

Ecological site R080BY147TX Claypan 26-33" PZ

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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.

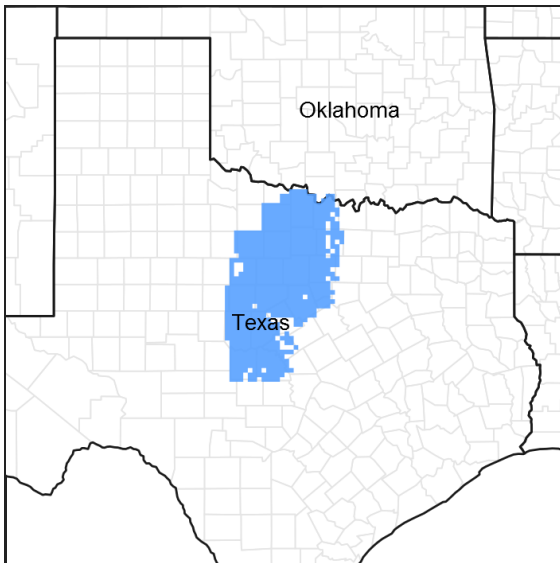


Figure 1. Mapped extent

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): 080B–Texas North-Central Prairies

MLRA 80B consists of gently rolling, dissected plains with very steep hillsides and sideslopes and narrow flood plains associated with small streams. Loamy and clayey soils range from very shallow to deep and developed in sandstones, shales, and limestones of Pennsylvanian age.

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 over loamy soils which have a dense clay subsoil on uplands. The reference vegetation includes native perennial midgrasses with numerous forbs and very few woody plants. Without fire or other brush management, woody species may increase and dominate the site, especially mesquite. The soils can be quite droughty due to the dense clay subsoils.

Associated sites

R080BY152TX	Loamy 26-33" PZ Loamy soils without restrictive clay layer. Higher productivity.
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Similar sites

R084BY168TX	Claypan 29-33" PZ Claypan site in MLRA 84B.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Bouteloua curtipendula</i> (2) <i>Panicum obtusum</i>

Physiographic features

This site occurs on linear base slopes and side slopes of hillslopes and ridges in the Texas North-Central Prairies. Slopes are typically less than 5 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills > Hillslope (2) Hills > Ridge
Runoff class	High to very high
Elevation	229–732 m
Slope	0–5%
Aspect	Aspect is not a significant factor

Climatic features

The climate is subtropical subhumid and is characterized by hot humid summers and relatively mild winters. Tropical maritime air controls the climate during spring, summer and fall. In winter and early spring, frequent surges of polar Canadian air cause sudden drops in temperatures and add considerable variety to the daily weather. The average first frost generally occurs about November 5 and the last freeze of the season usually occurs about March 19. The average frost free period ranges from 215 days in the northern counties, to 240 days in the south.

The average relative humidity in mid-afternoon is about 60 percent in the summer months. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible during the summer and 50 percent in winter. The prevailing wind direction is from the southwest and highest windspeeds occur during the spring months.

Approximately 75% of annual rainfall occurs between April 1 and October 31. Rainfall during the months of April through September typically occurs during thunderstorms which tend to be intense and brief, resulting in large amounts of rain in a short time. The wettest months of the year are May, June, September, and October. The driest months during the growing season are July and August. The winter months of November, December, January, and February are the driest months overall.

Average annual precipitation for the entire MLRA is approximately 28 inches. There is a noticeable difference in the average annual precipitation in the northern counties in comparison to the southern and western counties of this Major Land Resource Area. Jack, Clay, Young, and Palo Pinto Counties all have an average annual precipitation of more than 31 inches. Stephens, Eastland, McCulloch, and San Saba Counties all have an average annual precipitation of less than 28 inches.

Winters tend to be mild, with occasional periods of very cold temperatures which can be accompanied by strong northerly winds and freezing precipitation. Snow is infrequent and significant accumulations are rare. These periods of very cold weather are generally short-lived. Summers tend to be hot and dry. Drought conditions are common during most summers. Air temperatures of more than 95oF are common from mid-June through September. In the northern counties nearest to the Red River, temperatures are generally slightly cooler during winter months and slightly warmer during summer months than in the other counties in the North Central Prairie.

Table 3. Representative climatic features

Frost-free period (average)	240 days
Freeze-free period (average)	268 days
Precipitation total (average)	838 mm

Influencing water features

This being an upland site, it is not influenced by water from a wetland or stream. These site may shed water to adjacent areas downslope. Infiltration of rainwater may be restricted by the tight subsoils. However, the presence of herbaceous groundcover and deep rooted perennial plants can help increase infiltration.

Wetland description

NA

Figure 7-1 The hydrologic cycle with factors that affect hydrologic processes

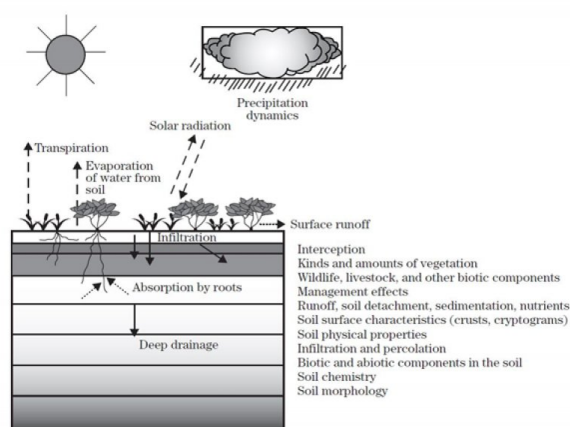


Figure 4.

