

Ecological site R087BY004TX Sandy

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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.

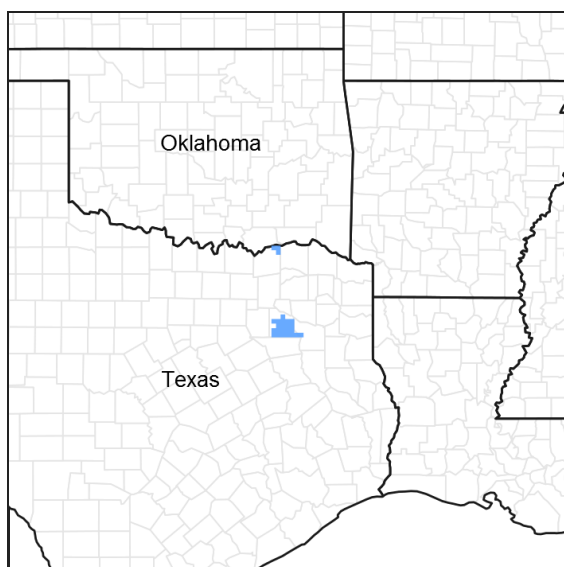


Figure 1. Mapped extent

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): 087B–Texas Claypan Area, Northern Part

This area is in northeastern Texas (79 percent) and southeastern Oklahoma (21 percent). It makes up about 4,480 square miles (11,610 square kilometers). The towns of Greenville, Sulphur Springs, Paris, Mount Vernon, Canton, and Athens, Texas, and Durant, Oklahoma, are in this MLRA. Interstates 30 and 20 and Highways 69, 70, 80, and 82 cross the area. The Caddo National Grasslands is in the north end of the area.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.

-Major Land Resource Area (MLRA) 87B

Ecological site concept

The Sandy sites are characterized by a sandy surface layer that extends 20 to 40 inches to a sandy clay loam subsurface layer. The sites are more productive and less droughty than soils with deeper sands, but not as productive as soils with a higher clay content.

Associated sites

| | |
|-------------|-----------------------|
| R087BY006TX | Very Deep Sand |
| R087BY003TX | Sandy Loam |
| R087BY005TX | Deep Sand |

Similar sites

| | |
|-------------|--------------|
| R087AY006TX | Sandy |
|-------------|--------------|

Table 1. Dominant plant species

| | |
|------------|---|
| Tree | (1) <i>Quercus stellata</i> (2) <i>Quercus marilandica</i> |
| Shrub | Not specified |
| Herbaceous | (1) <i>Schizachyrium scoparium</i> (2) <i>Sorghastrum nutans</i> |

Physiographic features

These soils are on gently sloping to strongly sloping ridges and stream terraces. Slopes range from 1 to 15 percent. Runoff is very low due to the sandy nature of the soils.

Table 2. Representative physiographic features

| | |
|--------------------|------------------------------------|
| Landforms | (1) Plains > Interfluve |
| Runoff class | Very low to low |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 76–229 m |
| Slope | 1–15% |
| Water table depth | 152–203 cm |
| Aspect | Aspect is not a significant factor |

Climatic features

The average annual precipitation is 47 inches in most of this area, but it can be higher or lower depending on the exact location. Most of the rainfall occurs in spring and winter. The average annual temperature is 62 to 66 degrees F. The freeze-free period averages 235 days and frost-free period averages 210 days.

Table 3. Representative climatic features

| | |
|-------------------------------|----------|
| Frost-free period (average) | 210 days |
| Freeze-free period (average) | 235 days |
| Precipitation total (average) | 1,194 mm |

Climate stations used

- (1) EMORY [USC00412902], Emory, TX
- (2) LAKE FORK RSVR [USC00414976], Quitman, TX
- (3) MT PLEASANT [USC00416108], Mount Pleasant, TX
- (4) BONHAM 3NNE [USC00410923], Bonham, TX

- (5) DENISON DAM [USC00412394], Cartwright, TX
- (6) MT VERNON [USC00416119], Mount Vernon, TX
- (7) BOSWELL 1 S [USC00340980], Boswell, OK
- (8) DURANT [USC00342678], Durant, OK
- (9) CLARKSVILLE 2NE [USC00411772], Clarksville, TX
- (10) PARIS [USC00416794], Paris, TX

Influencing water features

A stream does not influence the plant community of this site.

Wetland description

Wetlands are not associated with this site.

