USDA Natural Resources
Conservation Service

Ecological site R078CY095OK
Subirrigated Bottomland

Last updated: 9/15/2023
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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.

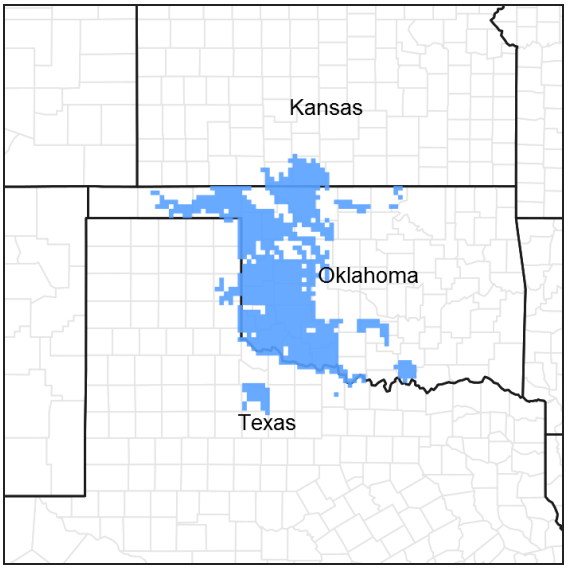


Figure 1. Mapped extent

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): 078C–Central Rolling Red Plains, Eastern Part

MLRA 78C is characterized by moderately dissected, rolling plains with prominent ridges and valleys and numerous terraces adjacent to dissecting streams. Loamy and clayey soils are generally deep, well drained, and developed in calcareous and gypsiferous sediments of Permian age.

LRU notes

NA

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

These sites occur on sandy alluvial soils with a high water table. The presence of this plant available water provides excellent growing conditions for many plants, even during periods of below average precipitation. Due to their

proximity to water courses, these site may be vulnerable to invasion by salt cedar.

Similar sites

R078CY090OK	**Ponded Bottomland** Sandy floodplain soils. Typically ponded. Episaturation.

Table 1. Dominant plant species

Tree	(1) *Salix nigra*
Shrub	(1) *Cephalanthus occidentalis*
Herbaceous	(1) *Panicum virgatum* (2) *Spartina pectinata*

Physiographic features

Subirrigated Bottomland sites are on nearly level, broad flood plains of the Central Rolling Red Prairies. These sites are characterized by their location along drainage ways and their high water tables with water at or near the surface during winter and spring. The typical land use on these sites is rangeland, used for grazing domestic animals. Some areas are cultivated or hayed. When cultivated, principle crops are usually small grains, sorghums, or alfalfa.

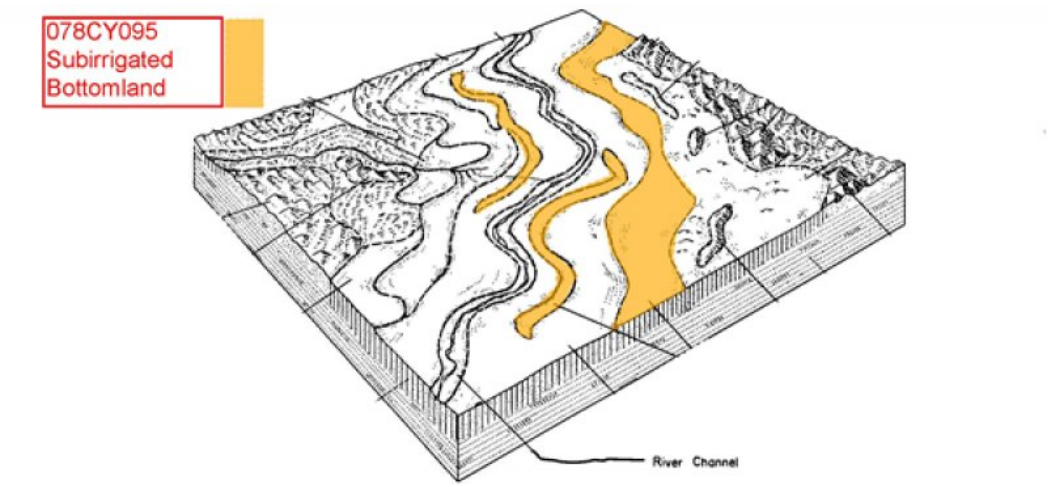


Figure 2. Subirrigated Bottomland

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain
Runoff class	Negligible to high
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding frequency	Rare to none
Elevation	213–762 m
Slope	0–2%
Water table depth	0–152 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 78C extends north and south from Coldwater, Kansas to just northeast of San Angelo, Texas (Ballinger, Texas), and east to west from Weatherford, Oklahoma to west of Shamrock, Texas. The weather is alternately influenced by cold dry air from the Arctic Circle in the winter, and warm moist air from the Gulf of Mexico in spring

and early summer. Seasonal changes are gradual with spring being a season of variable weather. Large precipitation events are commonly brought on by thunderstorms that may contain hail and high winds. Approximately 75 percent of the rainfall occurs during the warm season, and much of it comes in storms of high intensity and short duration in May and June. These rains can be particularly erosive on sites where vegetation is sparse. Summers are generally hot with low humidity and typically last longer than the winters. Occasional droughts are to be expected and are a reoccurring part of the ecosystem. Lack of rainfall along with hot dry winds often curtails forage production during July and August. Fall has periods of temperate weather interspersed with moderate to heavy rains, along with cooler temperatures that can dip below freezing especially towards the end of fall. Winter is typically moderate with cold winds from the north and infrequent storms can bring bitterly cold temperatures and snow to the area, but are commonly short lived.

