14510

West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Woody Wetland

Map Zones

37, 98

Model Splits or Lumps

This Biophysical Setting (BpS) is lumped with 1462.

Geographic Range

These systems were historically common in the Texas and Louisiana Southwest Flatwoods Subregion (The Nature Conservancy of Texas 2001), although only a few remnants remain today. Wet longleaf pine woodlands occur mainly on Pleistocene-aged formations in the southern part of the West Gulf Coastal Plain ecoregion on poorly drained to moderately permeable sandy loam to clay loam. The most extensive wetland pine savannas are found on the Montgomery Formation of the Pleistocene epoch. Found in map zone (MZ) 37 in ECOMAP (Cleland et al. 2007) subsections 232Ea, 232Fa, 232Fb, 232Fe, and 232Ff.

Biophysical Site Description

The term “savanna” is classically used to describe expansive herb-dominated areas with scattered trees. Wet longleaf pine woodlands are characterized by fine-textured soils, nearly featureless plains, and streams with broad, shallow valleys and poorly defined drainages. Much of the landscape exhibits undulating microtopography, including seasonally flooded depressional areas (sometimes referred to as flatwoods ponds) and pimple mounds. Drainage mottles occur in the subsoil, with most exhibiting the gray coloration characteristic of anoxic soil conditions. The nearly level topography and lack of well-defined drainages, combined with an impermeable subsurface soil layer (hardpan), result in soils that are seasonally saturated, especially in winter and spring. During summer and fall, the moderately permeable surface soils tend to become droughty. Soils are hydric, strongly acidic, nutrient-poor, fine sandy loams and silt loams, low in organic matter. There is a western Louisiana variant on saline soil termed Brimstone silt loam.

Vegetation Description

Common woody species include *Pinus palustris* (longleaf pine, usually predominant tree species), *Magnolia virginiana* (sweet bay), *Nyssa sylvatica* (black gum), *Quercus virginiana* (live oak), *Q. marilandica* (blackjack oak), *Q. laurifolia* (laurel oak), *Cyrilla racemiflora* (swamp cyrilla), *Morella cerifera* (wax myrtles), *Hypericum* spp. (St. John's worts), and *Styrax americana* (littleleaf snowbell).

Pine savannas possess a high level of herbaceous biodiversity dominated by graminoids, similar to that occurring in hillside bogs. Graminoids present include *Andropogon* spp. (broomsedges), *Schizachyrium scoparium* and *S. tenerum* (little and slender bluestem), *Panicum* spp. (panic grasses), *Aristida* spp. (threeawn grasses), *Ctenium aromaticum* (toothache grass), *Muhlenbergia capillaris* (hairawn muhly), *Erianthus* spp. (plume grasses), *Coelorachis* spp. (jointgrasses), *Rhynchospora* spp. (beak-rushes), *Xyris* spp. (yellow-eyed grasses), *Fuirena* spp. (umbrella grasses), *Scleria* spp. (nut-rushes), *Dichromena latifolia* (giant white top sedge), *Eriocaulon* spp. (pipeworts), *Lachnocaulon* spp. (bog buttons), and *Fimbristylis* spp. (fimbry-sedge). Some forbs common in the community include *Sarracenia* spp. (pitcher plants), *Agalinis* spp. (gerardias), *Lobelia* spp. (lobelias), *Rhexia* spp. (meadow beauties), *Eryngium integrifolium* (bog thistle), *Oxypolis filiformis* (narrow-leaved hog-fennel), *Polygala* spp. (milkworts), *Liatris* spp. (blazing-stars), *Sabatia* spp. (rose-gentians), *Drosera* spp. (sundews), *Pinguicula* spp. (butterworts), *Marshallia tenuifolia* (thin-leaved barbara's-buttons, southwestern Louisiana), *Utricularia* spp. (bladderworts), and *Platanthera* spp. (fringed-orchids). Various additional species belonging to the lily family (*Liliaceae*), sunflower family (*Asteraceae*), and orchid family (*Orchidaceae*) are prominent. *Lycopodium* spp. (club-mosses) and sphagnum moss are often abundant. Fire frequency is a major factor controlling species occurrence and community structure. Without frequent fire (preferably growing-season burns, which mimic historic fire regimes), deciduous shrubs and trees gain dominance and outcompete herbaceous flora. Additional inclusions in the community, include "flatwood ponds" and "baygalls."

