USDA Natural Resources Conservation Service

Ecological site F154XA009FL
Moist Basic Pine Uplands

Last updated: 2/21/2024
Accessed: 05/10/2025

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.

MLRA notes

Major Land Resource Area (MLRA): 154X–South-Central Florida Ridge

MLRA 154 is entirely in Peninsular Florida, and contains 8,285 square miles. The landscape of MLRA 154 is characterized by a series of parallel, prominent sandy ridges of Pleistocene marine origin, including the Brooksville and Mount Dora Ridges. These North to South oriented parallel ridges are interspersed with more low lying physiographic provinces, including: upland hills, plains, valleys and gaps (Puri and Vernon 1964).The extreme western portion of the MLRA consists of thin belt of coastal lowlands and marshlands.

Many of the soils of MLRA 154 are Pleistocene or Holocene sands that are underlain with older, loamy Pliocene marine sediments (Cypresshead formation) or the clayey Miocene marine sediments (Hawthorne formation). A combination of marine depositional events and the dissolution of underlying limestone (karst geology) is responsible for surficial topography throughout Peninsular Florida.

Classification relationships

All portions of the geographical range of this site falls under the following ecological / land classifications including:

-Environmental Protection Agency’s Level 3 and 4 Ecoregions of Florida: 75 Southern Coastal Plain; 75c Central Florida Ridges and Uplands (Griffith, G. E., Omernik, J. M., & Pierson, S. M., 2013)

-Florida Natural Area Inventory, 2010 Edition: Upland Pine, Upland Mixed Woodland, and Upland Hardwood Forest (FNAI, 2010)

Ecological site concept

This site is associated with Pleistocene or Holocene sands which are underlain by older, loamy Pliocene marine sediments (Cypresshead formation) or the clayey Miocene marine sediments (Hawthorne formation). A combination of marine depositional events and the dissolution of underlying limestone (karst geology) is responsible for surficial topography throughout Peninsular Florida. Soils are moderately well to well drained and have loamy subsoil with high base saturation. Limestone bedrock is within 80 inches on some soils. The map unit components occur on low gradient slopes of less than 5%.

This concept includes shallow to moderately deep, fertile, well drained map units (i.e., Hague, Levyville, Jonesville, Pedro, Shadeville, and Williston series). This site is extensive in the Fairfield Hills, Ocala Hill, Sumter Upland, and Western Valley physiographic units.

Associated sites

R154XX001FL	**Yellow Sands Xeric Uplands** This site is found on excessively well drained soils on slightly higher, drier, xeric landforms

F154XX002FL	**Xeric Bicolor Sandy Uplands** This site is found on excessively well drained soils on slightly higher, drier, xeric landforms
F154XA003FL	**Dry Yellow Sands Pine Woodland** This site is found on excessively well drained soils on slightly higher, drier, xeric landforms
F154XA004FL	**Moist Sandy Pine-Hardwood Woodlands** This site is found on somewhat poorly to moderately well drained soils on slightly lower landforms
F154XA006FL	**Dry White Sand Scrubs** This site is found on well drained soils on similar landforms
F154XA008FL	**Moist Sandy Scrubby Flatwoods** This site is found on somewhat poorly to moderately well drained soils on slightly lower landforms

Similar sites

F154XA006FL	**Dry White Sand Scrubs** This site is well drained on similar landform positions but will have lower subsoil silt and clay percentages (less than 10 %) that will reflect differences in the types and amount of vegetation present.

Table 1. Dominant plant species

Tree	(1) *Pinus palustris* (2) *Pinus taeda*
Shrub	(1) *Quercus falcata* (2) *Carya glabra*
Herbaceous	(1) *Aristida stricta*

Physiographic features

The physiography of the area is among the best defined in Peninsular Florida with rolling topography consisting of ridges, hills, and dunes interspersed with low-lying valleys, depressions, and drainageways. The entire area is located within the Floridian Section of the Coastal Plain Province of the Atlantic Plain. Elevation for this site varies between sea level to 148 feet (0 to 48 meters). This ecological site occurs on loamy, moderately well or well drained soils with high fertility on uplands in central and west-central Florida. Slopes are nearly level to sloping and range from 0 to 5%. The site occurs on rises and knolls of marine deposition with underlying limestone bedrock. Some soils formed in residuum from the underlying limestone. The soils are dominantly shallow to moderately deep.