Table 3. Representative climatic features

Frost-free period (characteristic range)	163-201 days
Freeze-free period (characteristic range)	192-223 days
Precipitation total (characteristic range)	660 mm
Frost-free period (actual range)	161-205 days
Freeze-free period (actual range)	191-230 days
Precipitation total (actual range)	660-686 mm
Frost-free period (average)	185 days
Freeze-free period (average)	208 days
Precipitation total (average)	660 mm

Climate stations used

- (1) COLDWATER [USC00141704], Coldwater, KS
- (2) MUTUAL [USC00346139], Mutual, OK
- (3) CLINTON SHERMAN AP [USW00003932], Dill City, OK
- (4) LAKE KEMP [USC00414982], Seymour, TX
- (5) ANSON 3ESE [USC00410268], Anson, TX

Influencing water features

The usual high water table enables growth of lush vegetation and is typically not affected by frequent dry periods during the growing season like other sites in this area. Wetland characteristics can be easily distinguished on this site and some obligate wetland plants can be found, but typically the site is dominated by facultative plants. These sites act as a filter for overland flow and can easily become saturated during heavy periods of rainfall especially during the spring. Evaporation is minimized by tall and dense plant growth that shades the soil surface. The site contributes to the stability of the overall riparian system that occurs along major streams and rivers. While the subirrigated soils are subject to endosaturation (water moving vertically upward or horizontally into the profiles), flood events may produce periods episaturation (surface water becoming perched above a layer of low permeability) and lead to a temporary increase in hydrophitic vegetation.

Wetland description

NA

Soil features

Subirrigated Bottomland soils consist of very deep, somewhat poorly drained, moderately rapid to rapidly permeable soils formed in calcareous sandy alluvium of recent age. These soils are located on nearly level, broad flood plains or back water positions of the Central Rolling Red Prairies (MLRA-78C). They may have a loamy top with sandy texture throughout the profile. These soils are usually closest to the stream channel. Subirrigated soils are typically saturated late in winter and early in spring and are somewhat poorly drained with high runoff during these periods.

The key series for this site are Gracemore and Gracemont soils which consist of very deep soils with a dark brown to reddish brown A horizon over single grained, loose fine sand or fine sandy loam. Slopes are 0 to 2 percent. Subirrigated soils are chacterized by endosaturation and have a zone within 40 inches of the surface for one month or more during the year and within 18 inches from November through May that is saturated. The soils are frequently to occasionally flooded with brief or very brief duration during months of March through August. These nearly level to very gently sloping flood plain soils can be found on large braided river systems as well as on small tributaries throughout the MLRA. Although used mainly for grazing beef cattle these sites can also be suitable for cultivated crops. If so suited, they are usually cultivated to alfalfa, small grains, sorghums, cotton, and tame pasture. Native vegetation is tallgrasses and midgrasses with Buttonbush on the wettest areas and Cottonwood as the site becomes slightly drier and transitions into sandier soils.

Representative Soils: Gracemont, Gracemore, Lesho, Sweetwater and Waldeck.

Table 4. Representative soil features

Parent material	(1) Alluvium–calcareous sandstone
Surface texture	(1) Fine sandy loam (2) Loam (3) Clay loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to well drained
Permeability class	Slow to moderately rapid
Soil depth	178–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	4.32–20.57 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–13
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The reference plant community is dominated by a mixture of tallgrasses with occasional midgrasses along with some grasslike plants, a variety of forbs, and a small component of shrubs and trees. Plants growing on this site are able to grow in wet and sometimes saturated soils. In many places throughout the site, hydrophytic species may be prevalent especially in the wettest areas. Subsurface water is available for plant growth during nearly all of the growing season even in dry periods. Plant production is typically very high as compared to other sites associated within the same areas during the growing season because of the sub surface water. These sites may be considered the highest producing sites in the MLRA. Shifts in the plant communities may occur due to high water tables for extended periods of times especially during wet periods following flood events. Plant diversity varies depending on the water fluctuation and the micro topography present on the landscape. Slightly saline sites may be dominated by only a few plants that are tolerant of the salty conditions within the soil, but the time needed for changes to salinity are highly dependent on the landscape position of the site and its proximity to the floodplain. Changes in the plant

community are much more variable along the water course channels because of the likelihood of scouring and replacement of material as compared to backwater positions.There is a good variety of both cool-season and warm-season plants. Water table fluctuations can cause slight to extreme differences in plant species present and their production potential. Native trees such as Cottonwood (Populus spp.), and Willow (Salix spp.) will usually be present in the high areas and around the perimeter, but the total of all woody species will not exceed 10% canopy cover. Buttonbush (*Cephalanthus occidentalis*) is a common shrub especially on the wettest areas with False Indigo Bush(*Amorpha fruticosa*) commonly found on similar to slightly drier areas.