Soil features

The soils that support this site are deep, with loamy top-soils and blocky clay sub-soils. The top-soils are very hard and crusty when dry. The substratum is calcareous shale or reddish clay and shale occasionally inter-bedded with sandstone. Air and water move through the subsoil very slowly and these soils tend to be droughty. During wet times, these soils often have a wet area above the clay. Fertility is medium to high.

Representative soil components for this ecological site include: Callahan, Thurber

The site is characterized by moderately deep to very deep hard setting soils.

Table 4. Representative soil features

Parent material	(1) Residuum–claystone (2) Slope alluvium–claystone
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Surface texture	(1) Loam (2) Clay loam (3) Fine sandy loam
Drainage class	Moderately well drained to well drained
Permeability class	Very slow
Soil depth	51 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0–2%
Available water capacity (0-101.6cm)	12.7–22.86 cm
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–10
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (0-101.6cm)	0–10%
Subsurface fragment volume >3" (0-101.6cm)	0–1%

Ecological dynamics

The plant communities that can occur on this site range from a mid and short grass prairie; to a short grass prairie; to a mesquite (*Prosopis glandulosa* var. *glandulosa*) dominated mid-grass and/or short grass range; to a thick canopy mesquite/shrub short and annual grass, forb, bare ground community. This wide diversity of plant communities occurring on this site is in direct response to type of grazing management, reaction to fire regimes, extermination of the prairie dogs, the impacts of droughts on the different hydrology's associated with each of the vegetative states, and the inherent droughtiness of the soils.

The reference plant community is a mid and shortgrass prairie. Sideoats grama (*Bouteloua curtipendula* var. *curtipendula*) is the dominate grass making approximately 25 percent of the total production. Other midgrasses are Arizona cottontop (*Digitaria californica*) (a site indicator plant), vine mesquite (*Panicum obtusum*), tall dropseed (*Sporobolus asper* var. *asper*), meadow dropseed (*Sporobolus compositus* var. *drummondii*), silver bluestem (*Bothriochloa laguroides* ssp. *torreyana*), plains bristlegrass (*Setaria vulpisetia*), and white tridens (*Tridens albescens*). Shortgrasses include buffalograss (*Bouteloua dactyloides*), blue grama (*Bouteloua gracilis*), Texas wintergrass (*Nassella leucotricha*), Western wheatgrass (*Pascopyrum smithii*), purple three-awn (*Aristida purpurea* var. *purpurea*), Wright's threeawn (*Aristida purpurea* var. *wrightii*) sand dropseed (*Sporobolus cryptandrus*), hairy tridens (*Erioneuron pilosum*), hairy grama (*Bouteloua hirsuta*), Scribner's rosette grass (*Dichantherium oligosanthes* var. *scribnerianum*) and sedges (*Carex* sp.). Numerous forbs are found on the site. They are heath aster (*Aster ericoides*), awnless bushsunflower (*Simsia calva*), dotted gayfeather (*Liatris punctata* var. *punctata*), englemann daisy (*Engelmannia peristena*), western ragweed (*Ambrosia psilostachya*), verbena (*Verbena* sp.), Louisiana sagewort (*Artemisia ludoviciana*), green thread (*Thelesperma simplicifolium*), Maximilian sunflower (*Helianthus maximiliani*), onion (*Allium* sp.), trailing ratany (*Krameria lanceolata*), tetraeneuris (*Tetraeneuris scaposa*), and catclaw sensitivebriar (*Mimosa nuttallii*). There is only a small amount of shrubs and it is composed of condalia (*Condalia* sp.) and vine ephedra (*Ephedra antisyphilitica*).

In the reference plant community, the midgrasses tend to dominate the shortgrasses due to their ability to capture sunlight and shade them. The midgrasses also have deeper root systems that allow them to capture the deep moisture while the early successional shortgrasses have shorter root systems and can capture only the more shallow moisture. Many of the deep-rooted grasses also have more root hairs that allow them to be more efficient at extracting moisture from very dry soil. Due to these differences, midgrasses maintain their dominance over the shortgrasses as they can produce much more food and maintain a higher state of health and vigor even; in times of drought.

When European settlers arrived, the area was inhabited by bison, whitetail deer, turkey, quail, dove, many song birds, rabbits, squirrel, prairie dogs, lizards and snakes. Fire was a major factor in maintaining the site in the reference state. Lightning fires and fires set by Native Americans would burn for days with out stopping. Hundreds of thousands of acres would burn as there was nothing but wide spread rivers or a change in weather to stop them. This repeated burning, which was considered historically to be a 4 – 12 year interval, kept this site in an open prairie state. The fresh green growth of the grass and forbs made this site a sea of lush growth that attracted the grazing animals and provided them highly nutritious forage.

