USDA Natural Resources Conservation Service

Ecological site R042AB733TX
Loamy Bottomland, Hot Desert Shrub

Accessed: 05/09/2024

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.

Associated sites

R042AB735TX	**Gravelly, Hot Desert Shrub** This site is located on older terraces above the flood plain.
R042AB736TX	**Arroyo, Hot Desert Shrub** This site is correlated with drainageways that flow across the Loamy Bottomland site and into the Rio Grande. Soils are very gravelly.

Similar sites

R042BY267TX	**Loamy Bottomland, Desert Shrub** Soil temperature regime is thermic rather than hyperthermic and average annual precipitation is lower (8-10 inches). Located on Rio Grande Floodplain in El Paso and Hudspeth Counties.
R042AB735TX	**Gravelly, Hot Desert Shrub** The Draw site is located on flood plains and terraces of arroyos. This site, however, has very gravelly soils.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The site occurs on flood plains of the Rio Grande. Slopes range from 0 to 3 percent and potential runoff is low to medium. Brief flooding occurs occasionally.

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Occasional
Elevation	549–1,158 m
Slope	0–3%

Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 10 to 13 inches and highly variable from 2 to 21 inches. Most of the precipitation occurs as widely scattered thunderstorms of high intensity and short duration during the summer. Occasional precipitation occurs as light rainfall during the cool season. Negligible amounts of precipitation falls in the form of sleet or snow.

Mean annual air temperature is 70° F. Daytime temperatures exceeding 100° F are common from May through September. Frost free period ranges from 254 to 295 days.

The average relative humidity in mid-afternoon is about 25 percent. Relative humidity is higher at night, and the average at dawn is about 57 percent. The sun shines 81 percent of the time in summer and 75 percent in winter. The prevailing wind is from the southwest. Average wind speed is highest, around 11 miles per hour, in March and April.

The combination of low rainfall and relative humidity, warm temperatures, and high solar radiation creates a significant moisture deficit. The annual Class-A pan evaporation is approximately 94 inches.

Table 3. Representative climatic features

Frost-free period (average)	295 days
Freeze-free period (average)	334 days
Precipitation total (average)	330 mm

Influencing water features

Soil features

The site consists of very deep, moderately to well drained, calcareous, and slow to rapidly permeable soils. These soils formed in young (Holocene) Quaternary aged loamy/clayey alluvium from igneous and sedimentary rock. Soils are non-gravelly. Subsurface fragments to a depth of 40 inches range from 0-5 percent by volume. Soil temperature regime is hyperthermic (mean annual soil temperature to depth of 20 inches is greater than 72º Fahrenheit). Representative soils include: Castolon, Galindo, Lomapelona, and Vicente.

Table 4. Representative soil features

Surface texture	(1) Silty clay loam (2) Silt loam (3) Fine sandy loam
Drainage class	Moderately well drained to well drained
Permeability class	Slow to rapid
Soil depth	203 cm
Available water capacity (0-101.6cm)	5.08–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	1–3%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5

Soil reaction (1:1 water) (0-101.6cm)	7.8–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–4%

Ecological dynamics

The Historic Climax Plant Community (HCPC) on the Loamy Bottomland (Hot Desert Shrub) was most likely a shifting mosaic that was savannah-like in appearance with cottonwoods, mesquite, willows and shrubs with an understory of mid to tallgrasses. Grasses and grasslikes made up about 60-70% of the plant composition by weight, while woody plants and forbs ranged from 10-15% and 5-10%, respectively. The dynamic nature of the Rio Grande was the most significant factor influencing plant communities at any one location. With the amount of available fine fuels, fire may have played a role in suppressing woody plant seedlings, but its frequency is unknown.

Extended dry weather also influences the vegetation. High rainfall events did occur but were episodic. Insects and grazers such as rodents, deer, and infrequent fire certainly played a part. Bison were not documented in the historical record as being present in any significant amount in the region. A lack of water was probably a contributing factor.

The perennial grasses on the site could survive the periodic droughts as long as the density of woody plants did not become excessive, and top-removal of the grass plants did not occur too frequently. Any over grazing amplifies the effects of drought. The natural flooding and shallow water would insure survival historically.