Since the majority of these sites are associated with fluvial systems, they are subject to the disturbances associated with watercourses and adjacent floodplains. Therefore, the classification of soils and ecological sites along these systems can be quite difficult do to the high potential for change. These floodplains may be shifting mosaics or relatively stable landforms depending on the frequency, season, and duration of flood events. The frequency and season of these flood events may be altered by anthropogenic or biotic factors or, many times, both. Historically, these floods varied in magnitude but generally occurred in conjunction with early spring rains. Flood control reservoirs, irrigation wells, and stream diversions can reduce flooding frequency and alter the timing of such events. However, a dense monoculture of salt cedars may obstruct the streamflow and lead to a more intense and prolonged flood event. Regardless of the source, a major flood event can reset the “successional clock” and completely change the ecological dynamics and plant community in these areas. These changes can range from slight where the plant community is shifted to another phase, to severe where the site becomes part of the stream channel and transitions to an alternative state.

Natural fire likely played an important role in the function of most plains sites, especially the tallgrass communities and this site is no exception to that. Fire as well as seasonal flooding provided the needed disturbance to maintain plant health and in some situations reset plant succession especially in the drier areas of the MLRA. Tallgrasses such as Sand Bluestem (*Andropogon hallii*), Switchgrass (*Panicum virgatum*), Eastern Gamagrass (*Tripsacum dactyloides*), and Indiangrass (*Sorghastrum nutans*) were dependent upon stimulation from fire or flooding to remove old growth that would accumulate on the soil surface. Fire also kept shrubs suppressed and removed old fallen timber from trees such as cottonwood. Praire Cordgrass (*Spartina pectinata*) and Grasslike plants such as rushes (Juncus spp.) and sedges (Carex spp.) also accumulate growth similar to tallgrass prairie species, and can sometimes become dominant in the wetter parts of this site. Fire helped keep a balance between the many different vegetation types. Wildlife habitat was improved by opening up canopies and removing barriers to movement. The wet soil acted as an insulator to late season soil temperatures that protected plant roots and lower stems from heat damage so that plant re-growth was rapid

The mixture of grasses, forbs, and woody plants make it excellent wildlife habitat. Also, the presence of water in the plains attracts all kinds of grazers and predators as well as birds and small mammals. This site has an abundance of all habitat factors required: water, nesting and escape cover, and a variety of food plants for turkey, quail, white tailed deer, as well as many other species of mammals and birds. Cattle find this site attractive as well, and will naturally spend a lot of time grazing and loafing in these areas. Even though cattle naturally gravitate to this site and usually overgraze the area if left unattended, the site can be grazed without damaging the plant community, or the riparian area, if proper grazing management is used. Continuous intensive grazing can lead to a decline in tallgrass species giving way to midgrass/shortgrass species that are better able to cope with grazing pressure. When the site is allowed to be overgrazed certain species can become dominant that are less desirable and since they thrive in wet soils these species will begin to dominate when improper management is employed over many years. The unique characteristics of the site and the vast differences from adjacent sites make special management techniques necessary. Often it may be beneficial to manage this site in such a way as to control and limit access by grazing animals that provides for use of this site exclusive to those around it. Occasional haying of this site may be a good alternative to grazing in some years due to the natural disturbances within any given year. Prescribed burning may be applicable in some cases to help sustain a diverse community along with many other types of management techniques.

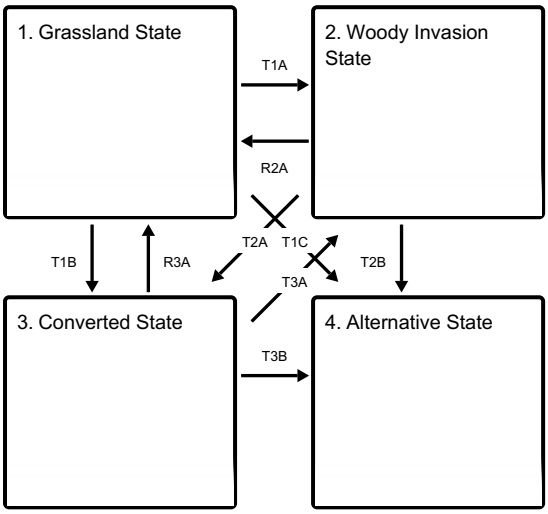
STATE AND TRANSITIONAL PATHWAYS (DIAGRAM):

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.

As a site changes in the structure and makeup of the plant community, the changes may be due to management, or to natural occurrences, or both. At some point in time, thresholds may be crossed. This means that once plant community changes have progressed to a certain point, the balance of the community has been altered to the extent that a return to the former state is not possible, that is, not possible unless some form of outside energy is applied to make it happen. These changes take place on all ecological sites, but some sites support communities that are more resistant to change. Also, some sites are more resilient, that is, they tend to heal or restore themselves more easily. Changes in management practices alone, such as prescribed grazing, will not be sufficient to restore former plant communities. An example of an outside energy input might be the implementation of prescribed chemical brush management to decrease the amount of woody shrubs and increase the amount of grasses and forbs. This shift in plant community balance could not be brought about with prescribed grazing alone. The amount of energy required to bring about a change in the plant community balance may vary a great deal depending on the present plant community state and the desired community state.

