USDA Natural Resources
Conservation Service

Ecological site R077CY689TX
Wet Saline 16-21" PZ

Last updated: 9/11/2023
Accessed: 06/30/2024

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): 077C–Southern High Plains, Southern Part

MLRA 77C is characterized by nearly level plains with numerous playa depressions, moderately sloping breaks along drainageways, and a steep escarpment along the eastern margin. From southwest to northeast, soils grade from coarse-textured to fine-textured. Soils are generally deep and occur in a thermic soil temperature regime and ustic soil moisture regime bordering on aridic. Current land use is dominantly cropland.

Classification relationships

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA Ag Handbook 296.

Ecological site concept

This site occurs on clayey and loamy saline soils in concave drainageways. The reference vegetation consists of saline tolerant grasses and forbs. The impact of abusive grazing and/or lack of fire may lead to a shift in the plant community.

Associated sites

R077CY023TX	**Draw 16-21" PZ** The Draw site has very deep loamy soils that collect runoff moisture upstream from Wet Saline sites. Midgrasses and shortgrasses dominate these sites but have some tallgrasses as well.
R077CY037TX	**Very Shallow 16-21" PZ** The Very Shallow site is on moderately sloping to very steep uplands. These sites have calcareous, gravelly soils that are shallow to restrictive layers. These soils flank the Wet Saline sites and contribute to runoff from rainfall and ponding of these sites. The reference plant community consists of midgrasses, shortgrasses and forbs.
R077CY028TX	**Limy Upland 16-21" PZ** The Limy Upland site is on nearly level to strongly sloping uplands. These sites have very deep calcareous, loamy soils that flank the Wet Saline sites and contribute to runoff from rainfall and ponding. Midgrasses and shortgrasses dominate these sites.

Similar sites

R077CY026TX	**High Lime 16-21" PZ** The High Lime site is on dunes, drainageways, and playa slopes. Both High Lime and Wet Saline sites have similar vegetation that are tolerant to saline conditions. Production will be a little higher on the High Lime sites. Midgrasses and Shortgrasses dominate these sites.
R077CY027TX	**Playa 16-21" PZ** Playa sites are on similar landscape positions as Wet Saline sites and collect runoff moisture from surrounding side slopes and plains. Playa sites do not have the high salinity and sodicity that Wet Saline sites have. Midgrasses, shortgrasses, and forbs dominate these sites.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Baccharis salicina*
Herbaceous	(1) *Sporobolus airoides* (2) *Distichlis spicata*

Physiographic features

These nearly level soils are in broad shallow, relatively linear relict valleys and drainage ways, and associated saline basins. Slope ranges from 0 to 2 percent. Elevation is 2600 to 4300 feet. This site rarely floods for very brief periods of time but can frequently pond for long periods. The water table occurs at a depth of 0 to 80 inches during the fall through spring months during most years.

Landform: Broad, shallow, relatively linear relict valleys and drainage ways and linear to slightly concave benches of saline basins.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Valley flat (2) Plateau > Drainageway (3) Plateau > Pluvial lake (relict) (4) Plateau > Closed depression
Runoff class	Negligible
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to very rare
Ponding duration	Very brief (4 to 48 hours) to very long (more than 30 days)
Ponding frequency	Occasional to frequent
Elevation	2,600–4,300 ft

Slope	0–2%
Ponding depth	0–35 in
Water table depth	0–80 in
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Climate is semi-arid dry steppe. Summers are hot with winters being generally mild with numerous cold fronts that drop temperatures into the single digits for 24 to 48 hours. Temperature extremes are the rule rather than the exception. Humidity is generally low and evaporation high. Wind speeds are highest in the spring and are generally southwesterly. Canadian and Pacific cold fronts come through the region in fall, winter and spring with predictability and temperature changes can be rapid. Most of the precipitation comes in the form of rain and during the period from May through October. Snowfall averages around 15 inches but may be as little as 8 inches or as much as 36 inches. Rainfall in the growing season often comes as intense showers of relatively short duration. Long-term droughts occur on the average of once every 20 years and may last as long as five to six years (during these drought years moisture during the growing season is from 50 to 60 percent of the mean.) Based on long-term records, approximately 60 percent of years are below the mean rainfall and approximately 40 percent are above the mean. May, June and July are the main growth months for perennial warm-season grasses. Forbs make their growth somewhat earlier.

