Ecological site R042BB028NM
Salt Meadow, Desert Shrub

Accessed: 05/10/2024

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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The topography is level to gently sloping with slopes up to 3 percent. The average slope is 1 percent or less. Elevations range from about 3,800 feet to 4,300 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Basin floor (2) Playa (3) Flood plain
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Rare to occasional
Elevation	1,158–1,311 m
Slope	0–3%
Water table depth	61–91 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual average precipitation ranges from 7.35 to 11.90 inches. Wide fluctuations from year to year are common, ranging from a low of about 2 inches to a high of over 20 inches. At least one-half of the annual precipitation comes in the form of rainfall during July, August, and September. Precipitation in the form of snow or sleet averages less than 4 inches annually. The average annual air temperature is about 60 degree F. Summer maximums can exceed 100 degrees F. and winter minimums can go below zero. The average frost-free season exceeds 200 days and extends from April 1 to November 1. Both the temperature regime and rainfall distribution favor warm-season perennial plants on this site. Spring moisture conditions are only occasionally adequate to cause significant growth during this period of year. High winds from the west and southwest are common from March to June, which further tends to create poor soil moisture conditions in the springtime.

Climate data was obtained from
http://www.wrcc.dri.edu/summary/climsmnm.html

Table 3. Representative climatic features

Frost-free period (average)	205 days
Freeze-free period (average)	227 days
Precipitation total (average)	305 mm

Influencing water features

This site is primarily found in the floodplains of the Rio Grande and Pecos rivers. Water tables are generally shallow but fluctuate within reach of deep rooted plants, and in most places are high enough that salts accumulate on the surface of the soil. The general aspect of this site is that of a wet, grassy meadow. This site is characterized by plants tolerant to saline or alkaline and to wet soil conditions.

Soil features

The soils of this site are alluvial. They have surface and sub-soil textures that generally are fine to moderately coarse-textured and are primarily found in the floodplains of the Rio Grande and Pecos. Water tables are generally shallow but fluctuate within reach of deep rooted plants, and in most places are high enough that salts accumulate on the surface of the soil.

Runoff ranges fro low to high.

minimum and maximum values listed below represent the characteristic soils for this site.

Characteristic soils:

Table 4. Representative soil features

Surface texture	(1) Coarse sand (2) Silt (3) Clay
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to poorly drained
Permeability class	Moderately slow to very slow
Soil depth	10–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62–12.7 cm
Electrical conductivity (0-101.6cm)	4–16 mmhos/cm
Soil reaction (1:1 water) (0-101.6cm)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	9%

