USDA Natural Resources
Conservation Service

Ecological site R040XC314AZ
Saline Swale 3"-7" 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) 40-3, Colorado Sonoran Desert, is characterized by desert scrub vegetation with a high amount of desert pavement on relict fan remnants. Trees are only in large washes and on hillslopes. Elevations range from 300 to 1200 feet, and precipitation averages 3 to 7 inches per year. Vegetation includes creosotebush, white bursage, brittlebush, Mormon tea, teddybear cholla, elephant tree, smoke tree, ocotillo, and big galleta. The soil temperature regime is hyperthermic 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 3 - Colorado Sonoran Desert Ecological Site Saline Swale, 3"-7" 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, 81l, 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

Saline Swale, 3"-7" p.z., occurs in low-lying areas with slightly to strongly saline soils. The water table can be seasonally high but is not a perennial water source for the plant community.

Associated sites

R040XC315AZ	**Saline Bottom 3"-7" p.z.**
F040XC328AZ	**Loamy Bottom, Woodland 3"-7" p.z.**

Similar sites

R040XB227AZ	**Saline Bottom 7"-10" p.z.**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Tamarix chinensis* (2) *Pluchea sericea*
Herbaceous	(1) *Distichlis spicata* (2) *Cynodon dactylon*

Physiographic features

This site occurs on bottomland positions, including floodplains and drainageways. It receives significant run-on moisture from adjacent areas.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Drainageway
Elevation	91–366 m
Slope	0–1%

Climatic features

Annual precipitation ranges from 3 to 7 inches. Annual rainfall is bimodal, with distinct rainy seasons occurring from December to March (winter) and July to September (summer). Rainfall ratios range from 40:60 (winter:summer). 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. Winter precipitation is the more dependable water source for vegetation, and snowfall is very rare. During summer months, atmospheric activity in the Gulf of Mexico produces convective thunderstorms when crossing over the mountains in the afternoon. These storms travel across the plains and valleys, producing precipitation of short duration, usually less than 30 minutes, but of moderate to heavy intensity. However, these thunderstorms often produce little more than gusty winds and light showers. Between these two seasons, little to no effective precipitation can occur for several months at a time. May and June are the driest months, and overall humidity is very low.

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 44% at Gila Bend (east) to 65% at Mohawk (west).

Winter temperatures are very mild, with an average of 53°F in January, with recorded extremes of 10°F. Summertime temperatures are hot to very hot, averaging 93°F in July, and with recorded extremes of 125°F. Spring and summer growing seasons are equally important for perennial grass, forb and shrub and tree growth. With above average precipitation, cool and warm season annuals, forbs and grasses can be common in their respective seasons. Perennial forbs may only be visible above ground following rainfall events.

Table 3. Representative climatic features

Frost-free period (average)	303 days
Freeze-free period (average)	348 days
Precipitation total (average)	178 mm

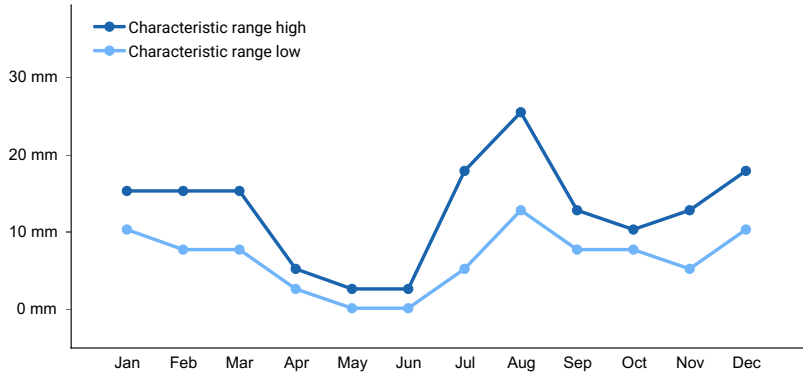

Figure 1. Monthly precipitation range

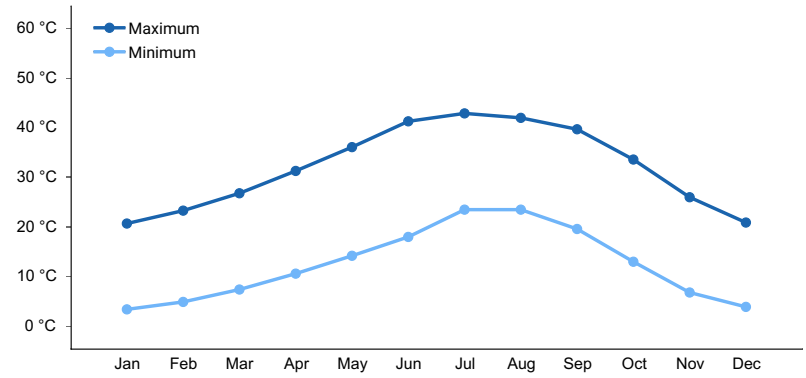

Figure 2. Monthly average minimum and maximum temperature

Influencing water features

Soil features

These soils are deep, with very high soluble salt accumulations and pH that ranges from 7.9 - 9.0. Infiltration rate is moderate with good vegetative cover conditions. Erosion stability is good. Plant-soil relationships are poor due to the high soluble salt content limiting available moisture. Coarse fragment content averages less than 15% of total soil volume.