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PIPA2 | *Pinus palustris* | Longleaf pine |
| SCHIZ4 | *Schizachyrium* | Little bluestem |
| SCSC | *Schizachyrium scoparium* | Little bluestem |
| ANDRO2 | *Andropogon* | Bluestem |
| ANVI2 | *Andropogon virginicus* | Broomsedge bluestem |

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

Frequent fires, seasonal wetness, and low nutrient availability of this ecosystem inhibit the establishment of woody understory species and maintain a sparse canopy of longleaf pine. Since natural fire breaks are few on this landscape, low-intensity surface fires burn frequently (fires every 1-4yrs), primarily during the growing season. This frequent fire regime is necessary to maintain the open savanna condition and provides bare ground for longleaf pine regeneration. Generally, these surface fires consume herbaceous and shrub fuels but rarely harm the larger, more established trees. Long fire return intervals (10yrs+) will lead to significant woody encroachment of shrubs and fire-intolerant trees. This condition can also lead to increased fuel loading that will put the larger, more established trees at risk due to hotter, less frequent fires. Repeated moderate intensity fires can force the "woody encroachment" state to the "open savanna" state.

Years of altered fire regime will result in a shift in species composition and vegetation structure. Woody shrubs rather than herbaceous species dominate the understory. Structural changes may include dense stands of small-diameter brush, with an increase in the potential for catastrophic wildfires. Prescribed fire has been used as an attempt to reverse the effects of decades of fire suppression. However, the results of these attempts have been mixed. Uncertainty remains over the frequency of burning necessary to restore fire-dependent ecosystems; however, a return frequency of every 2-5yrs appears best. Application of burns is often too infrequent, allowing woody understory species to crowd out longleaf or, in hardwood forests, oaks, beeches, and other dominant trees. Similarly, burns are ineffective if applied at the wrong life stage of plants or at the wrong point in the growing season. An example: late spring to early summer burns favor longleaf and associated herbaceous plants, whereas late-season or winter burns favor woody shrubs. However, prescribed burns, properly applied, are a crucial restoration and management tool in the pyrogenic longleaf pine ecosystems. Canopy gaps are created by fire mortality, lightning, and windthrow from hurricanes and tornados. These "gaps" are represented under structural Class A of the model. Palik and Pederson (1996) report patch disturbances that removed 550-1,300 square meters (0.14-0.32ac) of exposed crown area to form openings 1,000-2,000 square meters (0.25-0.5ac), but these occur only once per 1,000ha in 5yrs.

Wind/Weather/Stress disturbances are characterized by hurricane and tornado occurrences.

Damaging ice storms are also a weather factor, but to what degree is unknown.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 146 | 2 |  |  |
| Moderate (Mixed) | 180 | 1 |  |  |
| Low (Surface) | 3 | 97 | 1 | 5 |
| All Fires | 2 | 100 |  |  |

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

Large patch.

Adjacency or Identification Concerns

This BpS represents the presumed matrix vegetation of the outer (seaward) portions of the West Gulf Coastal Plain in Louisiana and eastern Texas, on relatively recent (Pleistocene) geologic formations within the range of longleaf pine. Within the range of longleaf pine, this BpS is adjacent to West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland.

Issues or Problems

Drainage of these wetlands for real estate development and pine plantations is endangering this ecosystem far more than the lack of fire and the subsequent progression of plant succession.

The proliferation of both invasive native and exotic vegetation is a negative impact on this ecosystem. Some native plants can be problematic in the absence of natural processes like fire. For example, yaupon holly (*Ilex vomitoria*) has crowded out other natives and become a dominant understory plant in some fire-suppressed areas. Most invasives are extremely difficult and costly to control once established. Other invasives already well established include Chinese tallow tree (*Triadica sebifera*), feral hog (*Sus scrofa*), and non-native fire ants (*Solenopsis invicta*).

Imported from MZ37 by Brendan Ward on 23 August 2007.

Native Uncharacteristic Conditions

Uncharacteristic vegetation types include even-aged canopy stands in which age structure has been homogenized by logging or clearing and establishment of monoculture pine plantations. Examples are found where loblolly pine (*P. taeda*), shortleaf pine (*P. echinata*), slash pine (*P. elliottii*), or oaks (*Quercus* spp.) have replaced some or all of the longleaf pine and where the grass-dominated ground cover has been lost due to soil disturbance or past canopy closure. Full restoration to reference condition may take a number of burns and may take many years if older trees are not present, but fire produces substantial ecological benefits before full restoration. In the absence of fire, shrub or midstory hardwood densities increase.

Comments

From "The Natural Communities of Louisiana, Louisiana Natural Heritage Program, Louisiana Department Wildlife & Fisheries"

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 1.0-3.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | >3.0 | A | A | A | A | A | A | A | A | A | A |
| Tree | 0-5 | A | A | A | A | A | A | A | A | A | A |
| Tree | 5-10 | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix |
| Tree | 5-10 | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf |
| Tree | 5-10 | C con | C con | C con | C con | C con | C con | C con | C con | C con | C con |
| Tree | 10-25 | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix |
| Tree | 10-25 | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf |
| Tree | 10-25 | C con | C con | C con | C con | C con | C con | C con | C con | C con | C con |
| Tree | 25-50 | D con | D con | D con | D con | D con | D con | D con | D con | D con | D con |
| Tree | 25-50 | E mix | E mix | E mix | E mix | E mix | E mix | E mix | E mix | E mix | E mix |
| Tree | 25-50 | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf |
| Tree | >50 | D con | D con | D con | D con | D con | D con | D con | D con | D con | D con |
| Tree | >50 | E mix | E mix | E mix | E mix | E mix | E mix | E mix | E mix | E mix | E mix |
| Tree | >50 | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf | E brdlf |