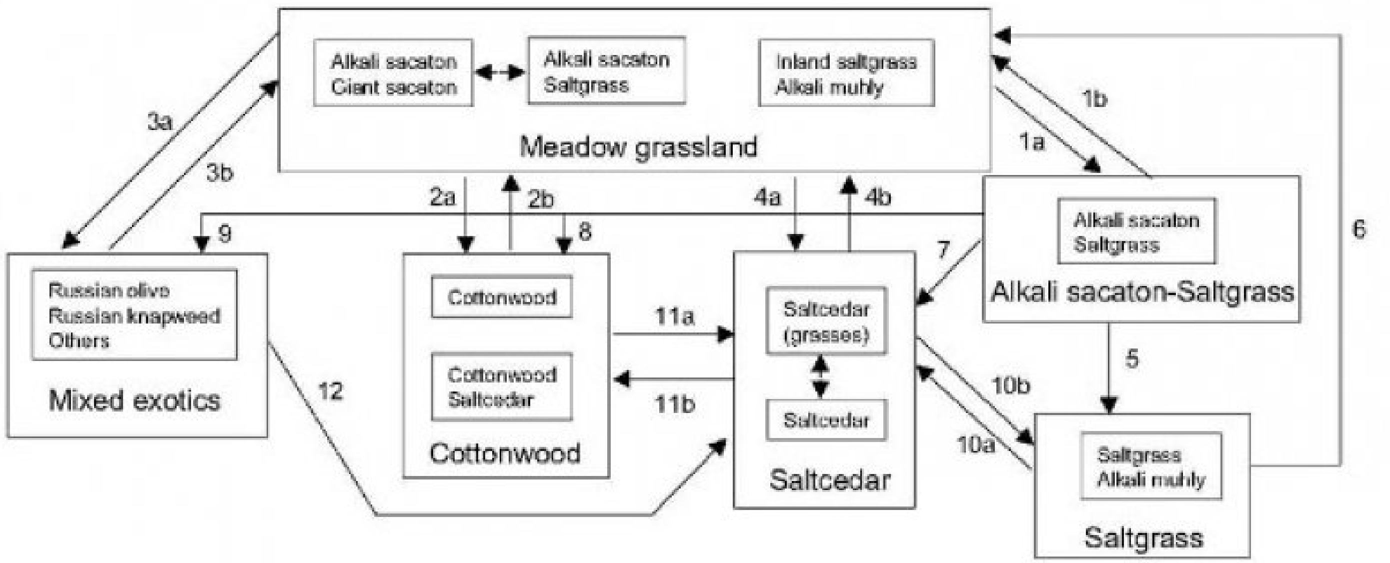
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Overview The historic plant community type of this site is dominated by alkali sacaton (*Sporobolus airoides*) and giant sacaton (*Sporobolus wrightii*). Inland saltgrass (*Distichlis spicata*) dominates secondarily, often in discrete patches. Sedges and rushes are common and screwbean mesquite (tornillo; Prosopis pubsecens) may be an important woody species. On the banks of the Rio Grande river, this site probably existed in a broad-scale, shifting mosaic with cottonwoods (Populus deltiodes var. wislizeni), mesquite stands (Prosopis spp.), and salty bottomland grasslands determined by changes in the river course. The grassland community is supported in areas where the depth to the water table is shallow and where flooding and drainage may stabilize salinity levels. Grazing may reduce both giant and alkali sacaton and increase the proportional representation of saltgrass. As salinity increases due to reductions of flood frequency, flood volume, or changes to soils or water table depth, a critical value may be crossed such that giant sacaton cannot survive. With continued overgrazing, changes in hydrology and increased salinity, or mechanical disturbance, saltgrass may become established (or vegetatively expand) and become dominant. Alternatively, fire or disturbance, perhaps in the context of dry soils, may produce a state dominated by exotics such as Russian olive (*Elaeagnus angustifolia*) or Russian knapweed (*Acroptilon repens*) as well as native species characteristic of more arid habitats. Periodic river floods may cover grassland areas with sediments on which cottonwood trees establish. Any state may be colonized by saltcedar (tamarisk; *Tamarix ramosissima*) once propagules are available. This transition may be favored by reduced flooding frequencies, disturbance, drier soils, or increases in salinity. Saltcedar invasion may cause severe ecosystem changes including vegetation structure, increases in fire frequency, and greatly increased salinity at the surface of the soil. Once it has invaded, this plant often progresses to extreme dominance. Mechanical removal measures and herbicides applied to exotic species may be used to recover grassland and cottonwood states.

State and transition model

State-Transition model: MLRA 42, SD-2, Saline lowland site group: Salt Meadow



1a. Decrease in flooding, increasing salt concentration, soil drying?, grazing. **1b.** Flushing of salts?
2a, 8. Flooding and sediment deposition. **2b.** Tree removal
3a, 9. Propagules, fire/disturbance with soil drying. **3b.** Herbicide, fire, mechanical removal, irrigation
4a, 7,10a,12. Propagules introduced, possibly favored in low flooding, high salinity, disturbed setting
4b. Herbicide, fire, mechanical removal, irrigation/elevated water table, seeding
5. Mechanical disturbance, overgrazing
6. Removal of saltgrass?, flushing of salts?, seeding
10b. Herbicide, fire, mechanical removal of exotics.
11a. Tree removal and colonization. **11b.** Herbicide, fire, mechanical removal, irrigation, plantings

