USDA Natural Resources Conservation Service

# Ecological site F152BY011TX
# Swamp

Last updated: 9/22/2023
Accessed: 04/28/2024

## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

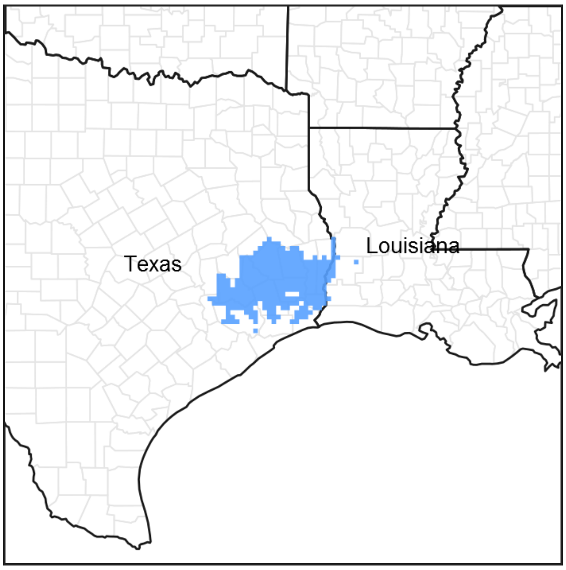



**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

## MLRA notes

Major Land Resource Area (MLRA): 152B–Western Gulf Coast Flatwoods

Major Land Resource Area (MLRA) 152B, Western Gulf Coast Flatwoods, is in eastern Texas and western Louisiana. Locally termed the Flatwoods, the area is dominated by coniferous forest covering 5,681 square miles (14,714 square kilometers). The region is a hugely diverse transition zone between the northern and eastern mixed forests and southern and western coastal prairies and grasslands.

## Classification relationships

Major Land Resource Area (MLRA) (USDA-Natural Resources Conservation Service, 2006)

## Ecological site concept

The Swamp ecological site has very deep, very poorly drained soils greater than 80 inches (203 centimeters) that are ponded throughout a portion of the year. A wetland plant community exists because it is the lowest position on the landscape, along with the flooding and ponding regimes.

## Associated sites

| | |
|---|---|
| F152BY010TX | **Terrace**<br>Soils are loamy throughout, better drained, and on a higher landform. |
| F152BY013TX | **Poorly Drained Loamy Bottomland**<br>Soils are loamy throughout, better drained, and on a higher landform. |
| F152BY014TX | **Poorly Drained Clayey Bottomland**<br>Soils are better drained, clayey throughout, and on a higher landform. |

## Similar sites

| | |
|---|---|
| F152BY013TX | **Poorly Drained Loamy Bottomland**<br>Soils are loamy throughout, better drained, and on a higher landform. |
| F152BY001TX | **Depressional**<br>Soils are on a higher landform and not ponded as long. |
| F152BY014TX | **Poorly Drained Clayey Bottomland**<br>Soils are better drained, clayey throughout, and on a higher landform. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Taxodium distichum* |
| Shrub | (1) *Cephalanthus occidentalis* |
| Herbaceous | (1) *Lemna*<br>(2) *Ludwigia palustris* |

## Physiographic features

The ecological site includes areas on nearly level soils in water receiving positions of oxbows and relict channels. Flooding is most frequent during the months of February through May. The flooding saturates the soils which stay ponded up to 4 feet in depth for long durations. Slopes is 0 to 1 percent. Elevation ranges from 10 to 150 feet.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) River valley > Swamp<br>(2) River valley > Oxbow |
| Runoff class | Negligible |
| Flooding duration | Very long (more than 30 days) |
| Flooding frequency | Frequent |
| Ponding duration | Very long (more than 30 days) |
| Ponding frequency | Frequent |
| Elevation | 3–46 m |
| Slope | 0–1% |
| Ponding depth | 0–122 cm |
| Water table depth | 0 cm |
| Aspect | Aspect is not a significant factor |

## Climatic features

The Western Gulf Coast Flatwoods (MLRA 152B) is within the humid subtropical climate zone. The region boasts one of the highest rainfall averages in the southern United States, over 60 inches (152 centimeters) annually. This is due to the gulf currents that carry humid air to the region, where it condenses and precipitates. Rainfall averages are fairly consistent month by month, ranging from the lowest of 3.5 inches (8.9 centimeters) in March and the highest of 5.6 inches (14.3 centimeters) in June.