Table 2. Representative physiographic features

Landforms	(1) Marine terrace > Knoll (2) Marine terrace > Rise
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None
Elevation	0–148 ft
Slope	0–5%
Water table depth	60–66 in
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified

Ponding frequency	Not specified
Elevation	Not specified
Slope	Not specified
Water table depth	48–80 in

Climatic features

The climate is characterized by humid subtropical with long hot summers and mild winters. In the winter months, Canadian air masses move across Peninsular Florida and produce cool, cloudy, rainy weather. Freezing temperatures are occasional in the northern half of MLRA 154 (where this site occurs). Typically, temperatures drop below freezing for fewer than 30 days of the year.

Precipitation is distributed fairly evenly throughout the year. Average annual precipitation ranges from 45 to 55 inches. Highest monthly precipitation falls from June through October, with June through August being the wettest period. Winter rainfall is associated with cold fronts.

Hurricanes and tropical storms affect much of the MLRA 154 region. Catastrophic hurricanes make landfall along the Atlantic coast of Peninsular Florida on the order of two to four time per century. Strong winds and heavy rainfall affect the interior peninsula; rainfall from hurricanes and tropical systems vary widely but can exceed 20 inches from one storm. Hurricanes are most likely to occur between June and November and are most common in August and September.

Table 4. Representative climatic features

Frost-free period (characteristic range)	221-279 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	51-53 in
Frost-free period (actual range)	209-344 days
Freeze-free period (actual range)	288-365 days
Precipitation total (actual range)	50-54 in
Frost-free period (average)	262 days
Freeze-free period (average)	348 days
Precipitation total (average)	52 in