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

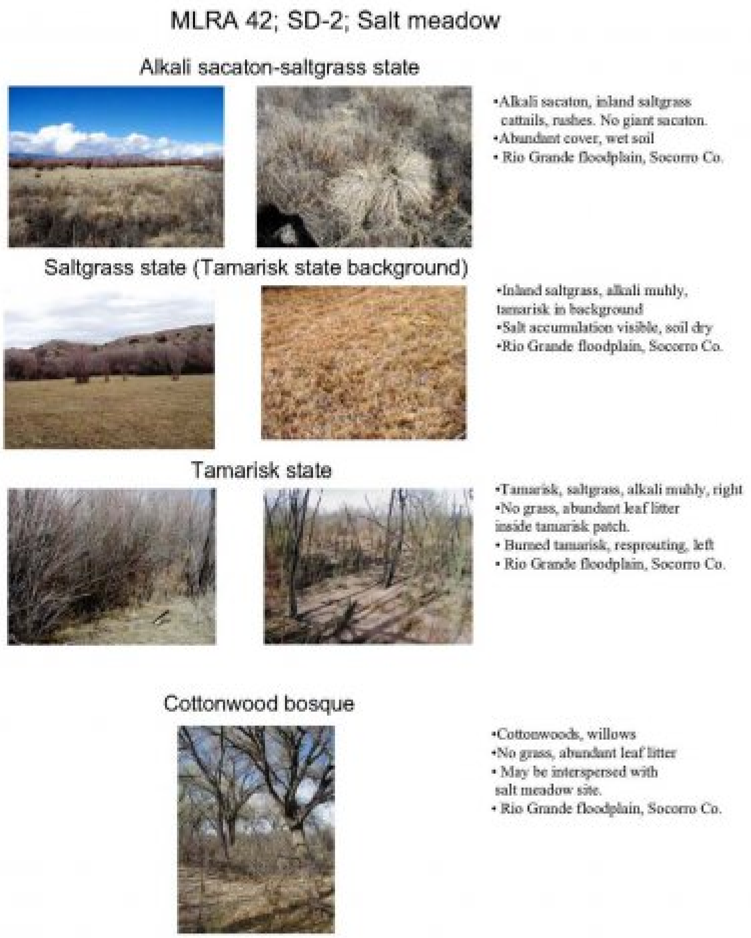


Figure 4. stateMLRA 42; SD-2; Salt meadow

Meadow Grassland Plant Community: The historic plant community is dominated by giant sacaton and alkali sacaton and harbors several other grass species including vine mesquite (*Panicum obtusum*) and tobosa (*Pleuraphis mutica*). Sedges and rushes are also common. Inland saltgrass and alkali muhly (*Muhlenbergia asperifolia*) often occur in flooded patches, perhaps were salts accumulate due to poor drainage or due to disturbance. Little is known about the environmental variables along which grass species segregate. Reductions in the sacaton species, particularly giant sacaton, may occur with grazing pressure or perhaps due to reduction in the water table. These communities used to occur alongside meadow communities on low salinity soils in the Rio Grande valley, but the non-saline communities have been largely eliminated by agriculture (Fosberg 1940). Diagnosis: Giant sacaton and alkali sacaton are co-dominant. Sedges and rushes present. Additional States: Transition to alkali sacaton-saltgrass state (1a): Increasing salinity due to changes in flooding regime (i.e. decreased frequency or volume) and/or to changes in the permeability of the soil due to soil-surface exposure and compaction, initiated by grazing or disturbance, may lead to the loss of giant sacaton. Without repeated flooding and drainage of salts into the ground water, sites with shallow water tables accumulate salts due to capillary rise (Hendrickx et al. 1999). Key indicators of approach to transition: Increases in bare ground cover, salinity, reduced frequency and volume of flooding. Transition to cottonwood state (2a): This transition used to occur independently of human influence and is considered a natural component of dynamics. Overbank flooding with sediment agradation may kill grasses and provide a substrate for germination and growth of cottonwood, as well as exotics. Transition to mixed exotics state (3a): May be due to disturbance, via mechanical means or by overgrazing, where propagules of exotics are available. Transition to saltcedar state (4a): Reduced flooding frequency with associated increases in salinity, or perhaps due to reduced water tables. This probably also requires disturbance to vegetation and the presence of propagules of exotics. The lowering of the water table and increasing salinity may reduce the resistance of the meadow communities to saltcedar invasion (Tesky 1992, Di Tomaso 1998). Disturbances (e.g. grazing) may facilitate saltcedar establishment by reducing competition (Di Tomaso 1998, Stromberg 1998). Periodic flooding disturbances, however, may inhibit the establishment of saltcedar. Key indicators of approach to transition: Increases in bare ground cover, increased salinity, reduced frequency and volume of flooding, lowering of water table.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1093	1457	1821
Shrub/Vine	387	516	644
Forb	202	269	336
Total	**1682**	**2242**	**2801**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	45%
Forb basal cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	29%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	25%