There were no fences. The bison were free to roam and migrate from south to north in the summer and north to south as the winter season was nearing. This area provided the winter grazing for the bison herds that had ventured north for the summer. They came by the thousands and grazed the range as they moved around and generally were presumed to follow the most recent burn having a significant short-term impact followed by extended rest periods. Antelope were on the range, and grazed and roamed at their desire, seeking the best nutrition they could find in the forbs and grasses. Prairie dogs lived in groups on the site. They kept the woody shrubs cut down as a means of protection from hawks, eagles, coyotes, bobcats, and cougars. Recent research has shown that they would not let a mesquite stand overnight that emerged in or around their town.

European settlers started settling this area in the early 1800's with a major thrust just before and after the civil war. The first settlers moved about from ranch to ranch as no one owned land. After the grass was grazed to a point of "being gone", they would move to another place where the grass was good and start another ranch. When the grass "came back" on the ranch they had left, a new rancher would move in and take over that ranch.

In 1880, barbed wire was introduced into this area. The land had also come under private ownership. The fencing stopped the open range where livestock had wandered to be guided only by the line riders. Now the forces of contained livestock grazing started to have its toll on the plant communities. The wild fires that once systematically burned over the land were either put out or burned with less intensity due to reduced fine fuel due to the heavier and continuous grazing.

Depending on how the rancher managed, the plant communities started to change. If the rancher allowed fire to continue to control the mesquite seedlings, they could manage this site to remain a mid and short grass prairie. If fire was not allowed to maintain the invading brush species, mesquite, prickly pear (*Opuntia macrorhiza*) and tasajillo (*Cylindropuntia leptocaulis*) would spread over the site. If the site was burned prior to the mesquite achieving approximately 6 feet in height (slick bark stage), fire could be used to manage the mesquite invasion. If the mesquite was allowed to exceed approximately 6 feet, then fire could no longer control the brush and the range entered a new vegetative state that would require more than fire to restore the reference plant community. The manager would have to use machinery or herbicide to manage the brush to a desired canopy.

Also, the manager would have to apply a well thought out prescribed grazing plan to maintain the vigor and health of the desired grasses and forbs. As the stocking rate exceeded the carrying capacity of the land and the natural graze-rest cycles were broken by continuous grazing, the palatable and highly selected midgrasses were grazed to the point that they could no longer produce sufficient food in their leaves to maintain their health and vigor. Records of stocking rates show that on much of the land, there was a cow to 2 acres. When the midgrasses were grazed to the point that they had little leaf area left, they stopped supplying the root system with food, as all available food produced was being used to grow more leaf area to enhance the food manufacturing process. If the overgrazing continued, the root system of the overgrazed plants was shrunk as energy consuming respiration continued in the root system. In time, with continued close grazing, the midgrasses would become not a deep rooted healthy plant, but a very shallow rooted, small leaf area, weak plant that was set up for doom during the next drought. This process was magnified due to the natural droughts that occur in the area as well as the natural droughtiness of the soil. This led to the demise of the midgrasses and the increase of shortgrasses. These shortgrasses were buffalograss, Texas wintergrass, purple threeawn, Wright's threeawn, hairy grama, hairy tridens, and scribner's rosettegrass. At the same time this was occurring with the grasses, the palatable forbs were being overgrazed and killed out of the plant community.

If the new vegetative state of mesquite and mid/ short grasses was overgrazed and no brush was controlled, the site would change to a canopy of 30 to 50 percent with mainly buffalograss, Texas wintergrass and other shortgrasses in the understory. If this management continued, the site would change to a dense canopy of tall mesquite, prickly pear, tasajillo, Texas wintergrass, annual cool-season grasses, invading forbs such as annual