Early records suggest cattle, sheep, and horses were introduced into the southwest from Mexico in the mid-1500's. However, extensive ranching began in the Trans-Pecos region in the 1880s. Early explorers described the lushness of vegetation in parts of the Trans-Pecos. Captain John Pope in 1854 described the Trans-Pecos area as "… destitute of wood and water, except at particular points, but covered with a luxuriant growth of the richest and most nutritious grasses known to this continent…". Other early travelers describe the springs and water sources that were found in the region. Wagon travel could be accomplished, under favorable conditions, with overnight stops having both water and forage. Livestock numbers peaked in the late 1880's following the arrival of railroads. Historical accounts document ranches with stocking rates as high as one animal unit per four acres.

Decades of overgrazing with loss of vegetation and erosion make it a slow process to return to the HCPC community. In 1944 the southernmost portion of the Trans-Pecos area was set aside as Big Bend National Park. Grazing activities with cattle ceased. In 1944, most of the Loamy Bottomland Hot Desert Shrub sites were probably degraded and dominated by woody shrubs. After 60 years of no grazing in the hyperthermic zone, the majority of sites have not recovered to the historic plant community which provides insight into the length of time it takes for recovery in this environment.

The large livestock herds brought in during the favorable years, mainly sheep, could not be sustained during the drought. Overgrazing became a major issue as the extended dry weather was a harsh taskmaster to the early stock growers.

The streams and rivers provided the main source of water for the early livestock industry. Therefore, improper grazing management which included high stocking rates as well as uncontrolled access, also contributed to vegetation change. Consequently, across the entire range of the ecological site, the original open Savannah (State 1) has crossed a compositional and functional threshold and is now in irreversible Woodland (State 2). These woody plants have caused the site to become drier and less diverse.

Cultivated cropland and pastureland is a common land use within the site and is represented in the Converted Land State (3).

It should be noted that abusive grazing by different kinds and classes of livestock will result in different impacts on the site. One effect of the removal of vegetated cover was to expose bare ground to erosion. Another effect was the deterioration of perennial grasses which removed the source of fine fuel to sustain periodic fires. More than likely, fires were not very frequent and when they did occur, the burn pattern was a mosaic governed by terrain and vegetative features.

A combination of human caused disturbances beginning in the late 1800s has drastically and permanently altered the hydrology and vegetation dynamics within the site. Dams, levees, tributary diversions, and irrigation channels built during the 20th century have altered the historic hydrology. These alterations reduced the natural scouring action of the floods, especially on the sandbars. This resulted in an increase of woody vegetation. Sediment and subsequent nutrient loading was no longer entrapped in the vegetation along the banks. The introduction of nonnative plants such as Bermuda grass (*Cynodon dactylon*), buffelgrass (*Pennisetum ciliare*), giant reed (*Arundo donax*), and saltcedar (Tamarix spp.) infused a seed or vegetative source that has now established in many places and displaced many native plants. This has further changed the hydrology of the site.

The State and Transition Diagram which follows provides information on some of the most typical pathways that the vegetation on this site can follow as the result of natural events, management inputs, and application of conservation treatments. There may be other plant communities that can exist on this site under certain conditions. Consultation with local experts and professionals is recommended prior to application of practices or management strategies in order to ensure that specific objectives will be met.