Figure 6. Plant community growth curve (percent production by month). NM2515, R042XB028NM-Salt Meadow-Warm Season Sub-irrigated HCPC. SD-2 Warm Season Sub-irrigated site..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	10	15	25	20	10	5	0	0

State 2
Alkali sacaton-saltgrass

Community 2.1
Alkali sacaton-saltgrass

Alkali sacaton-saltgrass: This site differs from the meadow grassland largely by the absence of giant sacaton, a large grass that is an important structural element of the historic community. It is unknown which other elements may differ within this state. Soil salinity is presumably higher within the state. Saltgrass assumes greater importance. Diagnosis: Giant sacaton is absent over extensive areas, and alkali sacaton is dominant. Saltgrass may dominate many patches. Transition to saltgrass state (5): The transition is caused by increasing salinity with soil compaction, and may also require mechanical disturbance or heavy grazing. If sacaton species are eliminated and the relatively unpalatable saltgrass expands in area, the dense roots of saltgrass effectively preempt space and inhibit germination by other species. Saltgrass reproduction by seed is poor under highly saline conditions, so vegetative reproduction through rhizomes is usually responsible for expansion (Hansen et al. 1976, Cluff and Roundy 1988). Key indicators of approach to transition: Increases in bare ground cover and loss of sacaton plants, increases in salinity, increasing soil compaction. Transition to saltcedar state (7): See 3a above. Transition to mixed exotics state (9): See 4a above.

State 3
Saltgrass Grassland

Community 3.1
Saltgrass Grassland

Saltgrass grassland: This state is characterized by a dense mat of saltgrass that may be interspersed with patches of alkali muhly. The dense root mass of saltgrass precludes establishment by other species and diversity is generally low in this state. Saltgrass is believed to tolerate a higher level of salinity than the sacaton species and is able to expand in compacted, clay soils by virtue of its rhizome morphology (Hansen et al. 1976). Saltgrass is also very flood tolerant (Uchytil 1990). Patches in this state are often associated with saltcedar-dominated patches. Diagnosis: Saltgrass is extremely dominant, almost completely covering the ground surface. Exposed soil often reveals encrusted salt. Transition to mixed exotics or saltcedar state (10a): See 4a above. Disturbance to saltgrass may be especially important to allow invasion, considering the dominance exerted by saltgrass. Campbell and Dick Peddie (1964) note that saltcedar does not grow well in saltgrass-dominated communities when the water table is within 3 feet (1 m). Observations in the Rio Grande valley by Darrell Reasner (NRCS Socorro), however, dispute this claim. He feels that tamarisk establishment is not limited in saltgrass. Transition to meadow grassland state (6): Unknown. May require the disruption of saltgrass root systems, but this would make the community susceptible to invasion by exotics (transition 10a or 11a). The return of flooding events and/or irrigation (see Hendrickx et al. 1999) to remove salt concentrations would probably be needed if salt limits sacaton establishment. Seeding may also be necessary.