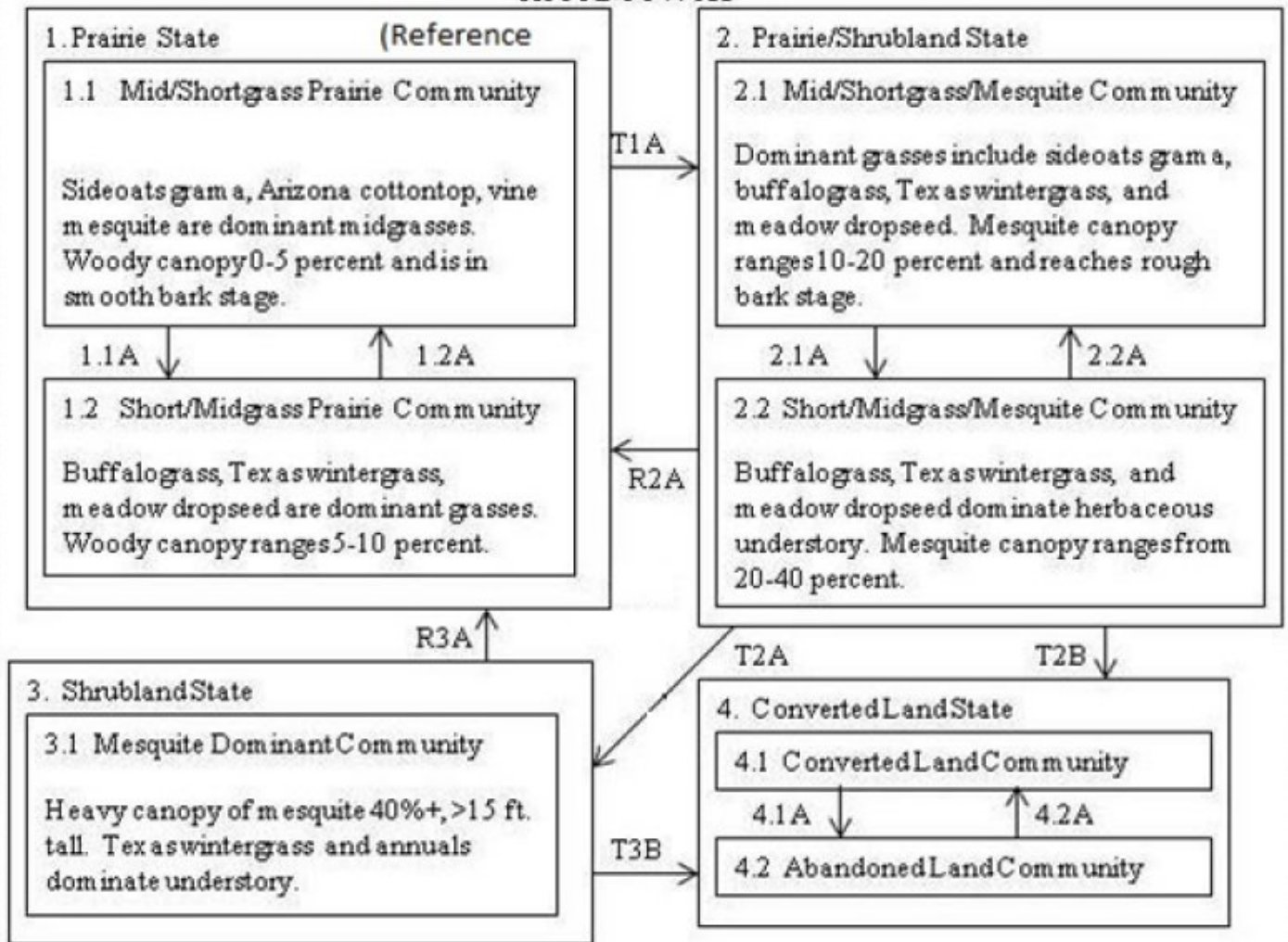
broomweed (*Amphichyris dracunculoides*) and much bare ground; especially during the dryer years.

A major characteristic of this ecological site is the droughtiness of the site. In all of the communities production of plant material is very limited to non-existent in drought years. But, it has been demonstrated that with good range management, the site can respond and recover to be very productive following drought. If the management is not designed to allow the plants to recover their health and vigor following drought, the site is very slow to recover.

Since the soils of this site are productive and fertile, much of this site has been converted into cropland. In many instances, this land has either been reseeded to native grasses or introduced grasses. It also has been left alone and is called Abandoned or "Go Back Land". After the land was planted to native or introduced grasses and forbs, management of the land to control the invasion of mesquite and pricklypear from neighboring lands is a must if the manager desires to keep the land open. This can be accomplished with prescribed burning or other means of brush management. Also, to maintain the stand of native or introduced grasses planted, a prescribed grazing plan must be designed and applied that meets the needs of the plants, the animals and the managers objectives.

STATE & TRANSITION DIAGRAM:

State and transition model



LEGEND

- 1.1A Heavy Continuous Grazing, No Fire
- 1.2A Prescribed Grazing, Prescribed Burning
- T1A Heavy Continuous Grazing, No Fire
- R2A Prescribed Grazing, Brush Management, Prescribed Burning
- 2.1A Heavy Continuous Grazing, No Fire, No Brush Management
- 2.2A Prescribed Grazing, Prescribed Burning, Brush Management
- T2A Heavy Continuous Grazing, No Fire, No Brush Management
- T2B Brush Management, Plow, Pasture Planting, Range Planting, Prescribed Grazing, Prescribed Burning, Crop Cultivation, Pest Management, Nutrient Management
- R3A Brush Management, Range Planting, Prescribed Grazing, Prescribed Burning
- T3B Brush Management, Plow, Pasture Planting, Range Planting, Prescribed Grazing, Prescribed Burning, Crop Cultivation, Pest Management, Nutrient Management
- 4.1A Idle, Abandonment
- 4.2A Brush Management, Range Planting, Prescribed Burning, Prescribed Grazing, Nutrient Management, Pest Management

**State 1
Prairie State - Reference**

The Prairie State is predominately a grassland with forbs and occasional low shrubs on the landscape. Within the Reference Plant Community, plant composition is dynamic, responding to drought and short term grazing effects.

Drought especially has a profound impact on this site. In dry years, the site produces very little taking on the appearance of bare ground even though the tillers of the mid and shortgrasses are present. If conditions are appropriate for its germination and establishment, common broomweed can be in abundance one year and non-existent the next year. Abundant fall rains favor a broomweed crop the following spring and summer.