Soil features

The soils are very deep, loamy fine sands with a surface 20 to 40 inches thick over sandy clay loam subsoils. Water soaks rapidly into the porous soils. Even light showers penetrate below the evaporation zone and are more effective on this site than sites with deeper sands. Water retention is relatively low but the soils give up a high percent of their moisture to growing plants. Although air, water, and plant roots move through the soil with ease, frequent rains are needed to produce optimum plant growth. Inherent low fertility causes these soils to produce forage of lower quantity than associated sites with higher clay content. The site is subject to erosion where adequate herbaceous cover is not maintained and on heavy use areas such as roads and livestock trails. Wolfpen is the representative soil with a taxonomic classification of loamy, siliceous, semiactive, thermic Arenic Paleudalf.

Table 4. Representative soil features

| | |
|--|----------------------------------|
| Parent material | (1) Residuum—sandstone and shale |
| Surface texture | (1) Loamy sand |
| Family particle size | (1) Loamy |
| Drainage class | Well drained |
| Permeability class | Moderately slow |
| Soil depth | 203 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 7.62–10.16 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Electrical conductivity (0-101.6cm) | 0–1 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 4.5–6.5 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–2% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

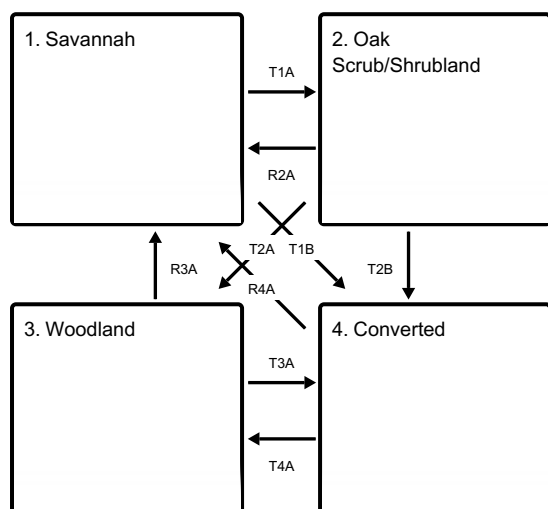
Ecological dynamics

The Sandy site evolved and was maintained by the grazing and herding effects of native wild large ungulates, periodic fires, and climatic fluctuations. Conversion of this site to cropland and the subsequent abandonment of cropping removed the natural native vegetation, organic matter, and fertility and allowed woody species to dominate the site. Continuous grazing by confined domestic livestock and the suppression of fire on non-cropland sites removes little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), and preferred forbs such as tephrosia (*Tephrosia* spp.) and prairie clover (*Dalea* spp.).

Less productive perennial and annual grasses and forbs will replace these plants. Years of continuous grazing generally lead to periods of prolonged rest for recovery of the perennial herbaceous plant component. These prolonged rest periods with no fire or brush management lead toward a community dominated by woody species such as winged elm (*Ulmus alata*), yaupon (*Ilex vomitoria*), post oak (*Quercus stellata*), and eastern red cedar (*Juniperus virginiana*).

State and transition model

Ecosystem states



T1A - Heavy continuous grazing, no brush management, abandonment

T1B - Brush management, crop cultivation, pasture planting

R2A - Brush management, prescribed grazing, prescribed burning

T2A - Heavy continuous grazing, no brush management, abandonment

T2B - Brush management, crop cultivation, pasture planting

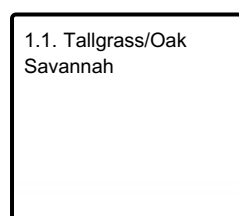
R3A - Brush management, range planting, prescribed grazing

T3A - Brush management, crop cultivation, pasture planting

R4A - Range planting, prescribed grazing, prescribed burning

T4A - Heavy continuous grazing, no brush management, abandonment

State 1 submodel, plant communities



State 2 submodel, plant communities

2.1. Oak
Scrub/Shrubland

State 3 submodel, plant communities

3.1. Post Oak/Elm
Woodland

State 4 submodel, plant communities

4.1. Converted Land

State 1 Savannah

One community exists in the Savannah State, the 1.1 Tallgrass/Oak Savannah Community. The State is dominated by warm season perennial grasses and the overstory canopy cover is less than 25 percent.