Table 3. Representative climatic features

Frost-free period (characteristic range)	165-189 days
Freeze-free period (characteristic range)	195-210 days
Precipitation total (characteristic range)	18-20 in
Frost-free period (actual range)	156-198 days
Freeze-free period (actual range)	182-213 days
Precipitation total (actual range)	18-21 in
Frost-free period (average)	180 days
Freeze-free period (average)	202 days
Precipitation total (average)	19 in

Climate stations used

- (1) LAMESA 1 SSE [USC00415013], Lamesa, TX
- (2) ARCH [USC00290525], Portales, NM
- (3) MULESHOE #1 [USC00416135], Muleshoe, TX
- (4) MORTON [USC00416074], Morton, TX
- (5) LEVELLAND [USC00415183], Levelland, TX
- (6) BROWNFIELD #2 [USC00411128], Brownfield, TX
- (7) TAHOKA [USC00418818], Tahoka, TX
- (8) BIG SPRING [USW00023041], Big Spring, TX
- (9) SEMINOLE [USC00418201], Seminole, TX

Influencing water features

This site receives runoff from surrounding areas. Ponding occurs as overflow from heavy rainfall events. A high water table is present on some of these sites for long periods of time after prolonged rainfall events.

Wetland description

Many of these sites have hydric soils and have predominantly hydrophytic vegetation. Hydric soils need and on-site investigation to confirm.

Soil features

The Wet Saline ecological site consists of very deep, very poorly to well drained, very slowly permeable to moderately rapidly permeable soils that formed in loamy eolian and alluvial sediments and valley fill of Holocene age and lacustrine sediments from the Blackwater Draw Formation and Tahoka Formation of Pleistocene age. Major Soil Taxonomic Units correlated to this site include: Cedarlake sandy clay loam, Grier clay loam, Hindman fine sand, Lenorah fine sandy loam, and Yellowlake silty clay loam.

Table 4. Representative soil features

Parent material	(1) Lacustrine deposits–limestone, sandstone, and shale
Surface texture	(1) Fine sand (2) Fine sandy loam (3) Sandy clay loam (4) Clay loam (5) Silty clay loam
Family particle size	(1) Coarse-loamy (2) Fine-loamy (3) Fine
Drainage class	Very poorly drained to well drained
Permeability class	Very slow to moderately rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3.2–5.9 in
Calcium carbonate equivalent (0-40in)	0–50%
Electrical conductivity (0-40in)	0–32 mmhos/cm
Sodium adsorption ratio (0-40in)	0–75
Soil reaction (1:1 water) (0-40in)	7.4–11
Subsurface fragment volume <=3" (0-40in)	0–12%
Subsurface fragment volume >3" (0-40in)	0%

Ecological dynamics

The soils, topographic location, climate, periodic droughts, declining water tables, and fire influenced the development of the Reference Plant Community for this site. The Midgrass/Shortgrass Community (1.1) is a combination of mid and shortgrasses with a few salt tolerant forbs and shrubs. Tallgrasses occur in isolated areas where the environment was more hospitable. Grasses make up approximately 80% of the total vegetation while forbs and shrubs make up approximately 20%. The dominant grass species are alkali sacaton (*Sporobolus airoides*) with lesser amounts of inland saltgrass (*Distichlis spicata*), creeping muhly (*Muhlenbergia repens*), whorled dropseed (*Sporobolus pyramidatus*), alkali muhly (*Muhlenbergia asperifolia*), and meadow dropseed (Sporobolus asper). The principal forbs are salt tolerant annuals. Principal shrubs include four-wing saltbush (*Atriplex canescens*) and willow baccharis (*Baccharis salicina*). No trees are present on the site.

While natural fire and periodic grazing by large herbivores influenced vegetative composition to some degree, the principal environmental factors driving the reference vegetation are salinity and the presence of a high water table.

