native State

Community 1.1

Mesquite, Native Community (Reference)

Mesquite dominates the reference plant community with a mixed understory.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	336	532	729
Shrub/Vine	392	448	504
Grass/Grasslike	280	308	336
Forb	224	252	280
Total	1232	1540	1849

State 2

Mesquite Bosque, Exotics State

Mesquite canopy intact, and groundwater table within normal range. Non-native annual forbs and grasses, such as London rocket and foxtail barley, dominate the understory. Shrubs and succulents are sparsely present. No flooding occurs.

State 3

Abandoned Farmland State

Mesquite bosque absent, and groundwater table within normal range. Initially, native annual forbs and grasses occupy the site, with some patches of non-native annuals. With time, desert broom, greythorn and other shrubs come to dominate the community, with patches of perennial grasses occurring in depressions.

State 4

Mesquite Scrubland State

Water table depleted. Mesquite bosque has altered to a shrubby aspect with a 5%-20% canopy, intermingled with greythorn and other large shrubs.

State 5

Non-Native Woodland State

Saltcedar dominates, becoming an impenetrable thicket.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				31–46	
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	31–46	–
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	31–46	–
	whiplash pappusgrass	PAVA2	<i>Pappophorum vaginatum</i>	31–46	–
	plains bristlegrass	SEVU2	<i>Setaria vulpiseta</i>	31–46	–
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	31–46	–
	big sacaton	SPWR2	<i>Sporobolus wrightii</i>	31–46	–
2				16–31	
	Santa Rita threeawn	ARCAG	<i>Aristida californica</i> var. <i>glabrata</i>	16–31	–
	Havard's threeawn	ARHA3	<i>Aristida havardii</i>	16–31	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	16–31	–
	Parish's threeawn	ARPUP5	<i>Aristida purpurea</i> var. <i>parishii</i>	16–31	–
	spidergrass	ARTE3	<i>Aristida ternipes</i>	16–31	–
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	16–31	–
	saltgrass	DISP	<i>Distichlis spicata</i>	16–31	–
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	16–31	–
	vine mesquite	PAOB	<i>Panicum obtusum</i>	16–31	–
	tobosagrass	PLMU3	<i>Pleuraphis mutica</i>	16–31	–
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	16–31	–

	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	16–31	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	16–31	–
	slim tridens	TRMU	<i>Tridens muticus</i>	16–31	–
3				31–46	
	prairie threeawn	AROL	<i>Aristida oligantha</i>	31–46	–
	needle grama	BOAR	<i>Bouteloua aristidoides</i>	31–46	–
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	31–46	–
	Rothrock's grama	BORO2	<i>Bouteloua rothrockii</i>	31–46	–
	Arizona brome	BRAR4	<i>Bromus arizonicus</i>	31–46	–
	brome	BROMU	<i>Bromus</i>	31–46	–
	feather fingergrass	CHVI4	<i>Chloris virgata</i>	31–46	–
	bearded cupgrass	ERAR5	<i>Eriochloa aristata</i>	31–46	–
	canyon cupgrass	ERLE7	<i>Eriochloa lemmonii</i>	31–46	–
	desert lovegrass	ERPEM	<i>Eragrostis pectinacea</i> var. <i>miserrima</i>	31–46	–
	tufted lovegrass	ERPEP2	<i>Eragrostis pectinacea</i> var. <i>pectinacea</i>	31–46	–
	little barley	HOPU	<i>Hordeum pusillum</i>	31–46	–
	Mexican sprangletop	LEFUU	<i>Leptochloa fusca</i> ssp. <i>uninervia</i>	31–46	–
	mucronate sprangletop	LEPAB	<i>Leptochloa panicea</i> ssp. <i>brachiata</i>	31–46	–
	delicate muhly	MUFR	<i>Muhlenbergia fragilis</i>	31–46	–
	littleseed muhly	MUMI	<i>Muhlenbergia microsperma</i>	31–46	–
	witchgrass	PACA6	<i>Panicum capillare</i>	31–46	–
	Bigelow's bluegrass	POBI	<i>Poa bigelovii</i>	31–46	–
	Arizona signalgrass	URAR	<i>Urochloa arizonica</i>	31–46	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	31–46	–
Forb					
4				2–12	
	bigseed alfalfa dodder	CUIN	<i>Cuscuta indecora</i>	2–12	–
	mesquite mistletoe	PHCA8	<i>Phoradendron californicum</i>	2–12	–
5				26–38	
	dwarf desertpeony	ACNA2	<i>Acourtia nana</i>	26–38	–
	wheelscale saltbush	ATEL	<i>Atriplex elegans</i>	26–38	–
	Wright's saltbush	ATWR	<i>Atriplex wrightii</i>	26–38	–
	hedge bamboo	BAMU2	<i>Bambusa multiplex</i>	26–38	–
	New Mexico thistle	CINE	<i>Cirsium neomexicanum</i>	26–38	–
	fingerleaf gourd	CUDI	<i>Cucurbita digitata</i>	26–38	–
	Missouri gourd	CUFO	<i>Cucurbita foetidissima</i>	26–38	–
	coyote gourd	CUPA	<i>Cucurbita palmata</i>	26–38	–
	desert thorn-apple	DADI2	<i>Datura discolor</i>	26–38	–
	pricklyburr	DAIN2	<i>Datura inoxia</i>	26–38	–
	Indian rushpea	HOGL2	<i>Hoffmannseggia glauca</i>	26–38	–
	redstar	IPCO3	<i>Ipomoea coccinea</i>	26–38	–
	Gila manroot	MAGI	<i>Marah gilensis</i>	26–38	–