State and transition model

Ecosystem states



T1A - Absence of disturbance, introduction of non-natives, and natural regeneration over time

T1B - Extensive soil disturbance followed by seeding

T1C - Altered site hydrology/removal of influencing water features

R2A - Removal of invasive species followed by reintroduction of historic disturbance regimes

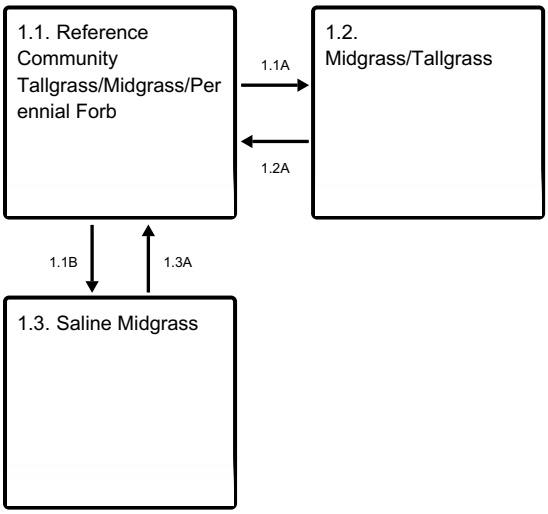
T2A - Extensive soil disturbance followed by seeding

T2B - Altered site hydrology/removal of influencing water features

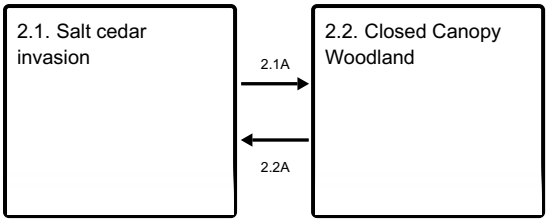
R3A - Absence of disturbance and natural regeneration over time

T3B - Altered site hydrology/removal of influencing water features

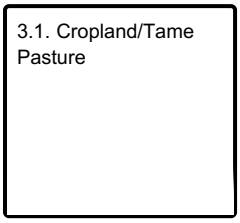
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Grassland State

The following narratives describe the potential communities within the Grassland stable state. This state is dominated by herbaceous species with a minor woody component.

Dominant plant species

- switchgrass (*Panicum virgatum*), grass
- prairie cordgrass (*Spartina pectinata*), grass

Community 1.1
Reference Community Tallgrass/Midgrass/Perennial Forb

Figure 9. 1.1 Reference Community

This is the reference plant community for this site. It is a mixture of tallgrasses, midgrasses, shortgrasses, forbs, and very few if any woody shrubs and trees. The major grasses are Switchgrass (*Panicum virgatum*), Indiangrass (*Sorghastrum nutans*), Eastern Gamagrass (*Tripsacum dactyloides*), Canada Wildrye (*Elymus canadensis*), and Prairie Cordgrass (*Spartina pectinata*). Some midgrasses such as Western Wheatgrass (*Pascopyrum smithii*), Tall Dropseed (*Sporobolus compositus*), and Alkali Sacaton (*Sporobolus airoides*) are common but not nearly as productive as the tallgrasses. A few shortgrasses are present with Buffalograss (Buchloe dactyloides) being the most common. The forb component includes Maximilian Sunflower (*Helianthus maximiliani*), Gayfeather species(Liatris spp.), Baldwin Ironweed (*Vernonia baldwinii*), and Goldenrod species (Solidago spp.). Grasslikes include Sedges (Carex spp.), Rushes (Juncus spp.) and occasionally Cattails (Typha spp.). Shrubs include Button Bush (*Cephalanthus occidentalis*), False Indigo Bush (*Amorpha fruticosa*), and occasionally Roughleaf Dogwood (Cornus drummondi.) and Buckbrush (Symphoricarpos orbiculatas). Trees are Cottonwood (Populus deltoids), Willow (Salix spp.), Elm (Ulmus spp.), Hackberry (Celtis spp.) and Western Soapberry (*Sapindus saponaria*).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	5380	7173	8967
Forb	673	897	1121
Tree	336	448	560
Shrub/Vine	336	448	560
Total	**6725**	**8966**	**11208**

Figure 11. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Community 1.2
Midgrass/Tallgrass