Dominant plant species

- sideoats grama (*Bouteloua curtipendula*), grass
- vine mesquite (*Panicum obtusum*), grass

Community 1.1 Mid/Shortgrass Prairie Community



Figure 5. 1.1 Mid/Shortgrass Prairie Community

This community represents the reference plant community for the Claypan ecological Site and is the reference plant community. Fire, bison and prairie dogs were major factors maintaining the area as an open prairie. Without their impacts on the woody component, the site can evolve to a heavy canopy of large mesquite. The dominant midgrass is sideoats grama, composing approximately 25 percent of the total composition. Other important midgrasses are Arizona cottontop, vine-mesquite, tall dropseed, meadow dropseed, sand dropseed, silver bluestem, cane bluestem, white tridens, and plains bristlegrass. Shortgrasses are buffalograss, blue grama, hairy grama, hairy tridens, purple and Wright’s threeawn and sedges. Cool-season grasses consist of Texas wintergrass, western wheatgrass, and Scribner’s rosettegrass. Numerous forbs are found on the area with scattered shrubs such as ephedra and condalia. Overgrazing by cattle or other grass eating ruminants can reduce the midgrasses and increase the shortgrasses and cool-season grasses such as Texas wintergrass. The longer the overgrazing the greater the shift to the shorter grasses. However, if Prescribed Grazing is used, along with Prescribed Burning, there is enough of the midgrass species left to return to the 1.1 plant community. Fire may be strategically used to hold woody species at low levels and maintain the prairie plant community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1580	2634	3688
Forb	84	140	196
Shrub/Vine	17	28	39
Tree	–	–	–
Total	1681	2802	3923

Figure 7. Plant community growth curve (percent production by month). TX3027, Mid/Shortgrass Prairie. Historic Climax Plant Community, Mid and Short grass Prairie..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	10	20	24	10	5	10	10	3	2

Community 1.2 Short/Midgrass Prairie Community

The Short/Midgrass Prairie Community (1.2) develops when the land is fenced and moderately overstocked. Resting of the key plants is reduced causing the midgrasses to be reduced in the plant community. The major species now include buffalograss, Texas wintergrass, and meadow dropseed. This plant community can still be managed back to the reference community by applying sound grazing management practices through a prescribed grazing plan and restoring fire when needed. Fire can still burn the area either naturally or as a prescription but not as frequently or as intensely as the reference community because of reduced fuel load and the presence of cool season plants.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	471	1849	2202
Forb	17	84	280
Shrub/Vine	17	28	39
Tree	–	–	–
Total	505	1961	2521

Figure 9. Plant community growth curve (percent production by month).
TX3028, Shortgrass Prairie. Historic Climax Plant Community with
buffalograss, Texas wintergrass, and dropseeds dominating site..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	7	15	18	15	5	5	10	10	5	3

Pathway 1.1A Community 1.1 to 1.2

Moderate to heavy continuous grazing pressure and no fires.

Pathway 1.2A Community 1.2 to 1.1

Prescribed Grazing and Prescribed Burning conservation practices drive the community back to the Mid/Shortgrass Prairie Community (1.1).

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2 Prairie/Shrubland State

The Mid/Shortgrass/Mesquite Community has mesquite that is large enough to not be controlled by fire. Generally, State 2 begins when the mesquite canopy exceeds 10 percent. Mesquite has started to invade the site since the forage was overgrazed, no fires were used and the prairie dog populations were removed from the site. At first the canopy was light, but as time moved on mesquite continues to reproduce and grow in height and canopy. The grasses and forbs remained approximately the same as climax. Species include sideoats grama, buffalograss, Texas wintergrass, meadow dropseed, and mesquite. The site has now moved from a prairie to a shrubland state that has changed the overall appearance of the landscape.

Dominant plant species

- honey mesquite (*Prosopis glandulosa*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass

**Community 2.1
Mid/Shortgrass/Mesquite Community**



Figure 10. 2.1 Mid/Shortgrass/Mesquite Community

If fire is stopped by the manager, either on purpose or by overgrazing, and the prairie dog populations are removed from the site, mesquite is provided a window of opportunity to invade. Mesquite canopy now has reached 10 percent and continues to reproduce and grow in height, number and canopy. At this height, most of the mesquite is getting to the “rough bark” stage which is more fire resistant than the “slick bark” stage. Rest will do very little to reduce the canopy at this point. A brush management approach including fire can arrest the mesquite at this level. The grasses and forbs remain approximately the same as climax. Species include sideoats grama, buffalograss, Texas wintergrass, meadow dropseed, and mesquite. The total production is higher in the Prairie Shrubland State than the Prairie State due to the woody species and the Texas wintergrass that now occupies most of the mesquite understory.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	527	2298	3194
Forb	56	224	336
Tree	168	224	280
Shrub/Vine	34	56	112
Total	785	2802	3922

Figure 12. Plant community growth curve (percent production by month). TX3029, Mid/Shortgrass with Mesquite. Mid and shortgrasses with Mesquite. Sideoats grama, buffalograss, Texas wintergrass, and Meadow dropseed are the dominant grass species for this condition..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	10	20	24	10	5	10	10	3	2

**Community 2.2
Short/Midgrass/Mesquite Community**



Figure 13. 2.2 Short/Midgrass/Mesquite Community

Once the mesquite reaches about 20 percent, shade becomes a controlling factor in the understory; especially with Texas wintergrass. Also at this point, rest will not reduce the canopy and fire is reduced because of the cool season component. Sideoats grama and other midgrasses becomes an insignificant part of the plant community composition. Buffalograss, Texas wintergrass and meadow dropseed became dominant herbaceous plants in the understory. Production is reduced to approximately 1000 pounds per acre because of shade and competition. There is a high percentage of bare ground in many of the years depending on rainfall. The site has now moved from a prairie to a shrubland site and has changed the overall appearance and wildlife habitat. White-tailed deer are now potentially abundant on the site due to the woody cover, forb and browse production. Quail and turkey are also seen on the site. Fire may reduce small mesquite and maybe some canopy, but will not control the mesquite. Integrated treatment using mechanical or herbicides along with prescribed burning can be used to achieve a desired plant community.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	235	1149	1625
Tree	224	336	392
Forb	56	112	129
Shrub/Vine	45	84	95
Total	560	1681	2241

Figure 15. Plant community growth curve (percent production by month). TX3030, Mid/Shortgrass with Mesquite - Buffalograss . Mid and Short Grass with Mesquite; Buffalograss, Texas Wintergrass, and Meadow Dropseed..