This site was not highly preferred by herbivores due to the high salt content in the vegetation. Grazing did occur periodically, especially when animals needed salt in their diet, and could obtain salt from grazing the vegetation. Natural fire did help to promote a grassland aspect and kept shrubs controlled. In pre-settlement times, this site occupied a relatively small portion of the landscape along draws and around ancient lacustrine salt lakes where salt water was near the surface. The presence of salty playas was noted by early day explorers. This site could be found most often along the ancient drainages that run from northwest to southeast across the southern high plains and around the associated salty playas. The soils were formed in old alluvium and lacustrine sediments. The site occurs over salt domes where salt water is near the surface. This ecological site in reference conditions has some variability in vegetation due to the degree of salinity and depth to water. In spots where the soils were highly saline, no vegetation would be present and the percent bare ground on this site could be as high as 40 to 50 percent.

In more recent times the spread of salty areas has greatly increased over the southern high plains. Salty “seeps” have outcropped along the old draws and in many cases even in areas that originally were neither saturated nor saline. There are some differing opinions as to the cause of the increase of wet saline areas. One possible cause for the increase may be the removal of much of the fresh water that occurred in the upper Ogallala formation allowing salt water below to make its way to the surface. Many of the acres now referred to as “wet saline” acres were cropped for many years and have been abandoned. Many were placed in the CRP program in the mid 1980’s. After cropping ceased, the water table under these areas rose and salt could be seen precipitating out of the soil surface; a byproduct of evaporation. These areas grew in size every year for at least 2 or 3 decades. As vegetation began to appear on land abandoned from cropping, salt cedar (*Tamarix ramosissima*), an exotic woody species, began to appear and has increased greatly over much of these areas. Forbs such as kochia (*Bassia prostrata*), Russian thistle (*Salsola kali*), and other salt tolerant introduced annual forbs have appeared as the first plants to occupy the site along with a few perennial grasses. It can be argued that these relatively recent saline areas have been caused by the influence of man’s activities, including depletion of the Ogallala and a change in farming practices.

Because of the rather recent appearance of this unique situation, it has been necessary to re-map soils on many of these areas. Soils that occurred sixty years ago have changed in chemistry and hydrology to the point that the old soil series have had to be re-named. Some series are hydric in nature with saturation to the surface common for at least part of the year. Many of these soils were previously categorized as upland sandy loams and clay loams.

The attempt to describe the reference community for a wet saline site must be done by looking at areas where it is reasonably certain that the vegetative community is not some recent development. Many of the sites determined to be wet saline today certainly do not resemble what was present on natural wet saline areas in pre-settlement days and probably never will. These recently formed wet saline areas, however, need to be addressed as many of them now support at least some native vegetation. It must be noted that the vegetative states described and present on these sites today may not be stable and may change over time.

In cases where domestic livestock are continually forced to overgraze the unpalatable vegetation on this site along with no fire, ecological retrogression can occur. As retrogression proceeds, this site will move towards a Shrub/Shortgrass/Annuals Community (2.1). Alkali sacaton and dropseed species will be replaced with inland saltgrass, Muhlenbergia species and annuals. Willow baccharis will increase along with an invasion of salt cedar. In this phase, ecological processes have changed somewhat, but the pathway back toward the reference community can be initiated through prescribed grazing, prescribed burning and brush management.

Continued overgrazing, along with periodic droughts, water table decline, and increased salinity, causes the site to move towards a Shrub Dominant Community (3.1). Salt cedar increases on the site to the point of domination with very little understory plants present. The percent bare ground may be even less than reference with salt cedar plants filling the voids. This phase of retrogression has low forage production potential and the ecological processes are not functioning very well. Poor hydrological conditions prevail. A major threshold has been crossed when the plant community is so degraded that it cannot reverse retrogression without extensive energy and management inputs. Restoration of the Shrub Dominant Community (3.1) requires extensive brush management, re-seeding, and prescribed grazing. Soil amendments and cultivation may be necessary under severe conditions.

NOTE: Rangeland Health Reference Worksheets have been posted for this site on the Texas NRCS website (www.tx.nrcs.usda.gov) in Section II of the eFOTG under (F) Ecological Site Descriptions.

