Ecological site F154XA004FL
Moist Sandy Pine-Hardwood Woodlands

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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.

MLRA notes

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

This MLRA makes up about 7,209 square miles (18,672 square kilometers) and is entirely in Florida. MLRA 154 contains 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). Many of the soils in this sub-unit 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: Sandhill - mesic variant, Upland Pine, Upland Mixed Woodland, and Upland Hardwood Forest (FNAI, 2010)

Ecological site concept

Soils of the Moist Sandy Pine-Hardwood Woodlands are deep, yellow, and acidic. They are variously classified as sandy, sandy over loamy, or sandy over clayey upland soils. The map unit components occur on slopes of 8% (ranging up to 12%). This concept includes very deep, somewhat poorly drained to well drained map units (Adamsville, Albany, Apopka, Arredondo, Blanton, Bonneau, Chipley, Duplin, Florahome, Fort Meade, Jumper, Kendrick, Lochloosa, Lutterloh, Mabel, Masaryk, Micanopy, Millhopper, Moriah, Nobleton, Norfolk, Ocilla, Orlando Variant, Otela, Ridgewood, Seffner, Sparr, Sumterville, Tavares, Troup, Wadley, and Wicksburg). This site is extensive on the Brooksville Ridge, Cotton Plant Ridge, Mount Dora Ridge, Northern Highlands, Ocala Hill, Marion Upland, and Sumter Upland physiographic units, and to a lesser extent in the Central and Western Valleys. The overall extent of this site is approximately 600,000 acres. This concept is distinct because of its native condition (i.e., reference site vegetation), component soils, successional patterns, and wildlife habitat. Reference site vegetation of this site is edaphically supported by very deep, yellow sands with a moderately deep or deep seasonal high water table. The Moist Sandy Pine-Hardwood Woodlands encompass a wide breadth of environmental and vegetation conditions, and natural disturbance regimes. In general, natural vegetation of this concept ranges from open pine woodland to closed forested conditions, depending on landscape position, soil moisture and fertility, and fire frequency.

Associated sites

F154XA009FL	**Moist Basic Pine Uplands** These sites are moderately well to well drained communities that occur in slightly higher, drier landscape positions
F154XA010FL	**Moist Lithic Flatwoods And Hammocks** These sites are somewhat poorly to well drained communities that occur in similarly mesic landscape positions

F154XA011FL	**Wet Lithic Flatwoods And Hammocks** These are poorly drained communities that occur in lower, wetter landscape positions
R154XX001FL	**Yellow Sands Xeric Uplands** These sites are excessively drained communities that occur in higher, drier, xeric landscape positions
F154XX002FL	**Xeric Bicolor Sandy Uplands** These sites are excessively drained communities that occur in higher, drier, xeric landscape positions
F154XA003FL	**Dry Yellow Sands Pine Woodland** These sites are excessively drained communities that occur in higher, drier, xeric landscape positions
F154XA005FL	**Poorly Drained Upland Pine-Hardwood Forests** These are poorly drained communities that occur in lower, wetter landscape positions
F154XA007FL	**Moist Sandy Wet-Mesic Flatwoods** These are poorly drained communities that occur in lower, wetter landscape positions
F154XA008FL	**Moist Sandy Scrubby Flatwoods** These sites are somewhat poorly to well drained communities that occur in similarly mesic landscape positions

Similar sites

F154XA009FL	**Moist Basic Pine Uplands** These sites occur on similar landscapes in slightly better drained positions. Greater amounts of finer textured materials and high base status result in greater soil fertility and available water capacity.
F154XA010FL	**Moist Lithic Flatwoods And Hammocks** These sites occur on similar landscapes with similar soil drainage. These soils will have a shallow to moderately deep rooting restriction that will influence plant community characteristics and soil chemistry.
F154XA012FL	**Wet Rich Forests And Woodlands** These sites occur on similar landscapes with similar soil drainage. The presence of a subsurface loamy or clayey layer will be shallower than Site 004, resulting in higher available water capacity and greater plant community production.