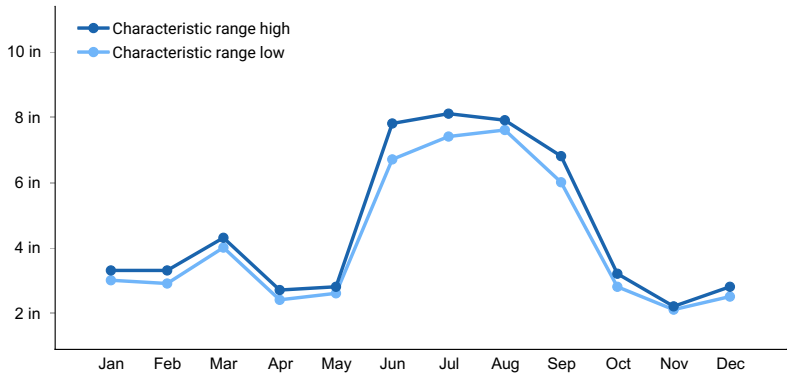

Figure 1. Monthly precipitation range

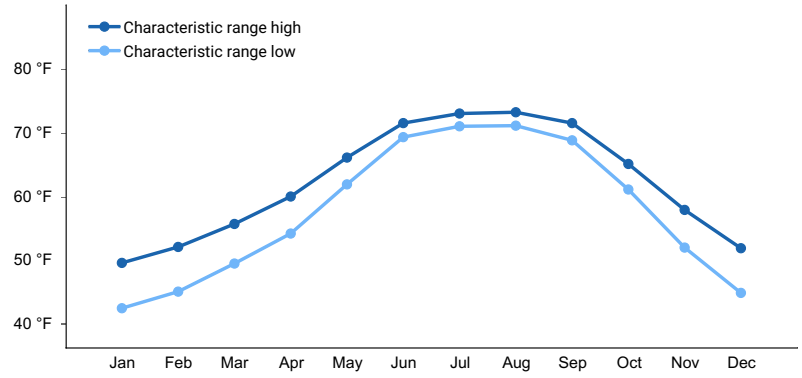

Figure 2. Monthly minimum temperature range

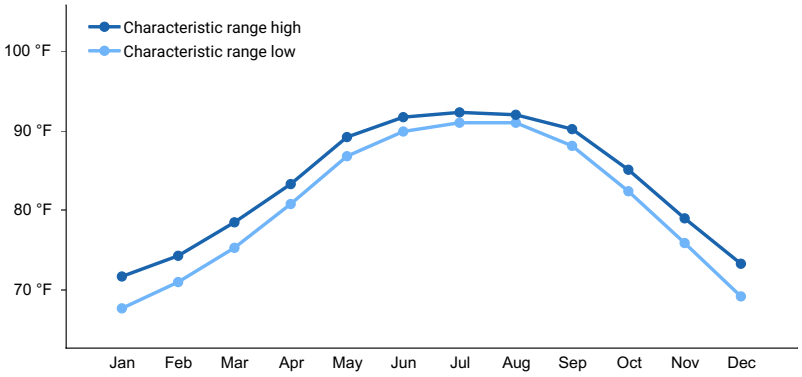

Figure 3. Monthly maximum temperature range

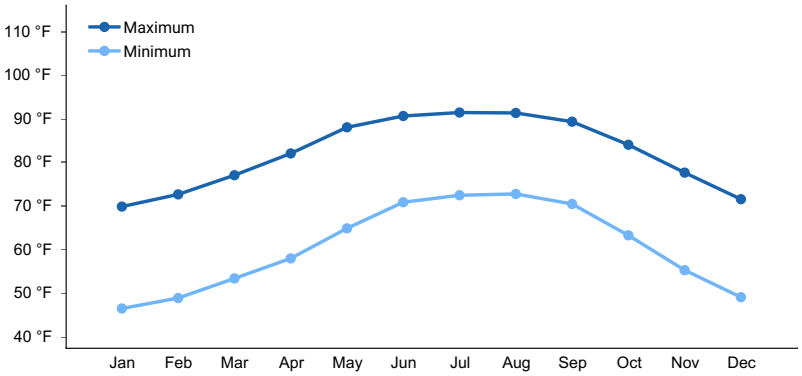

Figure 4. Monthly average minimum and maximum temperature

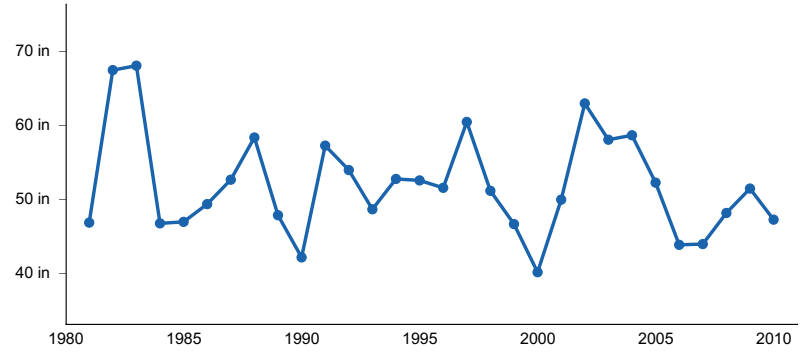

Figure 5. Annual precipitation pattern

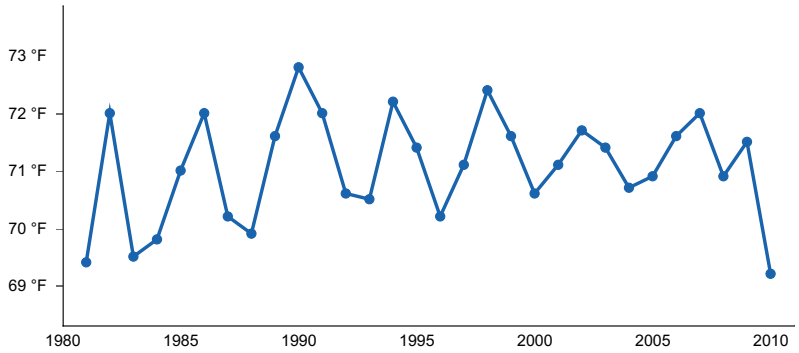

Figure 6. Annual average temperature pattern

Climate stations used

- (1) GAINESVILLE 11 WNW [USC00083322], Gainesville, FL
- (2) INVERNESS 3 SE [USC00084289], Inverness, FL
- (3) LISBON [USC00085076], Leesburg, FL
- (4) BROOKSVILLE CHIN HILL [USC00081046], Brooksville, FL
- (5) SAINT LEO [USC00087851], San Antonio, FL
- (6) TARPON SPGS SEWAGE PL [USC00088824], Tarpon Springs, FL

Influencing water features

Hydrology of this site is largely determined by karst features, including solution cavities, sinkholes, and chimneys. Most of this site occurs in the Western Valley which separates the Brooksville Ridge from surrounding hills and uplands. The modal concept for this site is areas of rises and knolls surrounded by wetter ecological sites (Wet Rich Forests and Woodlands). The site is situated on moderately well drained or well drained soils with high base status soils that are shallow to moderately deep to limestone. Subsurface water flow is dependent on the depth to the underlying limestone and karst features. The presence, depth, and orientation of these karstic features affect subsurface water movement into the Florida Aquifer or adjacent sites.