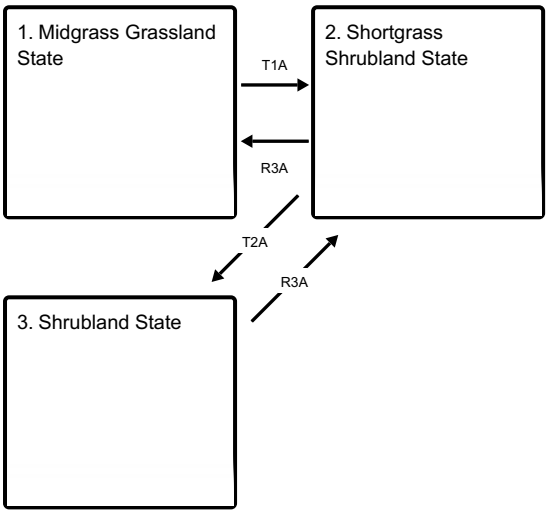
PLANT COMMUNITIES AND TRANSITIONAL PATHWAYS (DIAGRAM)

The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances; it does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

Changes in the structure and composition of the plant community may be due to management and/or natural occurrences. At some point thresholds are crossed as indicated by the lined box on the State and Transition Diagram. This suggests that once changes have progressed to a certain point, the plant community has been altered to the extent that a return to the former state is not possible unless some form of energy is applied. These changes take place on all ecological sites. Some sites support communities that are more resistant to change than others. Also, some sites are more resilient and can heal or restore themselves more easily. Usually, changes in management practices alone, such as grazing techniques, will not be sufficient to restore former plant communities. An example of energy input might be the implementation of chemical brush management to decrease the amount of woody/cacti shrubs and increase the amount of grasses and forbs. This shift in community balance could not be brought about with grazing alone. The amount of energy required to bring about a change in plant community balance may vary a great deal depending on the present state and the desired result.

State and transition model

Ecosystem states



T1A - Absence of disturbance, introduction of non-native species, and natural regeneration over time, may be coupled with excessive grazing pressure

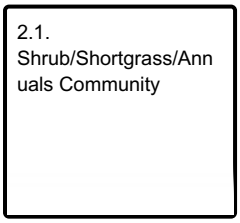
R3A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

T2A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

R3A - Adequate rest from defoliation and removal of woody canopy/non-native species

State 1 submodel, plant communities

State 2 submodel, plant communities



State 3 submodel, plant communities

3.1. Shrub Dominant Community

State 1
Midgrass Grassland State

The soils, topographic location, climate, periodic droughts, declining water tables, and fire influenced the Reference Plant Community for this site. The Midgrass/Shortgrass Community (1.1) is a combination of mid and shortgrasses with a few salt tolerant forbs and shrubs. Tallgrasses occur in isolated areas where the environment was more hospitable. Grasses make up approximately 80 percent of the total vegetation while forbs and shrubs make up approximately 20 percent. The dominant grass species are alkali sacaton with lesser amounts of inland saltgrass, creeping muhly, whorled dropseed, alkali muhly, and meadow dropseed. The principal forbs are salt tolerant annuals. Principal shrubs included four-wing saltbush and willow baccharis. No trees are present on the site. Bare ground occurs on 40-50% of the surface area with visible salt particles on the soil surface.

Dominant plant species

- alkali sacaton (*Sporobolus airoides*), grass
- saltgrass (*Distichlis spicata*), grass

Community 1.1
Midgrass/Shortgrass Community

Figure 8. 1.1 Midgrass/Shortgrass Community

The reference plant community is a combination of mid and shortgrasses with a few salt tolerant forbs and shrubs. Tall grasses occur in isolated places where the environment is more hospitable. Grasses make up approximately 80 percent of the total vegetation while forbs and shrubs make up approximately 20 percent. The dominant grass species is alkali sacaton with lesser amounts of inland saltgrass, creeping muhly, whorled dropseed, scratchgrass muhly, and meadow dropseed. The principal forbs are salt tolerant annuals. Principal shrubs include four-wing saltbush and willow baccharis. Forty to fifty percent bare ground was present where saline conditions were high. Most energy and nutrient cycling was contained in the narrow grass/soil interface where evapo-transpiration was minimal.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1000	1200	1400
Shrub/Vine	80	100	120
Forb	60	80	100
Microbiotic Crusts	0	0	1
Tree	0	0	0
Total	**1140**	**1380**	**1621**

Figure 10. Plant community growth curve (percent production by month). TX1023, Midgrass Dominant Community. Growth is predominantly mid and shortgrasses from April through October with a peak growth occurring from May through July..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	5	20	25	17	8	15	4	1	1

State 2
Shortgrass Shrubland State

Inland saltgrass, muhly species and annuals are replacing the alkali sacaton. There are increasing amounts of woody species such as willow baccharis and salt cedar present in this community. Bare areas are white due to salt particles percolating to the surface.