Community 1.1 Tallgrass/Oak Savannah

The characteristic plant community of this site is the reference plant community. This site is an open savannah of post oak and blackjack oak (*Quercus marilandica*) trees that shade 20 to 25 percent of the ground. The herbaceous component is mid and tallgrasses and is dominated by little bluestem which usually makes up 50 to 75 percent of the total annual production. Indiangrass, purpletop tridens (*Tridens flavus*), switchgrass, beaked panicum (*Panicum anceps*), sand lovegrass (*Eragrostis trichodes*), brownseed paspalum (*Paspalum plicatulum*), and thin paspalum (*Paspalum setaceum*) also occur. Cool season forage plants are scarce on this site. A variety of shrubs, vines, and forbs occur in this community. Grazing prescriptions that permit acceptable grazing periods and allow adequate rest periods along with prescribed fire every five to seven years are important in the maintenance of the reference herbaceous plant community and the savannah landscape structure. Continuous overgrazing or over rest and the absence of fire tend to allow a vegetative shift towards woody species. Without corrective measures, this shift will continue to the Shrubland State.

State 2 Oak Scrub/Shrubland

One community exists in the Shrubland State, the 2.1 Oak Scrub/Shrubland Community. The herbaceous production is not as great compared to the Savannah State, and overstory canopy has increased between 25 and 50 percent.

Community 2.1 Oak Scrub/Shrubland

This plant community is a transitional community between the Savannah and Woodland States. It develops in the absence of fire or mechanical or chemical brush management treatments. It is usually the result of abandonment

following either cropping or yearly continuous grazing. Trees and shrubs begin to encroach onto pastureland or replace the grassland component of the Tallgrass/Oak Savannah Community. In addition to the naturally occurring oaks, other woody species such as eastern persimmon, winged elm, and eastern red cedar increase in density and canopy coverage (25 to 50 percent). Remnants of little bluestem and Indiangrass may still occur but the herbaceous component of the community becomes dominated by lesser producing grasses and forbs. Initially, species such as brownseed paspalum (*Paspalum plicatulum*), tall dropseed (*Sporobolus compositus*), and fall witchgrass (*Digitaria cognata*) replace the taller grasses. As the site continues to transition, the plants which increase or invade on the site include sandbur (*Cenchrus* spp.), red lovegrass (*Eragrostis secundiflora*), Yankeeweed (*Eupatorium compositifolium*), bullnettle (*Cnidoscolus texanus*), croton (*Croton* spp.), snake cotton (*Froelichia* spp.), prickly pear (*Opuntia* spp.), queen's delight (*Stillingia texana*), beebalm (*Monarda* spp.), and baccharis (*Baccharis* spp.). Prescribed burning on a three to five year interval in conjunction with prescribed grazing may be a viable option for returning this site to the Savannah State providing woody canopy cover is less than 50 percent and adequate herbaceous fine fuel still exists. When this threshold is exceeded, mechanical or chemical brush control becomes necessary to move this transitional community back towards the Savannah State.

State 3 Woodland

One community exists in the Woodland State, the Post Oak/Elm Woodland Community. The site is characterized by little herbaceous production. The overstory canopy is over 50 percent and shrubs also limit light to the surface.

Community 3.1 Post Oak/Elm Woodland

This plant community is a closed overstory (50 to 80 percent) woodland dominated by post oak, winged elm, blackjack oak, black hickory (*Carya texana*), and eastern red cedar. Understory shrubs and sub-shrubs include yaupon, farkleberry, possumhaw (*Ilex decidua*), and American beautyberry (*Callicarpa americana*). Woody vines also occur and include poison ivy (*Toxicodendron radicans*), grape (*Vitis* spp.), greenbriar (*Smilax* spp.), Virginia creeper (*Parthenocissus quinquefolia*), and peppervine (*Ampelopsis arborea*). A herbaceous understory is almost nonexistent, but shade-tolerant species including longleaf woodoats (*Chasmanthium sessiliflorum*), cedar sedge (*Carex planostachys*), ironweed (*Veronia baldwinii*), and goldenrod (*Solidago* spp.) may occur in small amounts. Prescribed burning in conjunction with prescribed grazing may be used to convert this site back to a Savannah State but generally it takes many consecutive years of burning due to light fine fuel loads comprised mainly of hardwood tree leaves. Weather conditions are rarely conducive to burning this fuel type in this region. Chemical brush control on a large scale is not a viable treatment option on this site due to the resistance of yaupon to broadcast herbicide applications. However, individual plant treatment with herbicides on small acreage is a viable option. Mechanical treatment of this site, along with seeding, is the most viable option for reversion back to the reference community. Although, the economic viability of this option is questionable.