Hydrogeomorphically, these sites are members of upland landscape units receiving water through only local precipitation, and discharging water through the soil into the Florida Aquifer or through local runoff to adjacent wetter sites. Slope gradient, moderate to rapid infiltration and saturated hydraulic conductivity results in negligible to medium surface runoff. The combination of high fertility, very low to moderate available water, and moderately rapid or rapid saturated hydraulic conductivity are the keys to this sites plant community.

Soil features

Soils are well drained loamy Arenic Hapludalfs (Hague, Jonesville, Shadeville), Typic Paleudalfs, (Levyville, Zuber), Aquic Hapludalfs (Tarrytown), or shallow or moderately deep Typic Hapludalfs (Pedro, Williston). These soils formed in sandy over loamy or loamy and clayey marine sediments. Some members (Jonesville, Pedro, Shadeville, Williston) have limestone bedrock within 80 inches and formed partially in limestone residuum. The dominant representative slope for the correlated soil components ranges from 0 to 5 percent. The loamy or clayey marine sediments and high base status are largely responsible for maintaining adequate fertility and available water capacity. Clay content of the argillic horizon is dominantly 18 to 35%. Soil mineralogy is dominantly siliceous.

The very deep soils will not restrict rooting depth, and some deep rooted species may be able to access the apparent water table. The soils that are shallow or moderately deep to limestone will restrict rooting depth and affect the available water capacity. The porous underlying limestone has fractures, solution cavities and other voids filled with soil material that roots will follow to extract moisture during dry periods. Without sufficient, periodic precipitation, shallower rooted species can develop moisture stress during the hot summers.

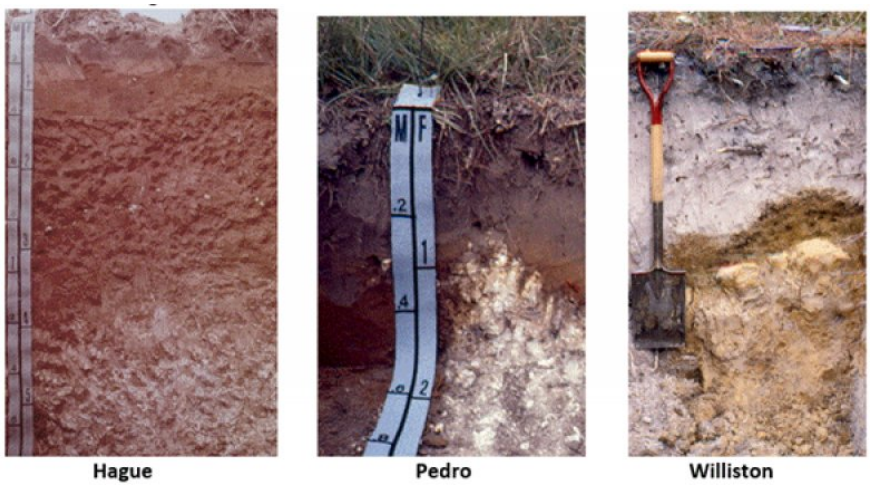

Figure 7. typical soil profiles

Table 5. Representative soil features

Parent material	(1) Marine deposits (2) Residuum–limestone
Surface texture	(1) Fine sand (2) Loamy fine sand (3) Sand
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to rapid
Soil depth	15–63 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1.2–5 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	1
Soil reaction (1:1 water) (0-40in)	5.3–7.5
Subsurface fragment volume <=3" (0-40in)	0–5%
Subsurface fragment volume >3" (0-40in)	0–3%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-40in)	1–8.6 in

Calcium carbonate equivalent (0-40in)	0–20%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	4.5–8.4
Subsurface fragment volume <=3" (0-40in)	Not specified
Subsurface fragment volume >3" (0-40in)	Not specified

Ecological dynamics

Reference State (State 1) vegetation associated with the Moist Basic Pine Uplands site include pine and pine-hardwood dominated woodlands and forests. In general, this site spans a range of pineland community types, including upland pine woodlands, and upland mixed woodlands (FNAI, 2010). The woodland or forest composition and structure of this site are dependent on local and regional geography, as well as disturbance history.