Table 1. Dominant plant species

Tree	(1) *Pinus palustris*

Shrub	(1) *Quercus falcata* (2) *Cornus florida*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Dichanthelium commutatum*

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. Elevations of this site range from sea level to 295 feet (0 to 90 m). This site occurs on somewhat poorly to well-drained uplands. Slopes are nearly level to sloping (0 to 12%). The site occurs on elevated ridges and hills of marine deposition. The soils are sandy, sandy over loamy, or sandy over clayey to > 80 inches.

Table 2. Representative physiographic features

Hillslope profile	(1) Backslope (2) Footslope (3) Summit (4) Shoulder
Landforms	(1) Marine terrace > Ridge (2) Marine terrace > Hill
Runoff class	Very low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	0 – 80 m
Slope	0 – 10 %
Water table depth	30 – 180 cm
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	0 – 90 m
Slope	0 – 10 %
Water table depth	30 – 200 cm

Climatic features

The climate varies considerably across the latitudinal gradient of MLRA 154. The north to south orientation of MLRA 154 spans three USDA plant hardiness zones in the Florida Peninsula (USDA-ARS).

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. Below freezing temperatures are occasional in the northern part of the MLRA, but very rare in the southern. Overall, there are typically fewer than 30 days of the year with below freezing temperatures in MLRA 154.

Similarly, average temperatures vary considerably from north to south over the range of the site. Average seasonal low temperature in the north is 12.7°C in January, and prolonged freezing temperatures are common in the winter months. In contrast, the south has more uniformity of seasonal temperatures and winter freezes are rare.

Precipitation in MLRA 154 is distributed fairly evenly throughout the year. Average annual precipitation ranges from 50 to 55 inches (127 to 140 cm). The highest monthly precipitation occurs from June through October, with June through August being the wettest period. However, the northern gradients receive substantially more precipitation during the winter months compared to the southern. Winter rainfall is associated with seasonal cold fronts, which tend to disintegrate before reaching the southern reaches of MLRA 154.

Hurricanes and tropical storms affect much of MLRA 154. Catastrophic hurricanes make landfall along the Atlantic coast of Peninsular Florida on the order of 2 to 4 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 (51 cm) from one event. 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)	260-370 days
Freeze-free period (characteristic range)	370 days
Precipitation total (characteristic range)	1,300-1,350 mm
Frost-free period (actual range)	220-370 days
Freeze-free period (actual range)	300-370 days
Precipitation total (actual range)	1,270-1,370 mm

Frost-free period (average)	310 days
Freeze-free period (average)	350 days
Precipitation total (average)	1,320 mm

- (1) ORANGE SPRINGS 2SSW [USC00086618], Fort Mc Coy, FL
- (2) GAINESVILLE 11 WNW [USC00083322], Gainesville, FL
- (3) INVERNESS 3 SE [USC00084289], Inverness, FL
- (4) PLANT CITY [USC00087205], Plant City, FL
- (5) BROOKSVILLE CHIN HILL [USC00081046], Brooksville, FL
- (6) MTN LAKE [USC00085973], Lake Wales, FL
- (7) TARPON SPGS SEWAGE PL [USC00088824], Tarpon Springs, FL
- (8) BARTOW [USC00080478], Bartow, FL
- (9) LISBON [USC00085076], Leesburg, FL
- (10) WINTER HAVEN [USC00089707], Winter Haven, FL

Influencing water features

The modal concept for this site is extensive areas of ridges and hills surrounded by wetter ecological sites. Hydrology surrounding this site can influence species composition. The site is situated on soils that have a shallow to deep seasonal high water tables (dominantly > 12 to 72 inches, but ranges to 80 inches). Subsurface water flow is dependent on the presence or absence of an aquitard (loamy or clayey layer). The presence, depth, and orientation of this water restrictive layer may affect subsurface water movement.