State 4
Saltcedar

Community 4.1
Saltcedar

Saltcedar: Saltcedar may come to dominate in systems where water tables are lowered and where disturbance has occurred. Dense stands of saltcedar occur in areas where the water table is from 5-20 feet (1.5-6 m; Tesky 1992). Saltgrass may persist in depressions and areas between saltcedar patches, but this grass tends to be absent within saltcedar patches. Saltcedar has been described as an opportunistic species that is not a strong competitor (Everitt 1998). Nonetheless, two feedback mechanisms may promote extreme dominance by this species. First, salts drawn from below the soil surface are excreted through glands in stems and leaves and concentrate on the soil surface, producing a saline crust that inhibits germination and survival of other species. Second, saltcedar is tolerant of fire. Litter accumulation in dense stands leads to fire frequencies of 16-20 years in some systems (Tesky 1992). In principle, this might help to exclude less fire tolerant species but the increased salinity and competitive interactions with established, dense saltcedar stands probably play a primary role in maintaining saltcedar dominance. Within the saltcedar state, natural (flooding) and management-induced disturbances (mowing) may promote a grassland aspect (Taylor and McDaniel 1998). Fire disturbances may also temporarily alter species composition of tamarisk communities. Diagnosis: Saltcedar is dominant, sometimes forming impenetrable stands. Grass cover (particularly saltgrass and alkali muhly) may occur in areas where saltcedar densities are lower. Transition to meadow grassland state (4b): Unknown. A combination of herbicide use, burning, and mechanical control can be used to clear saltcedar (Taylor and McDaniel 1998). The use of subsurface herbicide techniques may be useful (Hollingsworth et al. 1979). The reestablishment of flooding regimes and high water tables would probably be needed to restore and sustain a meadow grassland. Irrigation using water flow diversions may achieve this (Taylor and McDaniel 1998). Transition to saltgrass state (10b): Unknown. In principle, this transition can be brought about by the removal of saltcedar but without restoring the conditions required for the establishment of meadow grasslands (e.g. changed hydrology). Transition to cottonwood state (11b): Techniques applied by Taylor and McDaniel (1998) have been successful in establishing this state in the Bosque del Apache National Wildlife Refuge. This includes the removal of saltcedar via herbicides, fire, and mechanical control alongside irrigation and plantings of cottonwoods and black willow (*Salix nigra*).

State 5
Cottonwood

Community 5.1
Cottonwood

Cottonwood: This state is characterized by the development of a cottonwood canopy alongside other woody species such as black willow, coyote willow (*Salix exigua*), and tornillo and an understory of herbs. Grasses are usually a minor component. Transition to meadow grassland state (2b): Removal of cottonwood canopy, or perhaps aging and mortality of cottonwoods over longer periods. Transition to saltcedar state (11a): Removal of cottonwoods and subsequent colonization by saltcedar.