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Clay loam (3) Loam
Drainage class	Well drained
Permeability class	Very slow to moderate
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	18.29–22.86 cm
Calcium carbonate equivalent (0-101.6cm)	1–10%
Electrical conductivity (0-101.6cm)	2–32 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–60

Soil reaction (1:1 water) (0-101.6cm)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The reference plant community is dominated by non-native, salt-tolerant shrubs, which have largely replaced native species. Relic native plant communities or alternate states were not observed. The aspect is shrubland.

State and transition model

Ecosystem states

1. Woodland

State 1 submodel, plant communities

1.1. Salt Cedar (Reference)

State 1
Woodland

Community 1.1
Salt Cedar (Reference)

The reference plant community consists almost exclusively of salt-tolerant shrubs and trees. A few perennial grasses and some annual grasses and forbs can occupy openings in the dense, bushy stands. Construction of irrigation storage facilities, flood control infrastructure, and hydro-electric producing dams has highly altered Colorado River flow regimes. Large areas were further altered by extensive irrigation for agriculture, which altered water table depths and increased salt accumulation within the soils. These major changes in soil physical properties resulted in an invasion by and an increase in salt tolerant plants. The historic reference plant community that originally occurred along the free-flowing river has been effectively eliminated. Reference plant community composition and range health indices can vary greatly due to effects on vegetative cover from highly variable water table depths and increased salt accumulation in the soil profile.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	964	2010	3054
Grass/Grasslike	–	306	611
Forb	–	127	252
Total	**964**	**2443**	**3917**

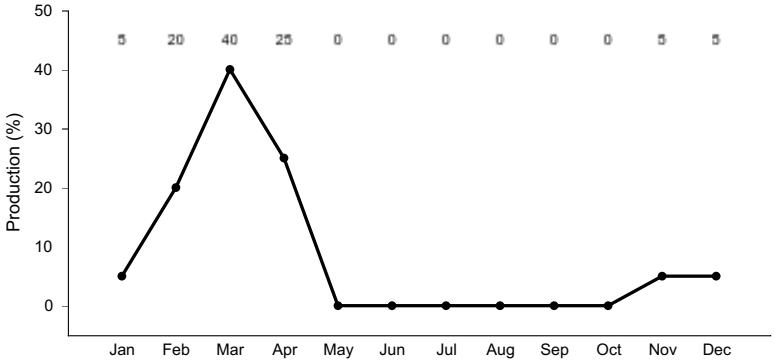

Figure 4. Plant community growth curve (percent production by month). AZ4041, 40.3 3-7" p.z. all sites. Most growth occurs in the winter to early spring, plants are dormant May through October..

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	**Perennial Grasses**			0–560	
	Bermudagrass	CYDA	*Cynodon dactylon*	0–252	–
	saltgrass	DISP	*Distichlis spicata*	0–252	–
	Grass, annual	2GA	*Grass, annual*	0–50	–
2	**Reed**			0–50	
	common reed	PHAU7	*Phragmites australis*	0–50	–
Forb					
3	**Annual Forbs**			0–252	
	Forb, annual	2FA	*Forb, annual*	0–252	–
Shrub/Vine					
4	**Saltbush**			644–1659	
	five-stamen tamarisk	TACH2	*Tamarix chinensis*	636–1681	–
	arrowweed	PLSE	*Pluchea sericea*	636–1271	–
	iodinebush	ALOC2	*Allenrolfea occidentalis*	0–319	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–64	–
	big saltbush	ATLE	*Atriplex lentiformis*	0–64	–
5	**Mesquites**			319–1345	
	velvet mesquite	PRVE	*Prosopis velutina*	0–504	–
	screwbean mesquite	PRPU	*Prosopis pubescens*	0–504	–
	western honey mesquite	PRGLT	*Prosopis glandulosa var. torreyana*	0–504	–

Other references

Griffith, G.E., Omernik, J.M., Johnson, C.B., and Turner, D.S., 2014, Ecoregions of Arizona (poster): U.S. Geological Survey Open-File Report 2014-1141, with map, scale 1:1,325,000, https://dx.doi.org/10.3133/ofr20141141. ISSN 2331-1258 (online)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of

Agriculture Handbook 296.

Contributors

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Approval

Kendra Moseley, 3/04/2025

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)	Dave Womack, Dan Robinett, Emilio Carrillo.
Contact for lead author	NRCS Tucson Area Office.
Date	03/09/2005
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** Water flow patterns are uncommon due to low slopes.

3. **Number and height of erosional pedestals or terracettes:** No pedestals or terracettes present. Flood events leave debris dams of woody and herbaceous litter around shrubs.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground cover ranges from 5%-50%. Expect low values in dry years.

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** No evidence.

7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter can move by wind

and water. Woody litter remains under shrub canopies except after very high flows.

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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):** Soil surface resistance to erosion is good under shrub canopies, and moderate in interspaces due to crust formed by evaporated salts.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Weak thir platy to single grain; 7.5-10YR6/4 dry; 7.5-10YR3/5 moist; thickness to 6 inches.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Shrubs 75%-80% of canopy cover, trees 20%-25%.

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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):** None.

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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: shrubs > trees > winter annuals > summer annuals.

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** 30%-70% canopy mortality on trees and shrubs.

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14. **Average percent litter cover (%) and depth (in):** Herbaceous litter is not persistent on the site.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 860 lbs/ac unfavorable precipitation; 2250 lbs/ac normal precipitation; 3640 lbs/ac favorable precipitation.

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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:** Asian mustard, saltcedar.

17. **Perennial plant reproductive capability:** Not impaired for shrubs and trees.