State and transition model

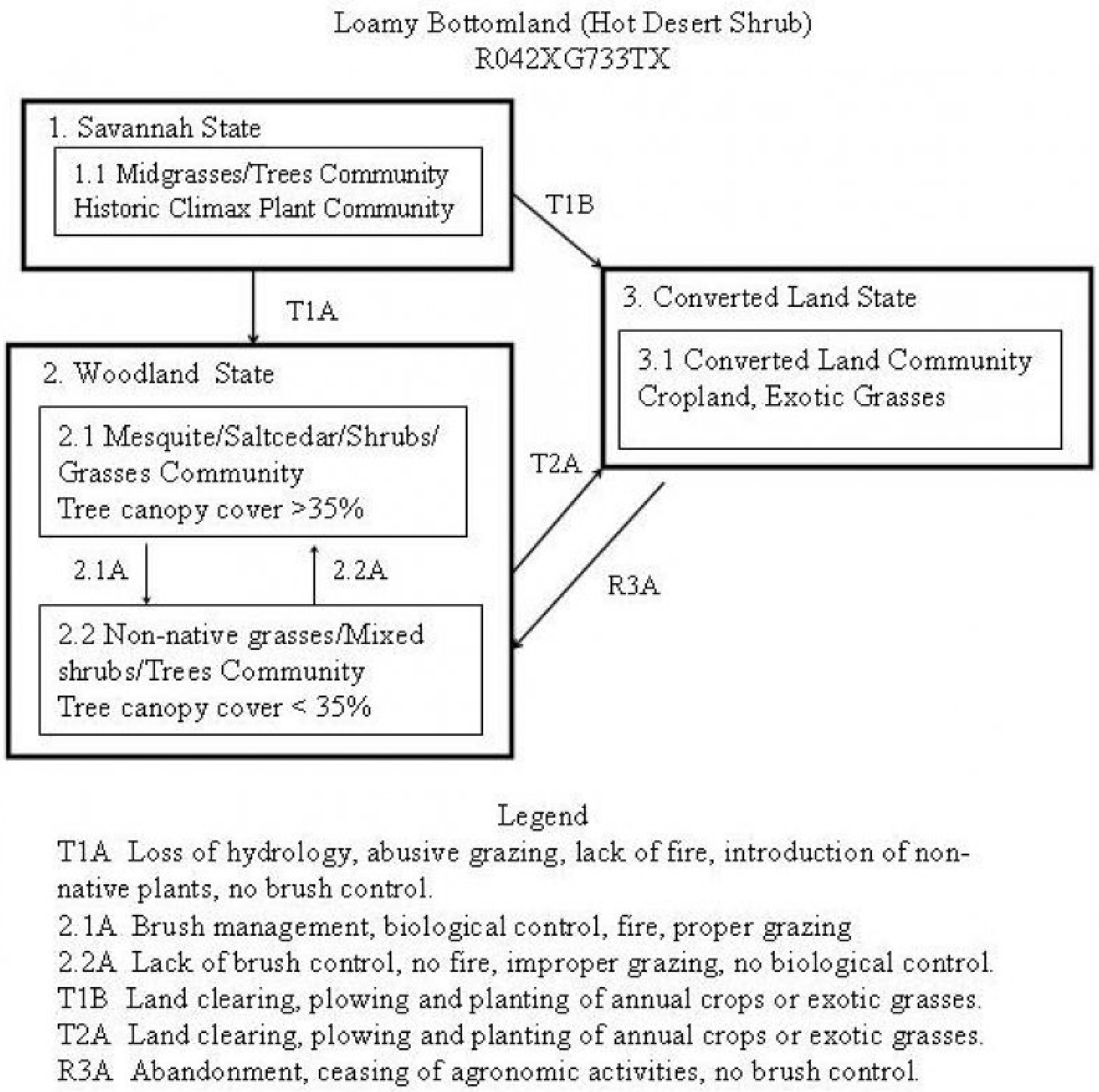

Figure 4. Loamy Bottomland (Hot Desert Shrub) State & Transi

State 1
Savannah State

Community 1.1
Midgrasses/Trees Community

This is the reference community. Based on relic plants, current data, and local knowledge of soil and vegetation dynamics, the Midgrasses/Trees Community (1.1) is the plant community that most likely existed prior to settlement. There were however records of scattered cottonwood trees, especially close to the river. The Plant Species Composition Table provides a detailed estimate of the presumed historic vegetation. The plant community was a continual shifting mosaic based on water flow, flood pulse, and sediment deposition based on the dynamic nature of the Rio Grande. Fire also helped to suppress seedlings of woody plants and keep resprouting woody species at low stature although fires were probably infrequent. Grasses were favored over the shrubs in a fire regime. This site provided optimal habitat for native wildlife. The lack of historic flooding and lack of fire has contributed to the change in the HCPC to a more woody dominate community. The appearance of non-native woody plants, such as saltcedar, signals this plant community approaching a threshold to the Woodland State (2). Once the threshold has been crossed, a return to the HCPC site is unrealistic even though certain species can be managed with applied treatments.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1121	1485	1849
Shrub/Vine	336	420	504
Tree	168	252	336
Forb	56	84	112
Total	**1681**	**2241**	**2801**