Fire is the dominant disturbance factor driving ecological dynamics of the Moist Basic Pine Uplands site. Before European settlement, pine and pine-hardwood woodlands burned frequently and with some regularity; estimated fire return intervals range from once every one to five years (Myers, 1990; Robbins and Myers, 1992; Platt, 1999; Glitzenstein et al. 2003). Abundant herbaceous ground cover vegetation provides fine fuels needed to carry frequent ground fires. Frequent ground fires affect woodland ecology in many ways: preparation of seedbed for germination of longleaf pine and other native species; stimulation of seed production in many species of grasses and forbs; maintenance of open stand conditions needed for sun-loving plant species; and reduced growth of hardwoods and non-native species (Abrahamson, 1984; Walker and Peet, 1983; Wade and Lundsford, 1990; Waldrop et al., 1992; Outcalt et al., 2002; Glitzenstein et al., 2003; Rienhard and Menges, 2004). Once established in upland woodlands, mature longleaf pines and oaks are resistant to injury from low intensity fire (Glitzenstein et al., 1995).

Changes in fire regimes trigger radical shifts in species composition and abundance in this site. Where fire is infrequent (fire return intervals > 10 years), woody abundance increases dramatically. Fire intolerant hardwoods species dominate the canopy and midstory strata. Fire intolerant hardwood species include water oak (Q. nigra), live oak (Q. virginiana), sweetgum (*Liquidambar styraciflua*), common persimmon (*Diospyros virginiana*), laurel oak (Q. laurifolia) and mockernut hickory (C. alba).

Changes from fire regime alteration affect the physiognomy and ecological dynamics of plant community associated with this site (Glitzenstein et al., 1995; Platt, 1999; Provencher et al., 2000; VanLear et al., 2005). The diversity and abundance of groundcover herbaceous species decreases with infrequent or absent fire, as thick growths of woody plants compete with herbaceous vegetation for light and other resources.

Following long term fire suppression, the reference community will eventually be replaced by oak dominated closed canopy forests, giving way to Upland hardwood forests (FNAI, 2010). Dominant hardwoods may include laurel and live oaks. Herbaceous understory of these forests is very sparse. Understory and midstory strata are dominated by vines and hardwood seedings.

Wind damage associated with hurricanes and strong storms infrequently affect ecological dynamics of this site. Strong winds can cause local or widespread pine mortality. Although hurricanes usually dissipate before reaching the interior of the peninsula, large storms do affect the region on the order of two to three per century.

Other natural disturbances that affect Moist Basic Pine Uplands include pine and hardwood mortality caused by insects and pathogens. Southern pine beetle (Dendroctonus frontalis; SPB) is a species of bark beetle native to the Southeastern Coastal Plain. Periodically SPB populations increase to epidemic levels and healthy pines are killed as infestations expand. Pine mortality, particularly when coupled with fire suppression, will speed succession to

upland hardwood forests.