The area is prone to severe thunderstorms and tornadoes when the proper conditions exist, generally in the springtime. Sometimes excessive rainfall occurs, leading to flooding. Hurricanes also strike the region, generally in late summer or early fall. These extreme weather events can be quite destructive, toppling trees, and serves to naturally reset the vegetation to primary succession. The higher humidity of the region amplifies the feeling of heat during the summer. Prolonged droughts and snowfall events are rare.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 249 days |
| Freeze-free period (average) | 289 days |
| Precipitation total (average) | 1,600 mm |

## Climate stations used

- (1) LIBERTY [USC00415196], Liberty, TX
- (2) LUMBERTON [USC00415435], Silsbee, TX
- (3) TOWN BLUFF DAM [USC00419101], Jasper, TX
- (4) DE QUINCY [USC00162361], Dequincy, LA
- (5) ELIZABETH [USC00162800], Oakdale, LA
- (6) CLEVELAND [USC00411810], Cleveland, TX
- (7) WILDWOOD [USC00419754], Kountze, TX
- (8) DE RIDDER [USC00162367], Deridder, LA
- (9) OBERLIN FIRE TWR [USC00166938], Oberlin, LA
- (10) ORANGE 9 N [USC00416680], Orange, TX

## Influencing water features

The Swamp ecological site is a semi-permanently flooded wetland. The site supports hydrophytic vegetation and the soils are hydric.

## Wetland description

The soils in this site are hydric. Wetland hydrology and vegetation dominate the site. Some sites may have small areas of non-hydric soils. Onsite investigation is needed to determine the local conditions.

## Soil features

The soils of this site are deep and characterized by gleyed horizons throughout the entire soil profile, measured to 80 inches (203 centimeters). The gleying, or grey soil color, is a result of anaerobic conditions from the soils being saturated for long periods. The soils show little soil development indicative of the entisols soil order. The surface layer is darkest and the underlying subsoil layers are mostly distinguished by color and exhibit more hydric soil features besides gleying. Iron-manganese masses, oxidized root channels, and other indicators of anoxic conditions are evident. The Cowmarsh series is a representative soil and consists of very deep, very poorly drained soils that formed in clayey alluvial deposits of the Holocene age. The series is classified as a fine, smectitic, acid, thermic Typic Fluvaqeunt. Other soils are included within the ecological site have the same influencing water features and support hydrophytic vegetation. Besides the Cowmarsh series, Deweyville is included in the Swamp ecological site.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium–igneous, metamorphic and sedimentary rock |
| Surface texture | (1) Mucky silty clay<br>(2) Mucky silt loam |
| Family particle size | (1) Clayey |
| Drainage class | Very poorly drained |

| | |
|---|---|
| Permeability class | Very slow |
| Soil depth | 203 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-152.4cm) | 12.7–22.86 cm |
| Calcium carbonate equivalent (0-152.4cm) | 0% |
| Electrical conductivity (0-152.4cm) | 0–1 mmhos/cm |
| Sodium adsorption ratio (0-152.4cm) | 0–2 |
| Soil reaction (1:1 water) (0-152.4cm) | 3.5–5 |
| Subsurface fragment volume <=3" (Depth not specified) | 0% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

The information in this ecological site description (ESD), including the state-and-transition model (STM), was developed using archeological and historical data, professional experience, and scientific studies. The information is representative of a complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals, and ecological processes are described to inform land management decisions.

Introduction – In southeastern Texas and southwestern Louisiana the transition from coastal grasslands to the large expanse of coniferous forest has been deemed the “Flatwoods”. As the name suggests, the region is relatively flat and, with many transitional areas, highly diverse in flora and fauna. Historically, the area was covered by pines with mixed hardwoods, sparse shrubs, and a diverse understory of grasses and forbs. Fire and drainage patterns play a significant role in shaping the plant communities and their development. Fire suppression, drainage alterations, and land conversion have reduced the amount of historical communities in existence today.

Background – Prior to settlement by the Europeans, the reference state for the Swamps were Bald Cypress Forests. Remnants of this presumed historic plant community still exist where natural conditions are intact. Evidence of the reference state is found in accounts of early historic explorers to the area, historic forest and biological survey teams, as well as recent ecological studies in the last 30 years. The age of this community varies and supports a diverse flora.