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

Pathway 2.1A Community 2.1 to 2.2



Mid/Shortgrass/Mesquite Community



Short/Midgrass/Mesquite Community

Heavy continuous grazing pressure, no fires, and no brush management are the drivers to the Short/Midgrass/Mesquite Community (2.2).

Pathway 2.2 Community 2.2 to 2.1



Short/Midgrass/Mesquite
Community



Mid/Shortgrass/Mesquite
Community

With the implementation of Prescribed Grazing, Prescribed Burning, and Brush Management conservation practices, the Short/Midgrass/Mesquite Community will shift back to the Mid/Shortgrass/Mesquite Community (2.1) or possibly the Prairie State depending upon the method of treatment and the aggressiveness of application.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 3 Shrubland State

In the Shrubland State, the drivers are no brush management or fire.

Dominant plant species

- honey mesquite (*Prosopis glandulosa*), shrub
- Texas wintergrass (*Nassella leucotricha*), grass

Community 3.1 Mesquite Dominant Community



Figure 16. 3.1 Mesquite Dominant Community

Given time with no brush management or fire, the mesquite on this site will grow to be large. They consume the resources of moisture, light, and fertility. Only during the winter when the mesquite are dormant is there production in the understory and then it is Texas wintergrass, annual cool season forbs, and in some instances Japanese brome (*Bromus japonicus*). In many instances, there is a high percentage of bare ground. Production is very limited except during wet winters. Deer and turkey utilize this site in this state, using it for cover and grazing of lush grasses and forbs. Rest from grazing has little effect on this community to restore it as shade has become the controlling factor. If the goal were to be to restore this plant community to the prairie state, a long term, integrated regime of fire, brush management and proper grazing is needed.

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	235	1149	1625
Tree	224	336	392
Forb	56	112	129
Shrub/Vine	45	84	95
Total	560	1681	2241

Figure 18. Plant community growth curve (percent production by month). TX3031, Mesquite 40% canopy with cool season grasses. Heavy mesquite with 40 percent canopy and having Texas wintergrass and annuals dominating the site..

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

State 4 Converted Land State

In the Converted Land State, the rangeland has been mechanically converted into a more intensive land use of cropland or monocultures of native or introduced pastureland.

Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass

Community 4.1 Converted Land Community

Once the site has been converted to perennial grass cover, there will be a need for follow-up of brush management or prescribed burning to control the inevitable mesquite and prickly pear invasion. Production will totally depend on the composition of the forage established, the management and the weather for the year. A limitation existing with this plant community is that a monoculture does not give as good year around forage quality as does a native mix. Introduced plants may also be more limiting as wildlife habitat but should be evaluated against wildlife species needs.

Table 10. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	560	1681	2130
Forb	112	560	673
Shrub/Vine	–	–	–
Tree	–	–	–
Total	672	2241	2803

Figure 20. Plant community growth curve (percent production by month). TX3003, Native Seeding. Native Seeding of grasses and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	15	20	20	5	5	14	7	3	2

Community 4.2 Abandoned Land Community



Figure 21. 4.2 Abandoned Land Community

Usually, common broomweed will come on the site first when farming operations are ceased and the land is idle. The soil is usually compacted, has a plowpan and has lost structure and is in generally poor health. Then plants such as western ragweed, croton (*Croton glandulosus* var. *lindheimeri*), sand dropseed, hairy tridens, Texas grama (*Bouteloua rigidisetata*), lovegrasses (*Eragrostis* sp.), grow on the site. Over the years, buffalograss and Texas wintergrass will start to grow. Mesquite and prickly pear start to invade the site almost from the day plowing stops. If the mesquite is not controlled, it will develop into a mesquite thicket within 10-15 years. Quail utilize this site in this state as many of the plants produce seeds. There is cover and bare ground. Production of plants is totally dependent on what stage of succession the site is in. There is a window of opportunity to use normal farm equipment to plant desirable plants before the mesquite gets greater than 4 feet tall.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Forb	560	785	964
Grass/Grasslike	–	112	841
Shrub/Vine	–	22	28
Tree	–	22	28
Total	560	941	1861

Figure 23. Plant community growth curve (percent production by month). TX3026, Go Back Land Vegetation. Go Back Land vegetation. Forbs dominate site with some grasses coming back..

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

Pathway 4.1A Community 4.1 to 4.2

Cessation of farming is the driver to the plant community shifting from a Converted Land Community into an Abandoned Land Community.

Pathway 4.2A Community 4.2 to 4.1

Brush Management, Range Planting, Prescribed Burning, Prescribed Grazing, Nutrient Management, and Pest Management conservation practices can shift from the Abandoned Land Community to the Converted Land Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting
Nutrient Management
Integrated Pest Management (IPM)

Transition T1A
State 1 to 2

Heavy continuous grazing pressure over long periods of time and no fires will transition the Prairie State into the Prairie/Shrubland State. Usually mesquite seeds have been brought into the site from adjacent sites.