Figure 12. 1.2 Midgrass increased forbs

This plant community is dominated by a mixture of midgrasses and tallgrasses including Dropseeds(Sporobolus spp.) and Little Bluestem(*Schizachyrium scoparium*). More palatable tallgrasses have declined and shortgrass species are increasing in abundance on the areas of bare ground along with annual forbs, sedges and rushes. Shrubs and trees such as Common Buttonbush(*Cephalanthus occidentalis*), Sandplum(*Prunus angustifolia*), Willow(Salix spp.) or other brush species increase in abundance along with an increased potential for encroachment by Eastern Redcedar(*Juniperus virginiana*). If there is an increase in soil salinity, Alkali Sacaton(*Sporobolus airoides*), Inland Saltgrass(*Distichlis spicata*), and other saline-tolerant herbaceous species will begin to increase. Salt cedar saplings can begin to appear if there is a seed source. Cottonwood will usually be found on the areas of higher elevation and around the perimeter. This community pathway may also be the result of long term exclusion of fire or a slight lowering of the water table.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	4035	5380	6725
Forb	1681	2242	2802
Tree	504	673	841
Shrub/Vine	504	673	841
Total	**6724**	**8968**	**11209**

Figure 14. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Community 1.3
Saline Midgrass

Figure 15. 1.3 Saline Midgrass

This plant community is dominated by salt tolerant vegetation such as Inland Saltgrass(*Distichlis spicata*), Alkali Sacaton(*Sporobolus airoides*), and salt tolerant forbs. Salt tolerant Trees and shrubs may begin to increase greater than 10% and there is a high risk of invasion by Salt cedar. Herbaceous production is limited in this community due to the lower production potential of the salt tolerant species.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3587	4663	5739
Forb	1121	1457	1793
Tree	448	583	717
Shrub/Vine	448	583	717
Total	**5604**	**7286**	**8966**

Figure 17. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

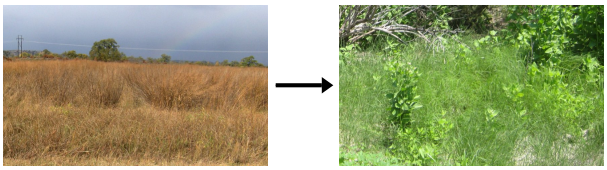
Pathway 1.1A
Community 1.1 to 1.2

Reference Community Tallgrass/Midgrass/Perennial Forb

Midgrass/Tallgrass

If the subirrigated ecological site is subjected to continuous overgrazing, the plant community can transition to midgrass dominated vegetation. Other factors that can be attributed to this community shift are the absence of prescribed burning or a decline in the water table below the rooting zone.

Pathway 1.1B
Community 1.1 to 1.3



Reference Community Tallgrass/Midgrass/Perennial Forb

Saline Midgrass

When this site is subjected to endosaturation by water with a high saline content, there is potential for accumulation of salts within the soil profile. If the water table recedes below the rooting zone of the plants in this community, the salts may remain within this zone or at the surface. This can lead to a shift in the plant community that is dominated by plants with a high to moderate salinity tolerance.

Pathway 1.2A
Community 1.2 to 1.1

Midgrass/Tallgrass

Reference Community Tallgrass/Midgrass/Perennial Forb

The plant community may be shifted back to the reference community through implementation of a prescribed burning and prescribed grazing program. However, if the water table has lowered slightly below the rooting zone of the palatable tallgrass species, deferment may be needed as part of a prescribed grazing plan.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A
Community 1.3 to 1.1

Saline Midgrass

Reference Community Tallgrass/Midgrass/Perennial Forb

If the accumulated salts within the soil profile are leached out, there is potential for this community to revert to the reference community. This may be the result of a flood event leaching the salts or the return of the elevated water table that supports the vegetation within the reference community.

State 2
Woody Invasion State

The following narratives describe the plant communities within the Woody state of this ecological site. In this state, woody vegetation begins to dominate the plant community.

Dominant plant species

- saltcedar (*Tamarix ramosissima*), tree

Community 2.1
Salt cedar invasion

Figure 18. 2.1 Salt Cedar Invasion

This community has been invaded by salt cedar. There is a significant increase in brush canopy cover (>30%) predominately made up of salt cedar. Salt tolerant forbs and grass species such as Inland Saltgrass(*Distichlis spicata*) and Alkali Sacaton(*Sporobolus airoides*) make up a significant portion of the herbaceous plant community. This community is of very little use for grazing animals due to the low palatablity of the plants. Some wildlife species and insects will still utilize this site. The risk of wildfire is increased due to the dense growth habits of the salt cedars.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2242	2914	3363
Tree	1681	2186	2690
Forb	1401	1821	2242
Shrub/Vine	280	364	448
Total	**5604**	**7285**	**8743**

Figure 20. Plant community growth curve (percent production by month).

OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Community 2.2
Closed Canopy Woodland

Figure 21. 2.2 Closed Canopy

This plant community has been invaded by Salt cedar(Tamarisk spp.). The trees have form a closed canopy stand with traces of other salt tolerant vegetation occuring in the understory.

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	4203	5464	6725
Grass/Grasslike	841	1093	1345
Forb	280	364	448
Shrub/Vine	280	364	448
Total	**5604**	**7285**	**8966**

Figure 23. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Pathway 2.1A
Community 2.1 to 2.2

Salt cedar invasion **Closed Canopy Woodland**

Without brush management, this palnt community can shift to a closed canopy plant community comprised mainly of invasive Salt cedar.

Pathway 2.2A
Community 2.2 to 2.1

Closed Canopy Woodland Salt cedar invasion

Through limited implementation of brush managment, the closed canopy of this community may be opened up allowing for more herbaceous plants to persist. However, these herbaceous palnts will be comprised of mainly low production, salt tolerant species.