Settlement Management – As human settlement increased throughout the area, so did the increase in logging and grazing by domestic livestock. The logging became so extensive that by the 1930’s most of the region had been cut-over. Replanting trees to historic communities was not common and early foresters began planting loblolly pine (*Pinus taeda*) for its quick growth. As more people colonized they began suppressing fire, which allowed dense thickets of shrubs to replace the herbaceous understory. While this is typical for most of the region, unless the drainage patterns were altered in the swamp areas, they have retained their natural species makeup and loblolly is not often seen in the swamps.

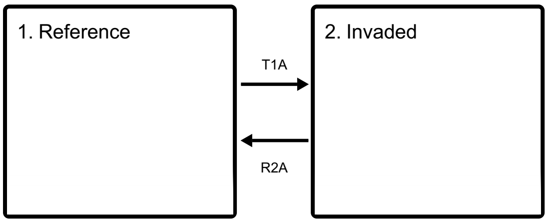
Current Management and State – Today much of the historic forest is gone, replaced by pine plantations, crops, and pastures. The areas that were not converted have been fire-suppressed so long that loblolly pine and fire intolerant hardwoods populate the overstory structure. Currently, federally-managed properties are the best place to view the remnant sites (National Park Service, U.S. Fish and Wildlife Service, etc.). Some private individuals have begun restoring communities through selective tree planting and retention of communities that remain. Other restoration efforts include mimicking natural-disturbance regimes through gap-phase regeneration on plantation sites.

Fire Regimes – Fire was a natural and important disturbance throughout the region. Fire occurred naturally from lightning strikes, by Native Americans for game movement, and eventually early European settlers. Fires throughout the Flatwoods occurred at two different times. Early in the year, they would occur during late winter and early spring, removing senescent vegetation, recycling nutrients and minerals, and spurring new plant growth. Late summer and early fall fires occurred as well, but with a different community effect. Summer fires burned hotter and with more intensity, greatly suppressing the shrub canopy layer. The summer fires also shifted the ecological site transitional state by decreasing grass densities and increasing forb densities. The topography, fuel loads, and other conditions caused patchy burns throughout the region resulting in mosaic patterns of plant communities and a heterogeneous landscape.

Disturbance Regimes – Extreme weather events occur occasionally throughout the region. Tornados uproot trees and open canopies in the spring months. In the late summer and early fall, hurricanes or tropical depressions can make landfall, dumping excessive amounts of rain and toppling trees with high winds. Another cause of large canopy openings is the effects of the southern pine beetle (Dendroctonus frontalis). Starting in the late 1950’s, beetle outbreaks have occurred every 6 to 9 years (although a major attack has not occurred in some time); usually when the trees are stressed due to multiple environmental factors. Flooding is the disturbance that affects the swamp sites most often. The amount and timing of flooding events shapes the plant communities by allowing only species adapted to the hydrologic conditions to thrive.

## State and transition model

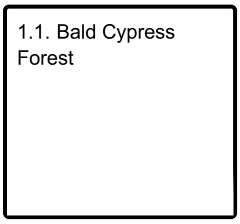
**Ecosystem states**



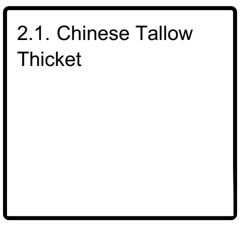

**T1A** - Introduction of highly competitive, non-native species

**R2A** - Biological, chemical and/or mechanical control of non-native species

**State 1 submodel, plant communities**




**State 2 submodel, plant communities**




## State 1
## Reference

The Swamp ecological site is a Bald Cypress Forest, usually ranging from 75 to 95 percent canopy cover. The dominant force in shaping the Swamp is the semi-permanent inundation of water. The hydrology does not allow oxygen to flow through the soil, causing anoxic conditions. Some soil indicators include: gleyed (grey) colors with redoximorphic features (reds and yellow intermixed) and the smell of rotten eggs when disturbed (release of hydrogen-sulfide gases). Bald cypress have adapted to the conditions and are the dominant as the overstory tree with water tupelo (*Nyssa aquatica*). Cypress “knees” can usually be found emerging from the soil as an adaption to acquire more oxygen.