State 4 Converted

The Converted Land State contains one community, the 4.1 Converted Land Community. The state is characterized by the land manager farming crops or planted grasses.

Community 4.1 Converted Land

Conversion of this site to cropland occurred from the middle 1800's to the early 1900's. Some remains in cropland today, typically cotton (*Gossypium* spp.), corn (*Zea mays*), sorghum (*Sorghum* spp.), and soybeans (*Glycine max*). Specifically, this site is used for watermelons, peas, sweet potatoes, and peanuts. Ditching, land leveling, and levee construction has significantly changed the topography and hydrology on many acres of this site. While restoration of this site to a semblance of the reference plant community is possible with seeding and prescribed grazing, complete restoration of the reference community in a reasonable time is very unlikely. Following crop production, this site is often planted to native or introduced grasses and legumes for livestock grazing or hay production. Typical species planted include improved Bermudagrass varieties, bahiagrass, switchgrass, dallisgrass, eastern gamagrass, annual ryegrass (*Lolium multiflorum*), and white clover. Many of the introduced species (bahiagrass,

Bermudagrass, and dallisgrass) are invasive-moving by wind, water, and animals. Once established, they are extremely difficult to remove and will hinder the reestablishment of native species. The establishment and maintenance of these species requires cultivation, fertilization, weed control, and prescribed grazing management.

Transition T1A

State 1 to 2

The Savannah State will transition to the Shrubland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 25 percent and grasses shift composition to more shade-tolerant species.

Transition T1B

State 1 to 4

The transition to the Converted State occurs when the site is plowed for planting crops or pasture. The driver for the transition is the land manager's decision to farm the site.

Restoration pathway R2A

State 2 to 1

Restoration back to the Savannah State requires brush management, prescribed grazing and/or prescribed fire. Mechanical or chemical controls can be used to remove the woody overstory species and shrubs. Prescribed grazing may require destocking and/or deferment.

Transition T2A

State 2 to 3

The Shrubland State will transition to the Woodland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 50 percent and grasses shift composition to more shade-tolerant species.

Transition T2B

State 2 to 4

The transition to the Converted State occurs when the site is plowed for planting crops or pasture. The driver for the transition is the land manager's decision to farm the site.

Restoration pathway R3A

State 3 to 1

Restoration back to the Savannah State requires substantial energy inputs. Brush management and prescribed grazing will be needed to shift the community back to the reference state. Mechanical or chemical controls can be used to remove the woody overstory species back below 25 percent. Prescribed grazing may require destocking and/or deferment to manage the understory grasses back to those found in the reference community. Fire may be an option, but only if adequate amounts of fine fuel exist in the understory.

Transition T3A

State 3 to 4

The transition to the Converted State occurs when the site is plowed for planting crops or pasture. The driver for the transition is the land manager's decision to farm the site.

Restoration pathway R4A

State 4 to 1

The restoration to State 1 can occur when the land manager ceases agronomic practices. Range planting of native species found in the reference community will be required to bring back a similar community as the State 1 plant

composition. The extent of previous soil disturbances will determine how much seedbed preparation will be needed, as well as the ability to be restored. Proper grazing and brush management will be required to ensure success.

Transition T4A

State 4 to 3

The Converted Land State will transition to the Woodland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 50 percent and grasses shift composition to more shade-tolerant species.

Additional community tables

Animal community

The historic savannah provided habitat to bison, deer, turkey, migratory birds and large predators such as wolves, coyotes, mountain lions, and black bear. White-tailed deer, turkey, coyotes, bobcats, and migratory birds find suitable habitat in these savannahs today. Domestic livestock and exotic ungulates are the dominant grazers and browsers on this site. As the savannah transitions through the various vegetative states towards the woodlands, the quality of the habitat may improve for some species and decline for others. Management must be applied to maintain a vegetative state in optimum habitat quality for the desired animal species.

Hydrological functions

Peak rainfall periods occur in May and June from frontal passage thunderstorms and in September and October from tropical systems as well as frontal passages. Rainfall amounts may be high (three to five inches per event) and events may be intense. Extended periods (60 days) of little to no rainfall during the growing season are common. Because of the gently sloping to sloping topography with a rapid intake rate of the surface sands and very rapid permeability of the soils, there is usually little to no runoff on this site. Water from these somewhat excessively drained soils provides groundwater recharge.