Figure 6. Plant community growth curve (percent production by month). TX0019, Grassland/Shrub/Tree. Majority of production is from warm season grasses and deciduous shrubs/trees during late summer to early fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	2	2	2	8	8	20	25	15	15	1

State 2
Woodland State

Community 2.1
Mesquite/Saltcedar/Shrubs/Grasses Community

Figure 7. 2.1 Mesquite/Saltcedar/Shrubs/Grasses Community

Changes in hydrology, improper grazing, lack of fire, a seed/vegetative source of non-native plants and timber harvest are the major drivers that transition this plant community from the Savannah State (1). This plant community is the prevalent and stable plant community across the range of the ecological site. Mesquite and saltcedar dominate the woody species with canopies exceeding 35%. Saltcedar is adapted to an environment with wet soil during the growing season but without scouring floods. A wide variety of shrubs dominate the secondary layer. Bermudagrass, buffelgrass, and giant reed (along the river) dominate the herbaceous layer. Relic native grasses such as sacaton, switchgrass, and cane bluestem can be observed occasionally. The endemic wildlife has changed along with the change in vegetation composition and structure. Species that preferred open savannah plant communities have been replaced with those that prefer the woodland plant community. Once the threshold from the Savannah State (1) had been crossed to the Woodland State (2), a return to the HCPC is difficult if not impossible. Treatment options are available to manage saltcedar include biological (beetle introduction), herbicide application, and prescribed fire. Herbicides and fires can also help suppress other woody plants. The nonnative grasses are the most difficult to control. Buffelgrass is a prolific seeder and readily establishes from seed. Buffelgrass also alters fire regimes (by increasing fire frequency) which can further promote its spread.

Bermudagrass is also very challenging because of its ability to produce aggressive stolons. Although poor for wildlife, buffelgrass and bermudagrass provide very good forage for livestock. Selective brush management, which can include Individual Plant Treatment of species specific herbicides or mechanical removal, achieves a degree of recovery although probably never to the HCPC. Brush control treatments can transition the mesquite/saltcedar/shrubs/grasses (2.1) to the non-native grasses/shrub/tree community (2.2). However continued integrated treatments will be needed to maintain the 2.2 community or it will return back to Community 2.1. Abandonment of cultivated crop or pastureland (Converted Land State 3) will eventually transition to this plant community as well.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	1121	1961	2802
Grass/Grasslike	224	392	616
Shrub/Vine	168	252	336
Forb	22	39	56
Total	**1535**	**2644**	**3810**

Figure 9. Plant community growth curve (percent production by month). TX0019, Grassland/Shrub/Tree. Majority of production is from warm season grasses and deciduous shrubs/trees during late summer to early fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	2	2	2	8	8	20	25	15	15	1

Community 2.2
Non-native Grasses/Mixed Shrubs/Trees Community

Figure 10. Non-native Grasses/Mixed Shrubs/Trees Community

This site transitions from Mesquite/Saltcedar/Shrubs/grasses (2.1) following either brush control treatment or prescribed fire. Following brush control, non-native grasses will dominate with some native grasses. Mesquite and saltcedar will eventually reestablish without continued treatments regardless of any grazing activity. Fire will initially clear most of the herbaceous layer and suppress many woody plants. However, saltcedar and mesquite resprout following fire. In addition, if buffelgrass is present, fire has been known to accentuate the spread of the grass. Generally, this community can be maintained by integrating treatments such as biological control, selective brush management, some mechanical removal, and fire. On sites where livestock are grazed, some deferment is needed as well as proper utilization heights to favor the herbaceous plants at the expense of the woodies. This will also preserve the fuel needed for fire.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	336	729	1121
Tree	112	224	336
Shrub/Vine	112	168	224
Forb	–	–	–
Total	**560**	**1121**	**1681**

Figure 12. Plant community growth curve (percent production by month). TX0019, Grassland/Shrub/Tree. Majority of production is from warm season grasses and deciduous shrubs/trees during late summer to early fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	2	2	2	8	8	20	25	15	15	1

Pathway 2.1A
Community 2.1 to 2.2

Mesquite/Saltcedar/Shrubs/Grasses Community

Non-native Grasses/Mixed Shrubs/Trees Community

Brush Management, Biological Control and Proper Grazing will lead to non-native grasses/mixed-shrubs/trees community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Pathway 2.2A
Community 2.2 to 2.1

Non-native Grasses/Mixed Shrubs/Trees Community

Mesquite/Saltcedar/Shrubs/Grasses Community

Lack of brush control, no fires, improper grazing and no biological control would lead to Mesquite/Salt cedar/Shrubs/Grasses Community.