State and transition model

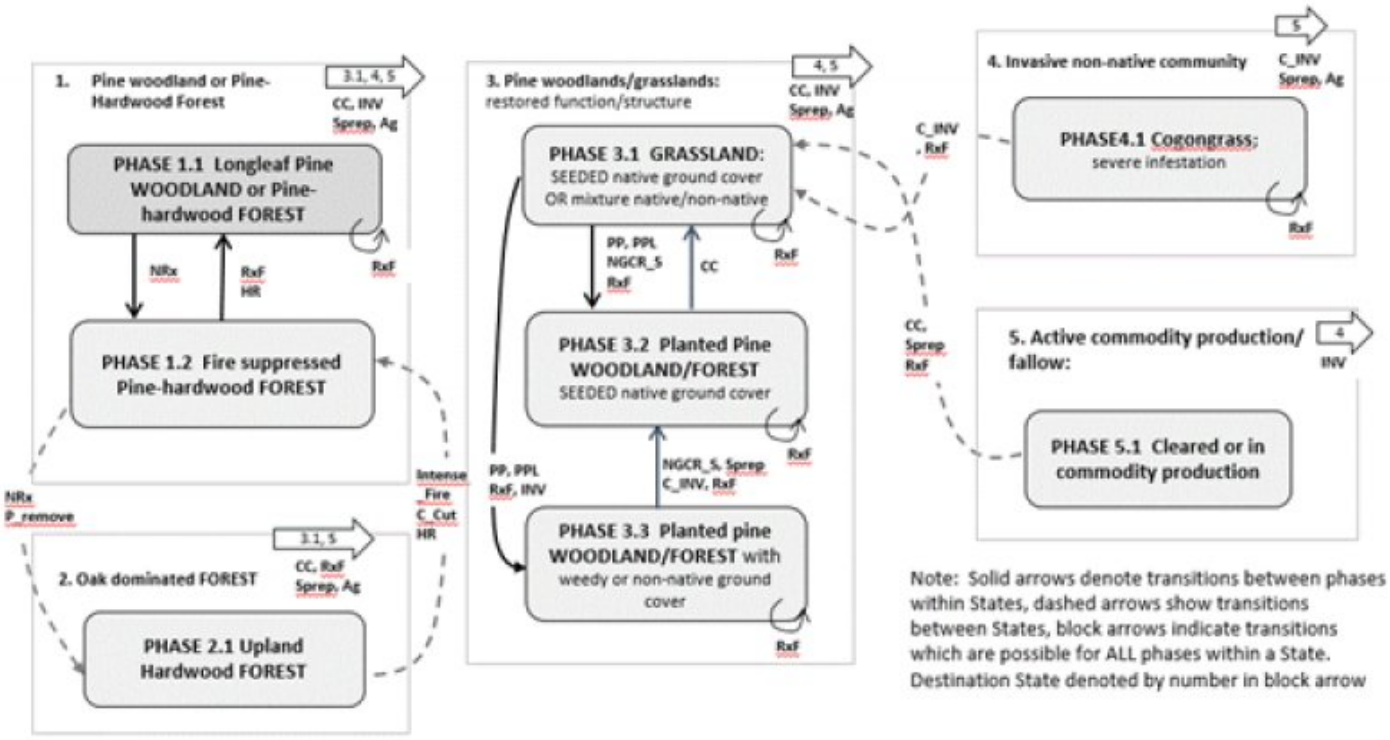

Figure 8. State and Transition Model

RxF	Frequent interval prescribed fire
Intense_Fire	Infrequent (intense) fire, often stand replacing catastrophic fire
NRx	Fire suppression, or very infrequent non-catastrophic fire
HR	Hardwood reduction (mechanical and chemical, no ground disturbance)
PP	Planted Pine (not Longleaf)
PPL	Planted Pine (Longleaf)
P_remove	Selective logging of pines
CC	Clearcut
Sprep	Site prep (mechanical and chemical)
INV	Invasion of noxious non-native plant species
C_INV	Mechanical/chemical control of invasive plant species
NGCR_S	Native ground cover restoration: active seeding
Ag	Various agricultural practices for crop cultivation

Figure 9. STM legend

State 1
Pine woodland or pine-hardwood forest

The canopy of State 1 contains widely spaced mature longleaf pines (P. palustris) intermixed with patches of regenerating longleaf pine seedlings and saplings. State 1 Upland Pine Woodlands which are frequently burned are mosaics of even-aged longleaf pine “cohorts” with dense patches of pine seedlings distributed in canopy gaps. Upland hardwoods are more abundant in woodlands located on more fertile soils and/or less frequently burned sites. These include oaks typical of mesic conditions (Southern Red oak, live oak, post oak, sand post oak), hickories (mockernut and pignut hickories), and other species (dogwood, persimmon, sassafras). Many of these hardwood species are somewhat fire tolerant, at least as mature trees. Groundcover vegetation of State 1 is dominated by perennial bunch grasses, including wiregrass (*Aristida stricta* var. beyrichiana), lopsided indiangrass

(*Sorghastrum secundum*), little bluestem (*Schizachyrium scoparium* var. stoloniferum), and other bluestem species (Andropogon spp.). In more mesic conditions, longleaf woodoats (*Chasmanthium laxum* var. sessiliflorum) may be common. Frequently burned upland pine woodlands are notable for the diversity of groundcover species, particularly herbaceous species of the Aster and legume families.

State 2
Oak dominated forest

State 2 describes late successional vegetation of the reference conditions, resulting from long term fire suppression of pine woodland and mixed pine-hardwood forest communities (FNAI 2010). State 2 Upland Hardwood forests are closed canopy forests of various oak and hickory species, which overtop mid- and under-story vegetation comprised of mainly hardwood seedlings. With the attenuation of fine fuels in the ground cover, Upland hardwood forests are less likely to carry ground fires. Furthermore, hardwood litter retains ample moisture which deters fire spread. Selective pine removal and pine mortality, coupled with fire suppression can accelerate transition to State 2.