	lacy tansyaster	MAPIP4	<i>Machaeranthera pinnatifida</i> ssp. <i>pinnatifida</i> var. <i>pinnatifida</i>	26–38	–
	desert tobacco	NIOBO	<i>Nicotiana obtusifolia</i> var. <i>obtusifolia</i>	26–38	–
	Mexican passionflower	PAME2	<i>Passiflora mexicana</i>	26–38	–
	doubleclaw	PRPA2	<i>Proboscidea parviflora</i>	26–38	–
	canaigre dock	RUHY	<i>Rumex hymenosepalus</i>	26–38	–
	silverleaf nightshade	SOEL	<i>Solanum elaeagnifolium</i>	26–38	–
6				26–38	
	brownfoot	ACWR5	<i>Acourtia wrightii</i>	26–38	–
	trailing windmills	ALIN	<i>Allionia incarnata</i>	26–38	–
	weakleaf bur ragweed	AMCO3	<i>Ambrosia confertiflora</i>	26–38	–
	carelessweed	AMPA	<i>Amaranthus palmeri</i>	26–38	–
	bristly fiddleneck	AMTE3	<i>Amsinckia tessellata</i>	26–38	–
	rockcress	ARABI	<i>Arabidopsis</i>	26–38	–
	milkvetch	ASTRA	<i>Astragalus</i>	26–38	–
	scarlet spiderling	BOCO	<i>Boerhavia coccinea</i>	26–38	–
	Coulter's spiderling	BOCO2	<i>Boerhavia coulteri</i>	26–38	–
	hoary bowlesia	BOIN3	<i>Bowlesia incana</i>	26–38	–
	Arizona wrightwort	CAAR7	<i>Carlowrightia arizonica</i>	26–38	–
	whitemargin sandmat	CHAL11	<i>Chamaesyce albomarginata</i>	26–38	–
	goosefoot	CHENO	<i>Chenopodium</i>	26–38	–
	hyssopleaf sandmat	CHHY3	<i>Chamaesyce hyssopifolia</i>	26–38	–
	cryptantha	CRYPT	<i>Cryptantha</i>	26–38	–
	hairy prairie clover	DAMO	<i>Dalea mollis</i>	26–38	–
	American wild carrot	DAPU3	<i>Daucus pusillus</i>	26–38	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	26–38	–
	Palmer's spectaclepod	DICA31	<i>Dimorphocarpa candicans</i>	26–38	–
	flatcrown buckwheat	ERDE6	<i>Eriogonum deflexum</i>	26–38	–
	miniature woollystar	ERDI2	<i>Eriastrum diffusum</i>	26–38	–
	buckwheat	ERIOG	<i>Eriogonum</i>	26–38	–
	California poppy	ESCAM	<i>Eschscholzia californica</i> ssp. <i>mexicana</i>	26–38	–
	Mexican fireplant	EUHE4	<i>Euphorbia heterophylla</i>	26–38	–
	hairy desertsunflower	GECA2	<i>Geraea canescens</i>	26–38	–
	redstar	IPCO3	<i>Ipomoea coccinea</i>	26–38	–
	Arizona poppy	KAGR	<i>Kallstroemia grandiflora</i>	26–38	–
	Gordon's bladderpod	LEGO	<i>Lesquerella gordonii</i>	26–38	–
	shaggyfruit pepperweed	LELA	<i>Lepidium lasiocarpum</i>	26–38	–
	Coulter's lupine	LUSP2	<i>Lupinus sparsiflorus</i>	26–38	–
	lacy tansyaster	MAPIP4	<i>Machaeranthera pinnatifida</i> ssp. <i>pinnatifida</i> var. <i>pinnatifida</i>	26–38	–