Recreational uses

Hunting, camping, bird watching, and equestrian are all common activities.

Wood products

Oaks are used for firewood. Hickory and mesquite are used for barbecue wood. Yaupon is used for landscaping.

Other products

Fruit from dewberries, grapes, and plums are harvested.

Inventory data references

These site descriptions were developed as part a Provisional Ecological Site project using historic soil survey manuscripts, available site descriptions, and low intensity field traverse sampling. Future work to validate the information is needed. This will include field activities to collect low, medium, and high-intensity sampling, soil correlations, and analysis of that data. A final field review, peer review, quality control, and quality assurance review of the will be needed to produce the final document.

Other references

1. Archer, S. 1994. Woody plant encroachment into southwestern grasslands and savannas: rates, patterns and proximate causes. In: Ecological implications of livestock herbivory in the West, pp. 13-68. Edited by M. Vavra, W. Laycock, R. Pieper. Society for Range Management Publication, Denver, CO.
2. Archer, S. and F.E. Smeins. 1991. Ecosystem-level Processes. Chapter 5 in: Grazing Management: An Ecological Perspective. Edited by R.K. Heitschmidt and J.W. Stuth. Timber Press, Portland, OR.
3. Bestelmeyer, B.T., J.R. Brown, K.M. Havstad, R. Alexander, G. Chavez, and J.E. Herrick. 2003. Development

- and use of state-and-transition models for rangelands. *J. Range Manage.* 56(2): 114-126.
4. Brown, J.R. and S. Archer. 1999. Shrub invasion of grassland: recruitment is continuous and not regulated by herbaceous biomass or density. *Ecology* 80(7): 2385-2396.
 5. Foster, J.H. 1917. Pre-settlement fire frequency regions of the United States: a first approximation. Tall Timbers Fire Ecology Conference Proceedings No. 20.
 6. Gould, F.W. 1975. The Grasses of Texas. Texas A&M University Press, College Station, TX. 653p.
 7. Hamilton, W. and D. Ueckert. 2005. Rangeland Woody Plant Control: Past, Present, and Future. Chapter 1 in: *Brush Management: Past, Present, and Future*. pp. 3-16. Texas A&M University Press.
 8. Scifres, C.J. and W.T. Hamilton. 1993. Prescribed Burning for Brush Management: The South Texas Example. Texas A&M University Press, College Station, TX. 245 p.
 9. Smeins, F., S. Fuhlendorf, and C. Taylor, Jr. 1997. Environmental and Land Use Changes: A Long Term Perspective. Chapter 1 in: *Juniper Symposium 1997*, pp. 1-21. Texas Agricultural Experiment Station.
 10. Stringham, T.K., W.C. Krueger, and P.L. Shaver. 2001. State and transition modeling: and ecological process approach. *J. Range Manage.* 56(2):106-113.
 11. Texas Agriculture Experiment Station. 2007. Benny Simpson's Texas Native Trees (<http://aggie-horticulture.tamu.edu/ornamentals/natives/>).
 12. Texas A&M Research and Extension Center. 2000. Native Plants of South Texas (<http://uvalde.tamu.edu/herbarium/index.html>).
 13. Thurow, T.L. 1991. Hydrology and Erosion. Chapter 6 in: *Grazing Management: An Ecological Perspective*. Edited by R.K. Heitschmidt and J.W. Stuth. Timber Press, Portland, OR.
 14. USDA/NRCS Soil Survey Manuals counties within MLRA 8BA.
 15. USDA, NRCS. 1997. National Range and Pasture Handbook.
 16. USDA, NRCS. 2007. The PLANTS Database (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
 17. Vines, R.A. 1984. Trees of Central Texas. University of Texas Press, Austin, TX.
 18. Vines, R.A. 1977. Trees of Eastern Texas. University of Texas Press, Austin, TX. 538 p.
 19. Wright, H.A. and A.W. Bailey. 1982. Fire Ecology: United States and Southern Canada. John Wiley & Sons, Inc.

Contributors

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Approval

Bryan Christensen, 9/21/2023

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

| | |
|---|-------------------|
| Author(s)/participant(s) | |
| Contact for lead author | |
| Date | 05/12/2025 |
| Approved by | Bryan Christensen |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

Indicators

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

2. **Presence of water flow patterns:**

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

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

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

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

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

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

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**