State 3
Restored woodland/forest

State 3 variously describes a grasslands and pine woodlands consisting of seeded and planted native species, OR a mixture of native and non-native herbaceous species. Notably, this state describes conditions where native propagules have been extirpated following long term fire suppression and/or extensive soil disturbance associated with commodity land uses. Native plant populations are purposefully re-established in this state, for the purpose of ecological restoration. The phases of State 3 include grasslands and, if native pines are planted, woodlands with herbaceous ground cover. These plant communities have restored ecological function and provide habitat for native wildlife species. Restoration of native bunchgrasses provides fine fuels for frequent ground fires and is necessary for restoration of ecological site dynamics. Once established, the bunch grass matrix provides habitat suitable for establishment of other native plant populations, either from artificial seeding or natural recruitment. State 3 grasslands and woodlands may provide suitable habitat for ground nesting birds and small mammals.

State 4
Invasive non-native community

State 4 describes a condition where a single noxious non-native species has invaded and dominated the site. By far, the most common noxious invasive plant species of this site is cogongrass (*Imperata cylindrica*; (MacDonald, 2004)). This highly clonal grass spreads rapidly by underground rhizomes and windblown seeds, forming dense circular patches which can become very large (on the order of 100’s of acres). Cogongrass grows vigorously in full sunlight (MacDonald 2004). Furthermore, cogongrass is a prolific seed producer, and readily invades following soil disturbances. (Yager, Miller, and Jones, 2010). Once clones are established, rapid cogongrass growth will extirpate native ground cover plant populations. In addition to its competitive advantage over native vegetation for space and resources, cogongrass may be allelopathic in some situations (Brook, 1989; Bryson and Carter, 1993). Cogongrass is a fire adapted species which burns readily and intensely. Furthermore, it thrives in post-fire conditions where it colonizes rapidly clonally and from seed. Cogongrass fueled fires are up to 20% hotter than natural ground fires of native pinelands (MacDonald, 2004). These hot fires may deter any pine or hardwood regeneration. In the Southeastern U.S., cogongrass does not have any natural herbivore enemies, nor any known pathogens.

State 5
Community land uses

This state describes commodity land uses of this site. Commodity crops common to Central Florida xeric sands include a variety of annual and perennial crops. Other crops include horticultural ornamentals, vineyards, and some row crops. Pine plantations which are managed for community production of pulpwood or saw timber are included in this state. Also included are improved pastures of bahiagrass (or other sod forming grass species). All phases of State 5 describe conditions following ground penetrating soil disturbance, to the degree that native ground cover is mostly absent. Generally these phases are characterized by the complete extirpation of native ground cover populations, including seed banks and dormant propagules, although native weedy species may persist (mostly annual species). Depending on the severity and frequency of ground disturbance, soil profile characteristics in the upper part of the soil may be altered.

References

. Fire Effects Information System. http://www.fs.fed.us/database/feis/.

. 2021 (Date accessed). USDA PLANTS Database. http://plants.usda.gov.

Other references

Abrahamson, W. G. (1984). Post-fire recovery of Florida Lake Wales ridge vegetation. American journal of botany, 71(1), 9-21.

Batista, W. B., & Platt, W. J. (1997). An old-growth definition for southern mixed hardwood forests (p. 11). US Department of Agriculture, Forest Service, Southern Research Station.

Brook, R. M. (1989). Review of literature on *Imperata cylindrica* (L.) Raeuschel with particular reference to South East Asia. International Journal of Pest Management, 35(1), 12-25.

Bryson, C. T., & Carter, R. (1993). Cogongrass, *Imperata cylindrica*, in the United States. Weed Technology, 7(4), 1005-1009.

Carr, S. C., Robertson, K. M., & Peet, R. K. (2010). A vegetation classification of fire-dependent pinelands of Florida. Castanea, 75(2), 153-189.

FNAI (2010). Guide to the natural communities of Florida: 2010 edition. Florida Natural Areas Inventory, Tallahassee, FL.

Gilliam, F. S., & Platt, W. J. (1999). Effects of long-term fire exclusion on tree species composition and stand structure in an old-growth Pinus palustris (longleaf pine) forest. Plant Ecology, 140, 15-26.

Glitzenstein, J. S. (2003). Long-Term Seasonal Burning at the St. Marks National Wildlife Refuge, North Florida: Changes in the Sandhill Plots After 23 Years. In 2nd International Wildland Fire Ecology and Fire Management Congress.