			<i>var. pinnatifida</i>		
	Nuttall's povertyweed	MONU	<i>Monolepis nuttalliana</i>	26–38	–
	glandular threadplant	NEGL	<i>Nemacladus glanduliferus</i>	26–38	–
	Florida pellitory	PAFL3	<i>Parietaria floridana</i>	26–38	–
	manybristle chinchweed	PEPA2	<i>Pectis papposa</i>	26–38	–
	phacelia	PHACE	<i>Phacelia</i>	26–38	–
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	26–38	–
	purslane	PORTU	<i>Portulaca</i>	26–38	–
	sage	SALVI	<i>Salvia</i>	26–38	–
	sleepy silene	SIAN2	<i>Silene antirrhina</i>	26–38	–
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	26–38	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	26–38	–
	woollyhead neststraw	STMI2	<i>Stylocline micropoides</i>	26–38	–
	brownplume wirelettuce	STPA4	<i>Stephanomeria pauciflora</i>	26–38	–
	sand fringe pod	THCU	<i>Thysanocarpus curvipes</i>	26–38	–
	woolly tidestromia	TILA2	<i>Tidestromia lanuginosa</i>	26–38	–
Shrub/Vine					
7				112–157	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	112–157	–
	Palmer's cock's comb	CEPA5	<i>Celosia palmeri</i>	112–157	–
	Drummond's clematis	CLDR	<i>Clematis drummondii</i>	112–157	–
	western white clematis	CLLI2	<i>Clematis ligusticifolia</i>	112–157	–
	longleaf jointfir	EPTR	<i>Ephedra trifurca</i>	112–157	–
	water jacket	LYAN	<i>Lycium andersonii</i>	112–157	–
	desert-thorn	LYCIU	<i>Lycium</i>	112–157	–
	Arizona desert-thorn	LYEX	<i>Lycium exsertum</i>	112–157	–
	lotebush	ZIOB	<i>Ziziphus obtusifolia</i>	112–157	–
8				2–45	
	whitethorn acacia	VACO9	<i>Vachellia constricta</i>	22–45	–
	iodinebush	ALOC2	<i>Allenrolfea occidentalis</i>	22–45	–
	cattle saltbush	ATPO	<i>Atriplex polycarpa</i>	22–45	–
	desertbroom	BASA2	<i>Baccharis sarothroides</i>	22–45	–
	singlewhorl burrobrush	HYMO	<i>Hymenoclea monogyra</i>	22–45	–
	alkali goldenbush	ISACA2	<i>Isocoma acradenia var. acradenia</i>	22–45	–
	southern goldenbush	ISPL	<i>Isocoma pluriflora</i>	22–45	–
	burroweed	ISTE2	<i>Isocoma tenuisecta</i>	22–45	–
	creosote bush	LATRT	<i>Larrea tridentata var. tridentata</i>	22–45	–
	nightblooming	PEGRT	<i>Peniocereus greggii var. transmontanus</i>	22–45	–

	cereus				
	soaptree yucca	YUEL	<i>Yucca elata</i>	22–45	–
Tree					
9				6–27	
	catclaw acacia	SEGR4	<i>Senegalia greggii</i>	6–27	–
	Jerusalem thorn	PAAC3	<i>Parkinsonia aculeata</i>	6–27	–
	honey mesquite	PRGLG	<i>Prosopis glandulosa var. glandulosa</i>	6–27	–
10				160–319	
	velvet mesquite	PRVE	<i>Prosopis velutina</i>	160–319	–
11				6–27	
	netleaf hackberry	CELAR	<i>Celtis laevigata var. reticulata</i>	6–27	–
	desert willow	CHLI2	<i>Chilopsis linearis</i>	6–27	–
	Jerusalem thorn	PAAC3	<i>Parkinsonia aculeata</i>	6–27	–
	screwbean mesquite	PRPU	<i>Prosopis pubescens</i>	6–27	–
	American black elderberry	SANIC4	<i>Sambucus nigra ssp. canadensis</i>	6–27	–

Animal community

This site produces good quantities of spring annual forbs and grasses prior to canopy leaf-out in April. If summer bean crops are harvested, care should be taken to avoid overgrazing the warm season perennial grasses. Horses should not be grazed when a bean crop exists in the trees or on the ground in the summer rainy season.

This site is extremely important to a variety of wildlife, offering well-wooded habitat adjacent to free water in the streambeds for part or all of the year.

Wood products

Fuelwood harvest should not reduce canopy cover to less than 20% to limit an increase in undesirable shrub cover. Coppice sprouts achieve canopy dominance faster if stumps are greater than 30 inches in height. Coppice production cuts should occur every 20 to 30 years. Trees should not be cut near streambanks. There are no soil-site factors limiting wood production.

Type locality

Location 1: Pima County, AZ	
Township/Range/Section	T8S R17E S7
General legal description	Tucson FO - San Pedro River - 7B Ranch at Mammoth, SW 1/4 Sec. 7
Location 2: Cochise County, AZ	
Township/Range/Section	T11S R18E S23
General legal description	Willcox FO - San Pedro River
Location 3: Pinal County, AZ	
Township/Range/Section	T4S R12E S6
General legal description	Casa Grande FO - Gila River - 15 Ranch
Location 4: Pima County, AZ	
Township/Range/Section	T15S R13E S35
General legal description	Sells FO - San Xavier

Contributors

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Approval

Kendra Moseley, 10/17/2024

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	11/24/2024
Approved by	Kendra Moseley
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):**
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**
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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant:
- Sub-dominant:
- Other:
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
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14. **Average percent litter cover (%) and depth (in):**
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**
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17. **Perennial plant reproductive capability:**
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