Dominant plant species

- willow baccharis (*Baccharis salicina*), shrub
- saltgrass (*Distichlis spicata*), grass
- creeping muhly (*Muhlenbergia repens*), grass

Community 2.1
Shrub/Shortgrass/Annuals Community

Figure 11. 2.1 Shrub/Shortgrass/Annuals Community

This plant community represents the first phase in the transition of the Midgrass/Shortgrass Community (1.1) towards the Shrub Dominant Community (3.1). Alkali sacaton will decrease as inland saltgrass, muhlenbergia and dropseed species increase. There will be a dramatic increase in willow baccharis and an invasion of salt cedar. The woody shrub component may represent 40 to 50 percent or more of the total vegetation. In areas with declining water tables, herbaceous production will decrease with increases in soil salinity. Once the invasion of salt cedar starts a threshold has been crossed. Returning to reference condition will require brush management along with prescribed grazing. Prescribed burning may be difficult with the reduced vegetative fuel and poor continuity.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	800	900	1000
Shrub/Vine	150	200	250
Forb	100	110	120
Microbiotic Crusts	0	0	1
Tree	0	0	0
Total	**1050**	**1210**	**1371**

Figure 13. Plant community growth curve (percent production by month). TX1042, Shrub/Shortgrass Community. Growth is predominantly shrubs and shortgrasses from April through October with peak growth from May through July..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	8	16	25	5	5	10	16	8	3

State 3
Shrubland State

Salt cedar dominant (>75% canopy) with low quality grasses and annuals filling in the voids where the salt cedar canopy is open. No plants in the understory of the salt cedar.

Dominant plant species

- saltcedar (*Tamarix ramosissima*), shrub

Community 3.1
Shrub Dominant Community

Figure 14. 3.1 Shrub Dominant Community

Salt cedar increases on the site to the point of domination (>75% canopy) with very few understory plants present. The percent bare ground may be even less than the reference community with salt cedar plants filling the voids. Scattered low quality grasses and annuals occur in areas where the salt cedar canopy opens up. Soil salinity continues to increase. This phase of retrogression has low forage production potential and the ecological processes are not functioning very well. Poor hydrological conditions prevail. Major energy inputs are necessary to restore the site to near reference conditions. These include brush management, soil amendments, range seeding, and prescribed grazing. Other factors such as the changing water table may prevent the site from improving regardless of management.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	500	650	800
Grass/Grasslike	200	300	400
Forb	140	150	160
Microbiotic Crusts	0	0	1
Tree	0	0	0
Total	**840**	**1100**	**1361**

Figure 16. Plant community growth curve (percent production by month). TX1043, Shrub Dominant Community. Growth is predominantly shrubs from March through October with peak growth March through June.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	5	18	23	16	5	5	8	15	3	0

Transition T1A
State 1 to 2

In cases where domestic livestock are continually forced to overgraze the unpalatable vegetation on this site along with no fire regime and no brush management practices, ecological retrogression can occur. As retrogression proceeds, this site will move towards a Shrub/Shortgrass/Annuals Community (2.1) from the Midgrass/Shortgrass Community.

Restoration pathway R3A
State 2 to 1

With Prescribed Grazing, Brush Management, and Prescribed Burning conservation practices, the Shrub/Shortgrass/Annuals Community can be able to be restored to the Midgrass/Shortgrass Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Transition T2A
State 2 to 3

With Heavy Continuous Grazing, No Fire, Brush Invasion, No Brush Management, Infrequent Flooding (five to twenty year intervals), and water table decline, the Shrub/Shortgrass/Annuals Community will be shifted to the Shrub Dominant Community.