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 16 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPA2 | Pinus palustris | Longleaf pine | Upper |
| ANVI2 | Andropogon virginicus | Broomsedge bluestem | Upper |
| SCSC | Schizachyrium scoparium | Little bluestem | Upper |

Description

Class A includes canopy gaps, mostly from a single tree to a quarter acre in size, with pine regeneration up to a few years old if present. The ground cover is predominantly native grasses. Longleaf regeneration cover is generally 30% or less. The higher percentages are local situations. Dominant lifeform is herbaceous. Longleaf pine present in grass stage and young saplings only. Frequent surface fires create opportunities for longleaf pines to escape their prolonged juvenile stage. Fire exclusion leads to a closed state, an “alternate succession” pathway associated with increased cover of fire-sensitive woody species.

*Maximum Tree Size Class*  
Sapling >4.5ft; <5" DBH

Class B 10 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPA2 | Pinus palustris | Longleaf pine | Upper |
| CYRA | Cyrilla racemiflora | Swamp titi | Low-Mid |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |
| ILVO | Ilex vomitoria | Yaupon | Low-Mid |

Description

Class B is the closed "shrub/woody encroachment box" with infrequent fire. Tree encroachment will follow, with continued fire exclusion over time. (This class includes bayheads that are found along streams and are naturally wet enough to exclude fire.) Replacement fires occur, and mixed fires will open the stand.

*Maximum Tree Size Class*  
Medium 9-21" DBH

Class C 23 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPA2 | Pinus palustris | Longleaf pine | Upper |
| ANVI2 | Andropogon virginicus | Broomsedge bluestem | Lower |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |

Description

Class C is characterized by patches, most a quarter acre or less, of canopy pines. Frequent surface fires in the herbaceous layer maintain this class. Rare replacement fires do occur.

*Maximum Tree Size Class*  
Medium 9-21" DBH

Class D 48 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPA2 | Pinus palustris | Longleaf pine | Upper |
| ANVI2 | Andropogon virginicus | Broomsedge bluestem | Lower |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |

Description

Class D includes canopy pines. The ground cover is dominated by grasses. The pine canopy is relatively open. Frequent surface fires in the herbaceous layer maintain this class. This system will move to a closed state with lack of fire. Rare replacement fires occur, and rare severe wind/ weather events can also move the system back to a regeneration state.

*Maximum Tree Size Class*  
Large 21-33" DBH

Class E 3 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPA2 | Pinus palustris | Longleaf pine | Upper |
| LIST | Linum striatum | Ridged yellow flax | Mid-Upper |
| ILVO | Ilex vomitoria | Yaupon | Low-Mid |
| NYSY | Nyssa sylvatica | Blackgum | Mid-Upper |

Description

Class E includes patches, most a quarter acre or less, with canopy pines. The ground cover consists of pine litter with sparse grasses and herbs. The shrub layer and lower midstory consist of dense to moderately open shrub thickets and sapling trees. Common species in this layer are *Pinus taeda* (loblolly pine), *Nyssa sylvatica* (black gum), sweet gum, *Acer rubrum* (red maple), *Q. falcata* (southern red oak), *Q. Nigra* (water oak), *Q. laurifolia* (laurel oak), *Q. Stellata* (post oak), *Ilex vomitoria* (yaupon), *Morella cerifera* (wax myrtle), etc. The overstory consists of longleaf with emerging loblolly, water oak, and sweetgum. Rare replacement fires and severe wind/weather events can move this system back to a regeneration stage. Mixed fires occur and will open the forest.

*Maximum Tree Size Class*  
Large 21-33" DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:OPN | 20 |
| Mid1:OPN | 21 | Late1:OPN | 50 |
| Mid1:CLS | 21 | Late1:CLS | 50 |
| Late1:OPN | 51 | Late1:OPN | 999 |
| Late1:CLS | 51 | Late1:CLS | 999 |

Probabilistic Transitions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Disturbance Type** | **Disturbance occurs In** | **Moves vegetation to** | **Disturbance Probability** | **Return Interval (yrs)** | **Reset Age to New Class Start Age After Disturbance?** | **Years Since Last Disturbance** |
| Alternative Succession | Early1:ALL | Mid1:CLS | 1 | 1 | Yes | 6 |
| Surface Fire | Early1:ALL | Early1:ALL | 0.3 | 3 | No | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 10 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.5 | 2 | No | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.02 | 50 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.05 | 20 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 15 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Wind or Weather or Stress | Late1:OPN | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.5 | 2 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.02 | 50 | Yes | 0 |

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