Restoration pathway R2A
State 2 to 1

With the application of various conservation practices including Prescribed Grazing, Brush Mangement, and Prescribed Burning, the Prairie/Shrubland State can be restored to the Prairie State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T2A
State 2 to 3

With drivers of heavy continuous grazing, no fires, and no brush management, the Prairie/Shrubland State will transition into the Shrubland State.

Transition T2B
State 2 to 4

With the use of the following conservation practices, the Prairie/Shrubland State can be transitioned into the Converted Land State: Brush Management, Land Clearing, Plowing, Pasture Planting, Range Planting, Prescribed Grazing, Prescribed Burning, Crop Cultivation, Nutrient Management and Pest Management.

Restoration pathway R3A
State 3 to 1

With the application of various conservation practices including Prescribed Grazing, Brush Management, Range Planting, and Prescribed Burning, the Shrubland State can be restored to the Prairie State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T3A State 3 to 4

With the use of the following conservation practices, the Prairie/Shrubland State can be transitioned into the Converted Land State: Brush Management, Land Clearing, Plowing, Pasture Planting, Range Planting, Prescribed Grazing, Prescribed Burning, Crop Cultivation, Nutrient Management and Pest Management.

Additional community tables

Table 12. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Midgrass			420–981	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	420–981	–
2	Midgrasses			622–1451	
	silver beardgrass	BOLAT	<i>Bothriochloa laguroides ssp. torreyana</i>	0–364	–
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	0–364	–
	vine mesquite	PAOB	<i>Panicum obtusum</i>	0–364	–
	streambed bristlegrass	SELE6	<i>Setaria leucopila</i>	0–364	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus var. compositus</i>	0–364	–
	Drummond's dropseed	SPCOD3	<i>Sporobolus compositus var. drummondii</i>	0–364	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–364	–
	white tridens	TRAL2	<i>Tridens albescens</i>	0–364	–
3	Shortgrasses			252–588	
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–146	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–146	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–146	–
	hairy woollygrass	ERPI5	<i>Erioneuron pilosum</i>	0–146	–
4	Cool-season Grasses			252–588	
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–196	–
	Texas wintergrass	NALE3	<i>Nassella leucotricha</i>	0–196	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–196	–
5	Shortgrasses			34–78	
	purple threeawn	ARPUP6	<i>Aristida purpurea var. purpurea</i>	0–28	–
	Wright's threeawn	ARPUW	<i>Aristida purpurea var. wrightii</i>	0–28	–
	sedge	CAREX	<i>Carex</i>	0–28	–
Forb					
6	Forbs			84–196	
	onion	ALLIU	<i>Allium</i>	0–50	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–50	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–50	–
	aster	ASTER	<i>Aster</i>	0–50	–
	Engelmann's daisy	ENGEL	<i>Engelmannia</i>	0–50	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	0–50	–

	trailing krameria	KRLA	<i>Krameria lanceolata</i>	0–50	–
	dotted blazing star	LIPUP	<i>Liatris punctata var. punctata</i>	0–50	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0–50	–
	awnless bushsunflower	SICA7	<i>Simsia calva</i>	0–50	–
	fineleaf fournerved daisy	TELI3	<i>Tetrameuris linearifolia</i>	0–50	–
	stemmy four-nerve daisy	TESCS	<i>Tetrameuris scaposa var. scaposa</i>	0–50	–
	slender greenthread	THSI	<i>Thelesperma simplicifolium</i>	0–50	–
	vervain	VERBE	<i>Verbena</i>	0–50	–
Shrub/Vine					
7	Shrubs			17–39	
	clapweed	EPAN	<i>Ephedra antisyphilitica</i>	0–22	–
	lotebush	ZIOBO	<i>Ziziphus obtusifolia var. obtusifolia</i>	0–22	–

Animal community

Bison and prairie dog were historical inhabitants of this site when the area was settled by European man. They have been mostly removed from the site.

This site is used for the production of domestic livestock and to provide habitat for native wildlife. Cow-calf and stocker operations are the primary livestock enterprises. Sheep and goat operations have been used in the past, but currently there are very few. Sustainable stocking rates have declined over the years due to a change in the plant community to more brush. As the mid-grasses have been removed by continuous overgrazing and the invasion of mesquite and prickly pear, and the increase of lotebush, the production of plants desired by cattle have been drastically reduced.

To determine the correct stocking rate, an on-site evaluation must be made. Forage production by the different plant species must be determined. When calculating stocking rates, calculate the forage used by the wildlife first and then calculate the stocking rate for the livestock based on what desired forage is left because wildlife move randomly. (See guidance in the NRCS National Range and Pasture Handbook on calculating safe starting stocking rates.) Consult a rangeland management professional to assist with forage inventories.

As the plant community changes, the stocking rate for one animal species may decrease while the amount of desired forage for other animals may increase. For instance, as grass production decreases, and the forbs and shrub/vine production increases, the production for food and cover for quail and whitetail deer are increasing. Therefore, the early stages of (3) Mid and Short Grass with mesquite, sideoats grama-buffalograss-Texas wintergrass-meadow dropseed-mesquite steady state may be outstanding for quail, turkey and deer. In the manager's goals he or she may desire to maintain all or part of their land in this steady state to meet their overall wildlife and domestic livestock plan.