State 3
Converted Land State

Community 3.1
Converted Land Community

Figure 13. 3.1 Converted Land Community

The Cropland/exotic grasses state is created when land clearing and plowing is done. Cultivated cropland and pastureland is a common land use practice within the site. Common forage crops include alfalfa, sorghum, and bermudagrass. Once more common in the past, vegetable crops include onions, cantaloupe, and squash were grown. Abandoned crop and pastureland will slowly transition back to the Woodland State (2) if abandon or neglected.

Transition T1A
State 1 to 2

Loss of hydrology, abusive grazing, lack of fire, introduction of non-native plants and no brush control has led to the transition of the Woodland State.

Transition T1B
State 1 to 3

Land clearing, plowing, and planting of annual crops or exotic grasses has led to the conversion of the Converted Land State.

Transition T2A
State 2 to 3

Land clearing, plowing, and planting of annual crops and/or exotic grasses.

Restoration pathway R3A
State 3 to 2

Abandonment, Ceasing of Agronomic Activities and no brush control can revert back to the Woodland State.

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	**Warm season, mid/tall bunchgrass, perennial**			807–1233	
	big sacaton	SPWR2	*Sporobolus wrightii*	560–1009	–
	alkali sacaton	SPAI	*Sporobolus airoides*	336–560	–
2	**Warm season, mid, bunchgrass, perennial**			90–168	
	switchgrass	PAVI2	*Panicum virgatum*	112–280	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	84–168	–

	sideoats grama	BOCU	*Bouteloua curtipendula*	[illegible]	
	silver bluestem	BOSA	*Bothriochloa saccharoides*	56–140	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	56–140	–
	false Rhodes grass	TRCR9	*Trichloris crinita*	56–140	–
	white tridens	TRAL2	*Tridens albescens*	28–112	–
3	**Warm season, mid, bunchgrass, perennial**			90–168	
	blue grama	BOGR2	*Bouteloua gracilis*	56–168	–
	pink pappusgrass	PABI2	*Pappophorum bicolor*	28–140	–
	threeawn	ARIST	*Aristida*	56–140	–
	whiplash pappusgrass	PAVA2	*Pappophorum vaginatum*	28–112	–
	Arizona cottontop	DICA8	*Digitaria californica*	28–112	–
	streambed bristlegrass	SELE6	*Setaria leucopila*	28–84	–
4	**Warm season, tall, bunchgrass, perennial**			78–157	
	common reed	PHAU7	*Phragmites australis*	78–157	–
5	**Warm season, short, stoliniferous, perennial**			34–67	
	vine mesquite	PAOB	*Panicum obtusum*	28–56	–
	hairyseed paspalum	PAPU5	*Paspalum pubiflorum*	6–45	–
6	**Grasslike**			6–56	
	sedge	CAREX	*Carex*	6–56	–
Shrub/Vine					
7	**Shrubs**			258–460	
	fourwing saltbush	ATCA2	*Atriplex canescens*	28–168	–
	big saltbush	ATLE	*Atriplex lentiformis*	28–112	–
	baccharis	BACCH	*Baccharis*	28–112	–
	catclaw acacia	ACGR	*Acacia greggii*	28–112	–
	whitebrush	ALGR2	*Aloysia gratissima*	28–112	–
	Apache plume	FAPA	*Fallugia paradoxa*	28–112	–
	American tarwort	FLCE	*Flourensia cernua*	28–112	–
	singlewhorl burrobrush	HYMO	*Hymenoclea monogyra*	28–112	–
	Torrey wolfberry	LYTO	*Lycium torreyi*	28–112	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	28–112	–
	Texas lignum-vitae	GUAN	*Guaiacum angustifolium*	28–84	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	28–84	–
	whitethorn acacia	ACCO2	*Acacia constricta*	28–84	–
8	**Succulent**			22–45	
	yucca	YUCCA	*Yucca*	22–45	–
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	11–34	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	11–34	–
	pricklypear	OPUNT	*Opuntia*	11–34	–
Tree					
9	**Deciduous-perennial**			168–336	
	Rio Grande cottonwood	PODEW	*Populus deltoides ssp. wislizeni*	56–224	–
	Fremont cottonwood	POFRM	*Populus fremontii ssp. mesetae*	56–224	–