State 6
Mixed Exotics

Community 6.1
Mixed Exotics

Mixed exotics: This state may exhibit dominance by Russian olive and/or other invasives, such as Russian knapweed, in disturbed settings. Little is known about the conditions under which different species invade. Because exotic species may coexist with native meadow grassland species, we speculate that the changed hydrology and salinization that accompanies the transition to a saltcedar state does not necessarily occur in this state. Where soil drying is a factor, upland species such as saltbush (*Atriplex canescens*) may colonize. Transition to meadow grassland state (3b): Variable recovery of grasses may be achieved by mowing and/or the use of herbicides to remove exotic shrubs if hydrology is not the limiting factor (Muldavin et al. 1999). Transition to saltcedar state (12): Disturbance and subsequent colonization by saltcedar. Data and information sources and theoretical background: Communities and states are derived largely from observations of Darrel Reasner, NRCS Socorro. Despite a proliferating literature on the ecology of cottonwoods and saltcedar, there is little work on the ecology of grasses in the riparian context. The mechanisms underlying the transitions rely largely on the idea that giant and alkali sacaton require conditions of relatively high soil moisture and low soil salinity relative to species defining the other states. The reduced frequency and volume of flooding may lead to accumulations of salt where the water table is high, leading to a turnover to more salt tolerant taxa. Grazing may also contribute to this turnover. Continued dominance of saltgrass, once it has established, may be enforced by its competitive preemption of space. For the invasion of opportunistic exotic taxa, disturbance is assumed to play an important role with or without changes in salinity by reducing competitive interactions with native species. On the other hand, a reduction in flooding disturbances has been invoked to explain the increase in saltcedar (Tesky 1992). It is possible that disturbance type is important. Alternatively, the role of flooding disturbance in inhibiting saltcedar establishment may apply to river banks and not to the more distant salt meadow sites. Similarly, the role of water table depth is unclear. Salinity seems to be promoted by shallow water tables but tamarisk is observed to dominate where water tables are relatively deep. Everitt (1998) notes that channel narrowing and subsequent sediment deposition over the last century due to depleted flow has led to a rise in dry-season water tables beneath the Rio Grande flood plain, and thus and increase in wetland conditions. The roles of salinity, water table depth, and flooding frequency on the vegetation dynamics of this ecological site have yet to be explored in detail.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm Season**			673–897	
	alkali sacaton	SPAI	*Sporobolus airoides*	673–897	–
	big sacaton	SPWR2	*Sporobolus wrightii*	673–897	–
2	**Warm Season**			224–336	
	saltgrass	DISP	*Distichlis spicata*	224–336	–
3	**Warm Season**			6–11	
	sedge	CAREX	*Carex*	112–224	–
	rush	JUNCU	*Juncus*	112–224	–
4	**Warm Season**			22–112	
	vine mesquite	PAOB	*Panicum obtusum*	22–112	–
5	**Warm Season**			22–67	
	common reed	PHAU7	*Phragmites australis*	22–67	–
6	**Warm Season**			22–67	
	tobosagrass	PLMU3	*Pleuraphis mutica*	22–67	–
7	**Warm Season**			22–112	
	Grass, perennial	2GP	*Grass, perennial*	22–112	–
Shrub/Vine					
8	**Shrub**			179–269	
	iodinebush	ALOC2	*Allenrolfea occidentalis*	179–269	–
	baccharis	BACCH	*Baccharis*	179–269	–
	screwbean mesquite	PRPU	*Prosopis pubescens*	179–269	–
9	**Shrub**			0–67	
	arrowweed	PLSE	*Pluchea sericea*	22–112	–
	willow	SALIX	*Salix*	22–112	–
	Fremont cottonwood	POFR2	*Populus fremontii*	0–67	–
10	**Shrub**			22–112	
	arrowweed	PLSE	*Pluchea sericea*	22–112	–
	willow	SALIX	*Salix*	22–112	–
Forb					
11	**Forb**			67–179	
	desert seepweed	SUSU	*Suaeda suffrutescens*	67–179	–
12	**Perennial Forbs**			112–224	
	Forb, perennial	2FP	*Forb, perennial*	112–224	–

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)

Animal community

This site provides hatitat which support a resident animal community that is characterized by raccoon, desert shrew, desert pocket gopher, Apache pocket mouse, great horned owl, red shafted flicker, mourning dove, ladder backed woodpecker, vermillion flycatcher, phainopepla, redwinged blackbird, Bullock’s oriole, boat-tailed grackle, Gambel’s quail, bullfrog, Great Plains skink, New Mexico whiptail, kingsnake, and checkered garter snake.

Hydrological functions

The runoff curve numbers are determined by field investigations using hydraulic cover conditions and hydrologic soil groups.

Hydrologic Interpretations
Soil Series Hydrologic Group
Aqua B
Belen C
Balmorhea C

Recreational uses

Associated cottonwood and other riparian trees provide welcome shade. The site has high suitability for bird watching, nature study and other non-consumptive forms of wildlife use. Picnicking and camping suitability if fair. Hunting for waterfowl, quail and dove is good. Suitability for hunting deer, small game and/or predators is poor to fair.

Wood products

The site has little, if any, significant value for wood products.

Other products

The site is grazed by cattle and horses, generally without regard to class of livestock or season of use. Palatability of the dominant forage plants is greatest during the summer months when inland saltgrass and alkali sacaton are green. Sheep and goats may also graze the site, with a tendency to browse as much or more than they graze. Site retrogression is characterized by a decline in alkali sacaton and an increase in inland saltgrass. Signs of serious deterioration of the site is indicated by a heavy canopy of woody plants such as salt cedar.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index Ac/AUM
100 - 76 2.8 – 4.0
75 – 51 3.5 – 4.5
50 – 26 4.0 – 7.0
25 – 0 7.0 - +

Other references

Other References:
Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains, Major Land Resource Areas of New Mexico. This site has been mapped and correlated with soils in the following soil surveys. Sierra County Dona Ana County Grant County Hidalgo County Luna County Otero County

Characteristic Soils Are:
Aqua Variant (wet) soils
Belen Variant (wet) soils

Other Soils included are:
Balmorhea loam

Contributors

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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:**

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):**

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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:

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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:**