Conservation practices

Brush Management
Prescribed Grazing

State 3
Converted State

This state has been converted to an agricultural site. Refer to appropriate Forage and Crop Suitability Reports for further information about vegetative production.

Community 3.1
Cropland/Tame Pasture

The higher islands and higher open areas may be cultivated for crops or introduced pasture species. Crop yields can be favorable do the available water on these sites. However, saturated soils at certain times of the year can be problematic for field operations.

State 4
Alternative State

Transition T1A
State 1 to 2

If there is a significant decrease in competition from native grasses, invasive salt cedars can begin to dominate this site. This can be caused by increased bare ground from overgrazing or by an increase in soil salinity from a prolonged drop in the water table. Salt cedar is a very prolific reproducer and can survive and multiply in both wet and dry conditions.

Transition T1B
State 1 to 3

If a site is suitable for cultivation, it may be converted to cropland or tame pasture through tillage and seeding.

Transition T1C
State 1 to 4

Due to the proximity of these sites to fluvial sytems(streams & rivers), there is potential for the transition to an alternative state. This can be the result of a significant, prolonged drop in the water table and the absence of endosaturation, scouring and relocation of the adjacent river channel, or sedimentation from a flood event that

creates permanent or temporary enundation. Other factors could also play a role in altering the hydrologic function of this site and lead to the transition to an alternative state.

Restoration pathway R2A
State 2 to 1

The woody state of this site may be restored to a grassland state through a well planned rehabilitation program. Chemical or mechanical brush management must be used to eradicate the dense stands of salt cedar followed by revegetation with native species. The success of the rehab depends on many factors and can be limited. The length of time that the site has been in this state, soil texture and salinity, precipitation patterns, and hydrology should be carefully evaluated before staring a rehabilitation program. Failure to carefully plan and implement rehab efforts can result in recolonization of the site by salt cedar or other undesirable species.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Transition T2A
State 2 to 3

If a site is suitable for cultivation, it may be converted to cropland or tame pasture through tillage and seeding. However, this transition will require additional inputs such as brush management or land clearing prior to cultivation. Precautions should be taken when considering crop or pasture production on a site with high soil salinity.

Transition T2B
State 2 to 4

Due to the proximity of these sites to fluvial sytems(streams & rivers), there is potential for the transition to an alternative state. This can be the result of a significant, prolonged drop in the water table and the absence of endosaturation, scouring and relocation of the adjacent river channel, or sedimentation from a flood event that creates permanent or temporary enundation. Other factors could also play a role in altering the hydrologic function of this site and lead to the transition to an alternative state.

Restoration pathway R3A
State 3 to 1

Even though a Subirrigated site has been in cultivation for a substantial period of time, it is not always impossible for the site to return to something resembling the Reference Plant Community. Cultivation is definitely not a one-way street for this ecological site. The return of a cultivated field to the Reference Plant Community depends on the integrity of the soil’s A horizon, length of time in cultivation, loss of organic matter, soil type, and water table depth. There are many examples in Oklahoma, Kansas, and Texas of abandoned cultivated fields that have re-vegetated; are in excellent condition; and closely resemble the HPC. Sometimes, however, it is very difficult to determine if fields were cultivated. Some of these sites may have been reseeded, others were not. If the soil resource has not been heavily degraded and given enough time, the site could get back to the HPC or something very close to it. The grasses are fastest to recover, the high seral forbs slowest.The soil resource (integrity of the soil) is the primary limiting factor.

Conservation practices

Range Planting

Restoration pathway R3A
State 3 to 1

Even though a Subirrigated site has been in cultivation for a substantial period of time, it is not always impossible for the site to return to something resembling the Reference Plant Community. Cultivation is definitely not a one-way street for this ecological site. The return of a cultivated field to the Reference Plant Community depends on the integrity of the soil's A horizon, length of time in cultivation, loss of organic matter, soil type, and water table depth. There are many examples in Oklahoma, Kansas, and Texas of abandoned cultivated fields that have re-vegetated; are in excellent condition; and closely resemble the HPC. Sometimes, however, it is very difficult to determine if fields were cultivated. Some of these sites may have been reseeded, others were not. If the soil resource has not been heavily degraded and given enough time, the site could get back to the HPC or something very close to it. The grasses are fastest to recover, the high seral forbs slowest.The soil resource (integrity of the soil) is the primary limiting factor.

Conservation practices

Range Planting

Transition T3A
State 3 to 2

If a cultivated site is abandoned, there is potential for invasion by woody species. Depending on seed availablity and soil salinity, this site be invaded by Salt cedar(Tamarisk spp.) in a short amount of time.

Transition T3B
State 3 to 4

Due to the proximity of these sites to fluvial sytems(streams & rivers), there is potential for the transition to an alternative state. This can be the result of a significant, prolonged drop in the water table and the absence of endosaturation, scouring and relocation of the adjacent river channel, or sedimentation from a flood event that creates permanent or temporary enundation. Other factors could also play a role in altering the hydrologic function of this site and lead to the transition to an alternative state.