### Community 1.1
### Bald Cypress Forest

The vegetation that has adapted to the anaerobic conditions are dominant. The United State Army Corps of Engineers (USACOE) classifies plants that occur in wetlands with an estimated probability greater than 99 percent obligate (OBL), and those 67 to 99 percent facultative wetland (FACW) plants. Obligate and facultative wetland plants are the most common encountered throughout the Swamps. When submerged, indicator species include coon’s tail (*Ceratophyllum demersum*) and duckweeds (Azolla sp., Lemna sp., and Wolffia sp.). When the conditions are drier, or more near the periphery, indicator species are swamp smartweed (*Polygonum hydropiper*oides), marsh seedbox (*Ludwigia palustris*), and various sedges (Carex sp. and Cyperus sp.).

### State 2
### Invaded

Giant salvinia (*Salvinia molesta*) is a small free-floating plant native to South America. It is rapidly growing and able to double in size every 4 to 10 days under good conditions. Colonies that cover the surface cut off light to native plants and can cause oxygen depletions. The depletions are detrimental to an already low-oxygen environment. Further, decomposition of dead salvinia in the water column can further deplete oxygen levels, causing fish kills. Salvinia has no known direct food value to native wildlife.

### Community 2.1
### Chinese Tallow Thicket

Other aquatic pests include alligatorweed (*Alternanthera philoxeroides*), water hyacinth (*Eichhornia crassipes*), hydrilla (Hydrilla sp.), and Chinese tallow (*Triadica sebifera*). As with salvinia, these noxious weeds out-compete the native plants. They lack natural control and upset the balance of the natural environment. Control of noxious weeds often proves difficult, expending great amounts of energy. Research, federal, and state agencies have devoted a great deal of time in developing management options for the control of these species.

### Transition T1A
### State 1 to 2

The transition from the Reference (State 1) to the Invaded (2) is a result of occupancy by noxious weeds. Invasion can be enhanced by clearing of the overstory. Invasive plants outcompete, and eventually choke out, all other native species.

### Restoration pathway R2A
### State 2 to 1

The driver for restoration is removal of the noxious invasives. Control of the many aquatic invasives is difficult, requiring great effort. Mechanical options include seining or raking, but the plants will reestablish from any remaining fragments. Biological controls include using triploid grass carp. Permits are required before usage and may be purchased through certified dealers. Salvinia weevils (Cyrtobagous salvinae) have also been used for control. They are natural predators and feed only on salvinia. Biological controls will not completely eradicate invasives, but have proven beneficial in some circumstances. Several chemicals methods are available, including diquat, fluridone, glyphosate, penoxsalum, and flumioxazin. Some aquatic herbicides have water use restrictions and can potentially affect non-target species, so labels and restrictions should be studied prior to application. Careful understanding of consequences is necessary before application of any control method.

## Additional community tables

**Table 5. Community 1.1 forest overstory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) | Diameter (Cm) | Basal Area (Square M/Hectare) |
|---|---|---|---|---|---|---|---|
| **Tree** | | | | | | | |
| bald cypress | TADI2 | *Taxodium distichum* | Native | – | – | – | – |
| water tupelo | NYAQ2 | *Nyssa aquatica* | Native | – | – | – | – |

**Table 6. Community 1.1 forest understory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) |
|---|---|---|---|---|---|
| **Grass/grass-like (Graminoids)** | | | | | |
| flatsedge | CYPER | *Cyperus* | Native | – | – |
| redroot flatsedge | CYER2 | *Cyperus erythrorhizos* | Native | – | – |
| cypress swamp sedge | CAJO2 | *Carex joorii* | Native | – | – |
| sedge | CAREX | *Carex* | Native | – | – |
| **Forb/Herb** | | | | | |
| coon's tail | CEDE4 | *Ceratophyllum demersum* | Native | – | – |
| duckweed | LEMNA | *Lemna* | Native | – | – |
| mosquitofern | AZOLL | *Azolla* | Native | – | – |
| watermeal | WOLFF | *Wolffia* | Native | – | – |
| swamp smartweed | POHY2 | *Polygonum hydropiperoides* | Native | – | – |
| marsh seedbox | LUPA | *Ludwigia palustris* | Native | – | – |
| **Shrub/Subshrub** | | | | | |
| common buttonbush | CEOC2 | *Cephalanthus occidentalis* | Native | – | – |
| **Tree** | | | | | |
| bald cypress | TADI2 | *Taxodium distichum* | Native | – | – |
| water tupelo | NYAQ2 | *Nyssa aquatica* | Native | – | – |
| **Vine/Liana** | | | | | |
| Spanish moss | TIUS | *Tillandsia usneoides* | Native | – | – |

## Wood products

These soils occur in the Woodland Suitability Group 5w0. They are ponded for much of the year. Under normal conditions, these soils do not grow commercial stands of timber that are feasible to manage. The extreme moisture conditions make growth slow and erratic and thus undependable. Access and operability are poor and road construction should be avoided whenever possible.