	western honey mesquite	PRGLT	*Prosopis glandulosa var. torreyana*	28–168	–
	screwbean mesquite	PRPU	*Prosopis pubescens*	28–112	–
	willow	SALIX	*Salix*	28–112	–
Forb					
10	**Perennial**			45–90	
	trailing windmills	ALIN	*Allionia incarnata*	6–28	–
	yerba mansa	ANCA10	*Anemopsis californica*	6–28	–
	spiny chloracantha	CHSP11	*Chloracantha spinosa*	6–28	–
	croton	CROTO	*Croton*	6–28	–
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	6–28	–
	morning-glory	IPOMO	*Ipomoea*	6–28	–
	pepperweed	LEPID	*Lepidium*	0–28	–
	alkali mallow	MALE3	*Malvella leprosa*	0–28	–
	groundcherry	PHYSA	*Physalis*	6–28	–
	goldenrod	SOLID	*Solidago*	6–28	–
	globemallow	SPHAE	*Sphaeralcea*	0–28	–
11	**Annnual**			11–22	
	Forb, annual	2FA	*Forb, annual*	11–22	–

Animal community

The site is suitable for properly managed (appropriate stocking rates) livestock grazing. The Woodland State (2) can provide some adequate grazing however woody plant canopy cover is high in some areas to limit grass production. Areas with sufficient buffelgrass and Bermudagrass can provide adequate grazing as long as they are properly managed. Flexibility of stocking rate is critical due to the episodic nature of the weather, especially on non-irrigated pastureland.

The site is important for wildlife mostly because of the accessibility to water and the habitat structure. Historically, beavers existed along the Rio Grande. Changes in river level fluctuation and vegetation led to the decline of beavers. Other wildlife reported to have declined were rodents such as Ord’s kangaroo rat. Birds such as the woodpecker and flycatcher guild declined with the development of dense mesquite-saltcedar woodlands. However, white-winged doves, among other birds, heavily use the mesquite-saltcedar woodlands. Currently, mule deer utilize the site as well as small mammals such as raccoons, badgers, coyotes, javelinas, and bobcats.

Plant Preference by Animal Kind:

This rating system provides general guidance as to animal preference for plant species. Grazing preference changes from time to time, especially between seasons, and between animal kinds and classes. It also changes depending upon the grazing experience of the animals. Grazing preference does not necessarily reflect the ecological status of the plant within the plant community.

Preferred (P) – Percentage of plant in animal diet is greater than it occurs on the land.
Desirable (D) – Percentage of plant in animal diet is similar to the percentage composition on the land.
Undesirable (U) – Percentage of plant in animal diet is less than it occurs on the land.
Not Consumed (N) – Plant would not be eaten under normal conditions; only consumed when other forages are not available.
Used, but Degree of Utilization Unknown (X) – Percentage of plant in animal diet is unknown.
Toxic (T) – Rare occurrence in diet and, if consumed in any tangible amounts, results in death or severe illness in the grazing animal.

Hydrological functions

Hydrology is an important ecosystem function within the site. The Historic Climax Plant Community reflected the regular natural flood pulses of the Rio Grande. The plant cover dissipates the energy of any flooding and traps sediment. The creation of dams, levees, and water diversions altered the flooding magnitude and frequency. This can not only lead to changes in vegetation, but also changes in the replenishment of soil fertility.

Areas lacking sufficient vegetative cover such as abandoned crop and pastureland, overgrazed land, and mechanically cleared areas, can be susceptible to soil erosion from flooding and the high intensity thunderstorms.

Recreational uses

With the lessened probability of major flooding, the site is suitable for campgrounds, picnic areas, and golf courses.

Wood products

Mesquite trees are used for fence posts, firewood, and furniture.

Other products

None.

Other information

None.

Inventory data references

Information presented here has been derived from the revised Loamy Bottomland range site description, literature, NRCS clipping and cover data, NRCS soil data, USDA-ARS vegetation data, field observations and personal contacts with range-trained personnel.

Other references

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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	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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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:**