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses**			4304–7173	
	switchgrass	PAVI2	*Panicum virgatum*	1289–2152	–
	sand bluestem	ANHA	*Andropogon hallii*	650–1076	–
	Indiangrass	SONU2	*Sorghastrum nutans*	650–1076	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	650–1076	–
	prairie cordgrass	SPPE	*Spartina pectinata*	426–717	–
	purpletop tridens	TRFL2	*Tridens flavus*	0–359	–
	giant sandreed	CAGI3	*Calamovilfa gigantea*	0–359	–
	little bluestem	SCSC	*Schizachyrium scoparium*	213–359	–
2	**Cool-Season Grasses**			538–897	
	western wheatgrass	PASM	*Pascopyrum smithii*	157–269	–
	Canada wildrye	ELCA4	*Elymus canadensis*	157–269	–
	foxtail barley	HOJU	*Hordeum jubatum*	56–90	–
	Heller's rosette grass	DIOL	*Dichanthelium oligosanthes*	56–90	–
	Carolina canarygrass	PHCA6	*Phalaris caroliniana*	22–45	–
	annual rabbitsfoot grass	POMO5	*Polypogon monspeliensis*	22–45	–

3	**Midgrass/Shortgrass**			135–224	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	78–135	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	56–90	–
	alkali sacaton	SPAI	*Sporobolus airoides*	56–90	–
	silver beardgrass	BOLA2	*Bothriochloa laguroides*	56–90	–
	saltgrass	DISP	*Distichlis spicata*	56–90	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	45–67	–
	marsh muhly	MURA	*Muhlenbergia racemosa*	22–45	–
	knotgrass	PADI6	*Paspalum distichum*	22–45	–
	vine mesquite	PAOB	*Panicum obtusum*	22–45	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–22	–
	barnyardgrass	ECCR	*Echinochloa crus-galli*	0–22	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–22	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–17	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–17	–
4	**Grasslike**			404–673	
	sedge	CAREX	*Carex*	202–336	–
	bulrush	SCHOE6	*Schoenoplectus*	146–247	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	112–179	–
	rush	JUNCU	*Juncus*	67–112	–
	southern cattail	TYDO	*Typha domingensis*	0–22	–
Forb					
5	**Forbs/Legumes**			673–1121	
	lanceleaf fogfruit	PHLA3	*Phyla lanceolata*	45–67	–
	turkey tangle fogfruit	PHNO2	*Phyla nodiflora*	45–67	–
	tall blazing star	LIAS	*Liatris aspera*	34–56	–
	dotted blazing star	LIPU	*Liatris punctata*	34–56	–
	cardinalflower	LOCA2	*Lobelia cardinalis*	34–56	–
	wholeleaf rosinweed	SIIN2	*Silphium integrifolium*	34–56	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	34–56	–
	azure blue sage	SAAZ	*Salvia azurea*	34–56	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	34–56	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	34–56	–
	hoary verbena	VEST	*Verbena stricta*	34–56	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	34–56	–
	Indianhemp	APCA	*Apocynum cannabinum*	22–34	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	22–34	–
	false boneset	BREU	*Brickellia eupatorioides*	22–34	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	22–34	–
	Maryland senna	SEMA11	*Senna marilandica*	0–22	–
	partridge pea	CHFA2	*Chamaecrista fasciculata*	0–22	–
	wild indigo	BAPTI	*Baptisia*	0–22	–
	prairie clover	DALEA	*Dalea*	0–22	–

	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–22	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–11	–
	common sunflower	HEAN3	*Helianthus annuus*	0–11	–
	sawtooth sunflower	HEGR4	*Helianthus grosseserratus*	0–11	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–11	–
	great ragweed	AMTR	*Ambrosia trifida*	0–11	–
	whitemouth dayflower	COER	*Commelina erecta*	0–11	–
	hogwort	CRCA6	*Croton capitatus*	0–11	–
	southern annual saltmarsh aster	SYDI2	*Symphyotrichum divaricatum*	0–11	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–11	–
	annual marsh elder	IVAN2	*Iva annua*	0–11	–
	prairie gentian	EUSTO	*Eustoma*	0–11	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–6	–
	evening primrose	OENOT	*Oenothera*	0–6	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	0–6	–
Shrub/Vine					
6	**Shrub/Vine**			336–560	
	false indigo bush	AMFR	*Amorpha fruticosa*	84–140	–
	common buttonbush	CEOC2	*Cephalanthus occidentalis*	84–140	–
	willow baccharis	BASA	*Baccharis salicina*	34–56	–
	Chickasaw plum	PRAN3	*Prunus angustifolia*	34–56	–
	fragrant sumac	RHAR4	*Rhus aromatica*	0–28	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	0–28	–
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–28	–
	roughleaf dogwood	CODR	*Cornus drummondii*	0–28	–
	crimsoneyed rosemallow	HIMO	*Hibiscus moscheutos*	0–17	–
	sorrelvine	CITR2	*Cissus trifoliata*	0–17	–
	soapweed yucca	YUGL	*Yucca glauca*	0–11	–
	pricklypear	OPUNT	*Opuntia*	0–6	–
Tree					
7	**Tree**			336–560	
	black willow	SANI	*Salix nigra*	157–263	–
	eastern cottonwood	PODE3	*Populus deltoides*	101–168	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	0–28	–
	gum bully	SILAL3	*Sideroxylon lanuginosum ssp. lanuginosum*	0–28	–
	American elm	ULAM	*Ulmus americana*	0–28	–
	common hackberry	CEOC	*Celtis occidentalis*	0–28	–
	little walnut	JUMI	*Juglans microcarpa*	0–17	–