## Inventory data references

This site description was developed as part of the provisional ecological site initiative using historic soil survey manuscripts, available range site descriptions, and low intensity field sampling.

## Type locality

| Location 1: Hardin County, TX | |
|---|---|
| UTM zone | N |
| UTM northing | 30.4963833 |
| UTM easting | -94.127613 |
| General legal description | Big Thicket National Forest – Jack Gore Baygall Unit |

## Other references

Ajilvsgi, G. 2003. Wildflowers of Texas. Revised edition. Shearer Publishing, Fredericksburg, TX.
Ajilvsgi, G. 1979. Wildflowers of the Big Thicket. Texas A&M University Press, College Station, TX.
Allen, J. A., B. D. Keeland, J. A. Stanturf, and A. F. Kennedy Jr. 2001. A guide to bottomland hardwood restoration. Technical report, USGS/BRD/ITR-2000-0011.
Bray, W. L. 1904. Forest resources of Texas. Bureau of Forestry Bulletin 47, Government Printing Office, Washington D.C.
Diggs, G. M., B. L. Lipscomb, M. D. Reed, and R. J. O'Kennon. 2006. Illustrated flora of East Texas. Second edition. Botanical Research Institute of Texas & Austin College, Fort Worth, TX.
Jones, S. D., J. K. Wipff, and P. M. Montgomery. 1997. Vascular plants of Texas: a comprehensive checklist including synonymy, bibliography, and index. University of Texas Press, Austin.
Liu, C., P. A. Harcombe, and I. S. Elsik. 1990. Fire study report, including Roy E. Larsen Preserve species list. Summer 1990. Department of Ecology and Evolutionary Biology, Rice University, Houston, TX.
Marks, P. L., and P. A. Harcombe. 1981. Forest Vegetation of the Big Thicket, southeast Texas. Ecological Monographs 51:287-305.
Matos, J. A. 1985. Roy E. Larsen Sandylands Sanctuary vascular plant species list. Master thesis, Stephen F. Austin University, Nacogdoches, TX.
NatureServe. 2002. International classification of ecological communities: Terrestrial vegetation of the United States. National forests in Texas final report. NatureServe, Arlington, VA.
Nixon, E. S. 2000. Trees, shrubs & woody vines of East Texas. Second edition. Bruce Lyndon Cunningham Productions, Nacogdoches, TX.
Randall, J. M., and J. Marinelli. 1996. Invasive plants: weeds of the global garden. Volume 149. Brooklyn Botanic Garden, Brooklyn, NY.
Stanturf, J. A., S. H. Schoenholtz, C. J. Schweitzer, and J. P. Shepard. 2001. Achieving restoration success: Myths in bottomland hardwood forests. Restoration Ecology, 9:189-200.
Stringham, T. K., W. C. Krueger, and P. L. Shaver. 2003. State and transition modeling: An ecological process approach. Journal of Range Management 56:106-113.
Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database.
Truett, J. C. 1984. Land of bears and honey: A natural history of East Texas. The University of Texas Press, Austin, TX.
Van Kley, J. E., R. L. Turner, L. S. Smith, and R. E. Evans. 2007. Ecological classification system for the national forests and adjacent areas of the West Gulf Coastal Plain. Second approximation. Stephen F. Austin University and The Nature Conservancy, Nacogdoches, TX.
USDA-NRCS Ag Handbook 296 (2006).
Vines, R. A. 1960. Trees, shrubs, and woody vines of the Southwest. University of Texas Press, Austin, TX.
Watson, G. E. 2006. Big Thicket Plant Ecology. Third Edition. University of North Texas Press, Denton, TX.

## Contributors

Tyson Hart

## Approval

Bryan Christensen, 9/22/2023

## Acknowledgments

Thanks to all involved during the preparation, sampling, and reviewing of the Flatwoods project. Thanks to Josh Berry, Dennis Brezina, Kenny Hall, Jason Hohlt, Stacey Kloesel, Ricky Lambert, Cody Langston, Mark Moseley, Ramiro Molina, Mike Oliver, Alan Peer, Sara Russell, Don Sabo, Mary Webb-Marek, and Jon Wiedenfeld for all their help.

## 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 | 09/21/2021 |
| 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:**

---