Glitzenstein, J. S., Streng, D. R., & Wade, D. D. (2003). Fire Frequency Effects on Longleaf Pine(Pinus palustris P. Miller) Vegetation in South Carolina and Northeast Florida, USA. Natural Areas Journal, 23(1), 22-37.

Glitzenstein, J. S., Platt, W. J., & Streng, D. R. (1995). Effects of fire regime and habitat on tree dynamics in north Florida longleaf pine savannas. Ecological Monographs, 65(4), 441-476.

MacDonald, G. E. (2004). Cogongrass (*Imperata cylindrica*)—biology, ecology, and management. Critical Reviews in Plant Sciences, 23(5), 367-380.

Myers, R. L. (1985). Fire and the dynamic relationship between Florida sandhill and sand pine scrub vegetation. Bulletin of the Torrey Botanical Club, 241-252.

Myers, R. L., & White, D. L. (1987). Landscape history and changes in sandhill vegetation in north-central and south-central Florida. Bulletin of the Torrey Botanical Club, 21-32.

Peet, R. K. (2006). Ecological classification of longleaf pine woodlands. The longleaf pine ecosystem, 51-93.

Provencher, L., Galley, K. E., Litt, A. R., Gordon, D. R., Brennan, L. A., Tanner, G. W., & Hardesty, J. L. (2000). Fire, herbicide, and chainsaw felling effects on arthropods in fire-suppressed longleaf pine sandhills at Eglin Air Force Base, Florida. In The Role of Fire in Nongame Wildlife Management and Community Restoration: Traditional Uses and New Directions Proceedings of a Special Workshop (Vol. 2001, p. 24).

Provencher, L., Herring, B. J., Gordon, D. R., Rodgers, H. L., Galley, K. E., Tanner, G. W., ... & Brennan, L. A.

(2001). Effects of hardwood reduction techniques on longleaf pine sandhill vegetation in northwest Florida. Restoration Ecology, 9(1), 13-27.

Reinhart, K.O. and E.S. Menges. (2004). Effects of re-introducing fire to a central Florida sandhill community. Applied Vegetation Science, 7: 141-150.

Robbins, L. E., & Myers, R. L. (1992). Seasonal effects of prescribed burning in Florida: a review. Miscellaneous publication/Tall Timbers Research, Inc.(USA).

Rodgers, H. L., & Provencher, L. (1999). Analysis of longleaf pine sandhill vegetation in northwest Florida. Castanea, 138-162.

Schowalter, T. D., Coulson, R. N., & Crossley Jr, D. A. (1981). Role of southern pine beetle and fire in maintenance of structure and function of the southeastern coniferous forest. Environmental Entomology, 10(6), 821-825.

Puri, H. S., & Vernon, R. O. (1964). Summary of the geology of Florida and a guidebook to the classic exposures.

Van Lear, D. H., Carroll, W. D., Kapeluck, P. R., & Johnson, R. (2005). History and restoration of the longleaf pine-grassland ecosystem: implications for species at risk. Forest ecology and Management, 211(1-2), 150-165.

Varner III, J. M., Gordon, D. R., Putz, F. E., & Hiers, J. K. (2005). Restoring fire to long-unburned Pinus palustris ecosystems: novel fire effects and consequences for long-unburned ecosystems. Restoration Ecology, 13(3), 536-544.

Wade, D. D., & Lundsford, J. (1990). Fire as a forest management tool: prescribed burning in the southern United States. Unasylva, 41(3), 28-38.

Waldrop, T. A., White, D. L., & Jones, S. M. (1992). Fire regimes for pine-grassland communities in the southeastern United States. Forest Ecology and Management, 47(1-4), 195-210.

Walker, J., & Peet, R. K. (1984). Composition and species diversity of pine-wiregrass savannas of the Green Swamp, North Carolina. Vegetatio, 55, 163-179.

Yager, L. Y., Miller, D. L., & Jones, J. (2010). Susceptibility of longleaf pine forest associations in south Mississippi to invasion by cogongrass [*Imperata cylindrica* (L.) Beauv.]. Natural areas journal, 30(2), 226-232.

Contributors

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Approval

Charles Stemmans, 2/21/2024

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	05/10/2025

Approved by	Charles Stemmans
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:

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

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

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

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

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17. **Perennial plant reproductive capability:**