It should also be understood that wildlife species may use this site for only a portion of their habitat needs. For more specific guidance, consult a professional biologist or refer to a habitat appraisal guide for the desired management species. Smaller mammals on the site include rodents, jackrabbit, cottontail rabbit, raccoon skunks, opossum, and armadillo. Mammalian predators include coyote, red fox, gray fox, and bobcat. Species of snakes and lizards are native to the site.

Many species of birds are found on this site including game birds, song birds and birds of prey. Major game birds that are economically important are Rio Grande turkey, bobwhite quail, and mourning dove. Turkey prefers plant communities with substantial amounts of shrubs and trees interspersed with grassland. Quail prefer plant communities with a combination of low shrubs, bunch grass, bare ground and low successional forbs. The different song birds vary in their habitat preferences. In general, habitat that provides a large variety of grasses, forbs,

shrubs, vines and trees and a complex of grassland, savannah, shrubland and woodland will support a good variety and abundance of songbirds. Birds of prey are important to keep the numbers of rodents, rabbits and snakes in balance. The different plant communities of the site will sustain different species of raptors.

Feral hogs are present on this site in many instances. They can cause much damage to the site as they up root the desirable plants and spread prickly pear through droppings.

Hydrological functions

The land form is a plain that ranges in elevation from 850 to 2300 feet above sea level. The hydrologic group is D and the runoff class is high to very high. The drainage class is well to moderately well-drained. Permeability class is very slow. There is no water table within 6 feet of the surface, except in the case of Hassee and Waurika soils. These soils during wet times have a water table from within 9 to 12 inches of the surface, respectively. Site does not pond water and the area does not flood.

The Mid/Shortgrass Prairie steady state has a very favorable influence on the infiltration and deep percolation of rainfall. As the site is overgrazed there is a reduction in the mid-grasses. As this change occurs, organic matter in the soil is reduced. This has a negative impact on infiltration and water holding capacity of the soil. Research has shown that there is a marked difference in infiltration on Sideoats grama dominated sites as compared to buffalograss dominated sites. More runoff is generated from rainfall, and erosion becomes more evident. When the soil is dry, it cracks. This allows rapid infiltration at first, but as the cracks close, infiltration is greatly reduced. Light showers tend to be ineffective on this site.

As the site is invaded by mesquite, the water cycle is further altered. Interception of rainfall by tree canopies is increased which reduces the amount of rainfall reaching the surface. Stem flow is increased due to the funneling effect of the canopy, which increases soil moisture at the base of the tree. Increased transpiration, especially when mesquite dominates, provides less chance for water storage for grass and forb growth. As woody species increase, grass cover decreases, which causes some of the same effects as overgrazing. During dryer years, there is little grass and forb production on this site exposing much bare ground. Brush management combined with good grazing management is essential to restore and maintain the natural hydrology of the site.

Recreational uses

This site has the appeal of the wide open spaces. The abundant midgrasses, such as sideoats grama and Arizona cottontop, with the scattered condalia provides excellent fall color variations. This site produces a variety of plant communities, ranging from open prairie to dense mesquite. Therefore, it produces wildlife foods and cover in varying degrees, providing habitat for bird watching, viewing deer, turkey, and quail, as well as hunting.

Wood products

Honey mesquite can be used for firewood and the specialty wood industry. Some larger mesquite can be found on this site, especially along water drainage ways.

Other products

None.

Other information

None.

Inventory data references

Information presented here has been derived from limited NRCS clipping data and field observations of range trained personnel.

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Approval

Bryan Christensen, 9/19/2023

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

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, Soil Survey Region 9
Contact for lead author	colin.walden@ok.usda.gov
Date	02/13/2018
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Minimal evidence of current or past rill formation.

2. **Presence of water flow patterns:** Few water flow patterns on steep areas. Short and stable, not incising.

3. **Number and height of erosional pedestals or terracettes:** No pedestals or terracettes present.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 10 percent. Bare areas small and not connected.

5. **Number of gullies and erosion associated with gullies:** No gullies present.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement less than 3 feet. Vegetative cover should restrict litter movement over long distances. Only herbaceous litter less than .25 inches expected to move.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability scores of 5 or greater expected.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Callahan:

Ap--0 to 7 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/4) moist; massive; hard, firm

See official description for specific soil component.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Presence of native midgrasses and few tallgrasses allow for good infiltration across landscape. However, some runoff still expected due to the nature of the clay subsoils.
-

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction under reference conditions. Beware texture change of Bt horizon not product of compaction.
-

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: Midgrasses (Group 1&2)

Sub-dominant: Other grasses (3,4,5)

Forbs (6)

Other: Shrubs (7)

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Possible mortality only during prolonged drought. Less than 5%.
-

14. **Average percent litter cover (%) and depth (in):** Litter expected to be at 75% cover at average .25 inch depth.
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production 2,500 lb/ac. Ranging from 1,500 to 3,500 lbs.
-

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:** Mesquite and Juniper(ash juniper/eastern redcedar) most common invaders.
-

17. **Perennial plant reproductive capability:** Plants should be capable of reproducing every year with exception of prolonged growing season drought.