Animal community

Native animals that occupy this site include bobwhite quail, whitetail deer, turkey, squirrel, various small mammals

and grassland birds. The site provides roosting trees for turkey and cover and nesting habitat for both turkey and quail. Deer frequent the site for screening cover and escape cover. Many whitetail deer fawns are observed in the tall grass cover in the spring. Many species of small mammals find this site ideal habitat. Predators such as bobcats and coyotes are often seen also.

Hydrological functions

The usual high water table enables growth of lush vegetation. Wetland characteristics often prevail and the site acts as a filter for overland flow. Evaporation is minimized by tall and dense plant growth that shades the soil surface. The site contributes to the stability of the overall riparian system that occurs along major streams.

Recreational uses

Hunting, Camping, Hiking, Bird watching, Photography, Horseback Riding

Wood products

Several species of trees might be found on this site, but there is not enough for any appreciable harvest of wood products.

Inventory data references

Inventory data for this report was assembled from Oklahoma Range Site descriptions, 417s, field data collections, and discussions with other Oklahoma Rangeland Management Specialists. This data has been combined and correlated with the previous work completed on this ESD by the original author.

Type locality

Location 1: Woods County, OK

Other references

Bay, R.F.,& Sher, A.A. 2008. Success of Active Revegetation after Tamarix Removal in Riparian Ecosystems of the Southwestern United States: A Quantitative Assessment of Past Restoration Projects. Restoration Ecology Vol. 16, No. 1, pp. 113–128
Bestelmeyer, B.T., Moseley, K., Shaver, P., Sanchez, H., Briske, D., Fernandez-Gimenez, M. 2010. Practical guidance for developing state-and-transition models. Rangelands. 32(6):23-30.
Hupp, C.R., & Osterkamp, W.R. 1996. Riparian vegetation and fluvial geomorphic processes. Geomorphology , 277-295.
USDA NRCS Plants Database. Online.
Weber, R.,& Fripp, J. 2010. Understanding Fluvial Systems: Wetlands, Streams, and Flood Plains. NRCS Technical Note No. 4

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Approval

Bryan Christensen, 9/15/2023

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.

Author(s)/participant(s)	Colin Walden (Modified from original worksheet developed by Kay Anderson, David Kraft, Mark Moseley, Jack Eckroat, Harry Fritzler, and Steve Glasgow 4/2005)
Contact for lead author	100 USDA, Suite 206, Stillwater, OK 74074
Date	09/05/2012
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** This site usually has flatter slopes and sandier soils. There are few, if any, rills (only in lowest area where flooding occurs) and there is no active headcutting and sides are covered with vegetation.

2. **Presence of water flow patterns:** There is little, if any, evidence of soil deposition or erosion (some possibly apparent after significant rain events). Water generally flows evenly over the entire landscape.

3. **Number and height of erosional pedestals or terracettes:** There should not be any evidence of erosional pedestals or terracettes on this site.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** There is <5% bare ground on this site. Bare areas are small and not connected.

5. **Number of gullies and erosion associated with gullies:** None, drainages are represented as natural stable channels; vegetation is present with no signs of erosion.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

7. **Amount of litter movement (describe size and distance expected to travel):** Uniform distribution of litter. Litter rarely

moves >6 inches on flatter slopes and may be doubled on steeper slopes only during high intensity storms.

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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):** Surface soil is stabilized (Stability Score 5-6). Stability scores based on a minimum of 6 samples tested.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface horizon intact. A horizon: 0 to 12 inches; brown fine sand, granular structure. B horizon: 12 to 30 inches; light yellowish brown. Loose.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Infiltration and runoff are not affected by any changes in plant community composition and distribution. (Tallgrass/Midgrass dominated). Any changes in infiltration and runoff can be attributed to other factors (e.g. compaction).

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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):** There is usually no compaction layer.

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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: Tallgrasses>>Cool-season perennials>Midgrasses>Forbs

    Sub-dominant: Shrubs=Trees

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There is some plant mortality and decadence on the perennial grasses, especially in the absence of fire and herbivory, but usually <5%.

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14. **Average percent litter cover (%) and depth (in):** Litter should cover >95% of the area between plants with accumulations of 1-2 inches deep.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production is 6000 – 10,000 pounds per year. Production on these sites is typically not as variable due to fluctuation in precipitation like other sites in the MLRA.

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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: Potential invasive plants include: Eastern redcedar and/or Salt cedar(Tamarisk)

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17. **Perennial plant reproductive capability:** All plants capable of reproducing at least every year. Seed stalks, stalk length and seedheads are vigorous. Overall health of plants is excellent.