Restoration pathway R3A
State 3 to 2

Restoration of the Shrub Dominant Community (3.1) to the Shrub/Shortgrass/Annuals Community (2.1) requires extensive brush management, re-seeding, and prescribed grazing. Soil amendments and cultivation may be necessary under severe conditions.

Conservation practices

Brush Management
Prescribed Burning

Prescribed Grazing
Range Planting

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Midgrass**			700–980	
	alkali sacaton	SPAI	*Sporobolus airoides*	700–980	–
2	**Shortgrasses**			200–280	
	saltgrass	DISP	*Distichlis spicata*	100–250	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	100–250	–
	creeping muhly	MURE	*Muhlenbergia repens*	100–250	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	100–250	–
	Madagascar dropseed	SPPY2	*Sporobolus pyramidatus*	50–100	–
3	**Tallgrass**			10–15	
	switchgrass	PAVI2	*Panicum virgatum*	10–15	–
4	**Shortgrasses**			90–125	
	windmill grass	CHLOR	*Chloris*	10–50	–
	squirreltail	ELEL5	*Elymus elymoides*	10–50	–
	threeawn	ARIST	*Aristida*	10–25	–
Forb					
5	**Forbs**			60–100	
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	20–40	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	20–40	–
	dotted blazing star	LIPU	*Liatris punctata*	20–40	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	20–40	–
	stiff greenthread	THFI	*Thelesperma filifolium*	20–40	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	20–40	–
	rose heath	CHER2	*Chaetopappa ericoides*	20–40	–
	golden prairie clover	DAAU	*Dalea aurea*	20–40	–
	buckwheat	ERIOG	*Eriogonum*	0–20	–
	Forb, annual	2FA	*Forb, annual*	0–20	–
Shrub/Vine					
6	**Shrubs**			80–120	
	fourwing saltbush	ATCA2	*Atriplex canescens*	50–120	–
	willow baccharis	BASA	*Baccharis salicina*	50–100	–

Animal community

This site offers limited wildlife habitat. As conditions degrade the bare ground and decreasing grasses and forbs provide little forage value for wildlife. The increasing shrub cover can provide shelter for songbirds and cover for

wildlife.

Recreational uses

Hunting, Hiking, Bird watching, and Photography.

Wood products

None.

Other products

None.

Other information

None.

Inventory data references

NRCS FOTG – Section II of the FOTG Range Site Descriptions and numerous historical accounts of vegetative conditions at the time of
early settlement in the area were used in the development of this site description. Vegetative inventories were made at several site locations
for support documentation.
Inventory Data References (documents):
NRCS FOTG – Section II - Range Site Descriptions
NRCS Clipping Data summaries over a 20 year period

Other references

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The following individuals assisted with the development of this site description:
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Approval

Bryan Christensen, 9/11/2023

Acknowledgments

Site Development and Testing Plan

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

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.

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Date	09/04/2007
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slight to moderate.

2. **Presence of water flow patterns:** Slight to moderate.

3. **Number and height of erosional pedestals or terracettes:** Slight to moderate.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 30-40%.

5. **Number of gullies and erosion associated with gullies:** Slight.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Slight to moderate.

7. **Amount of litter movement (describe size and distance expected to travel):** Slight to moderate.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Moderate resistance to surface erosion with water flow.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Saline/Calcareous sandy clay loam soils with low SOM.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Basal cover and density with large interspaces make rainfall impact moderate. This site has very slowly permeable soils with very poorly drainage and available water holding capacity is moderate to low.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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: Warm-season midgrasses >

    Sub-dominant: Warm-season shortgrasses >

    Other: Cool-season grasses > Warm-season tallgrasses > Forbs > Shrubs/Vines

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Grasses due to their growth habit will exhibit some mortality and decadence, though minimal.

14. **Average percent litter cover (%) and depth (in):** Litter is dominantly herbaceous.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1,100 to 1,600 pounds per acre.

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:** Salt cedar, Baccharis, and Fourwing saltbush are potential invasive species for this site.

17. **Perennial plant reproductive capability:** All plant species should be capable of reproduction except during periods of prolonged drought conditions, heavy natural herbivory or intense wildfires.