Given the extensive nature of this site and adjacent sites with similar or dissimilar hydrologic properties, this site can have either an abrupt ecotone or a very diffuse ecotone.

Hydrogeomorphically, these sites are members of upland landscape units receiving water through only local precipitation, and discharging water through the soil to adjacent wetter sites or the Florida Aquifer. Slope gradient, rapid or very rapid infiltration and slow to rapid saturated hydraulic conductivity results in negligible to high surface runoff. The combination of a shallow to deep water table, underlying loamy or clayey material, and low or moderate available water are the keys to this site’s plant communities.

Soil features

Soils are dominantly somewhat poorly to well drained; sandy, sandy over loamy, or sandy over clayey. Components within this site classify as Grossarenic or Arenic Paleudults (Apopka, Arredondo, Blanton, Bonneau, Kendrick, Millhopper, Sparr, Wadley, Wicksburg), Grossarenic Paleudalfs (Lutterloh, Otela), Humic Psammentic Dystrudepts (Florahome, Fort Meade), and Aquic Quartzipsamments (Adamsville, Chipley, Ridgewood, Tavares). Minor taxa within this site are Albaquic Hapludalfs (Mabel), Aquic Paleudalfs (Micanopy), Aquic Paleudults (Duplin), Aquic Arenic Hapludalfs (Moriah), Aquic Arenic Paleudults (Albany, Lochloosa), Arenic Plinthaquic Paleudults (Jumper), Quartzipsammentic Haplumbrepts (Orlando Variant), Typic or Grossarenic Kandiudults (Norfolk, Troup), and Aquic Humic Dystrudepts (Seffner).

These soils formed mainly from sandy marine sediments of varying thickness that are underlain with loamy or clayey marine sediments. The dominant representative slope for the correlated soil components is 0 to 8% but ranges up to 12%. Mineralogy is siliceous or mixed.

Figure 7. Soil profiles

Table 5. Representative soil features

Parent material	(1) Eolian deposits (2) Marine deposits

Surface texture	(1) Fine sand (2) Sand (3) Loamy fine sand (4) Loamy sand
Drainage class	Somewhat poorly drained to well drained
Permeability class	Rapid to very rapid
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	3.05 – 13.21 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	4.8 – 5.9
Subsurface fragment volume <=3" (0-101.6cm)	Not specified
Subsurface fragment volume >3" (0-101.6cm)	0 – 10 %

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Slow to very rapid
Soil depth	140 – 200 cm
Surface fragment cover <=3"	0 %
Surface fragment cover >3"	0 %
Available water capacity (0-101.6cm)	Not specified
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	3.5 – 8.4
Subsurface fragment volume <=3" (0-101.6cm)	Not specified
Subsurface fragment volume >3" (0-101.6cm)	Not specified

Ecological dynamics

Reference State (State 1) vegetation associated with the Moist Sandy Pine-Hardwood Woodlands include pine and pine-hardwood dominated woodlands. In general, this concept spans a range of pineland community types, including the more mesic variant of longleaf pine sandhills, upland pine woodlands, and upland mixed woodlands (FNAI, 2010). The woodland or forest composition and structure of this site are also dependent on local and regional geography. Many upland hardwoods reach the southern limits of their range in North and Central Florida.

Fire is the dominant disturbance factor driving ecological dynamics of the Moist Sandy Pine-Hardwood Woodlands site. Before European settlement, upland pine and pine-hardwood woodlands burned frequently and with some regularity; estimated fire return intervals range from once per 1 to 5 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 (> 80 years), upland pine and mixed uplands 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 Moist Sandy Pine-Hardwood Woodlands. 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 2 to 3 per century.

Other natural disturbances that affect Moist Sandy Pine-Hardwood Woodlands include pine and hardwood mortality caused by insects and pathogen. 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. Moist Sandy Pine-hardwood Woodlands

Figure 9. Moist Sandy Pine-hardwood Woodlands Legend

Additional community tables

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Contributors

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Approval

Matthew Duvall, 5/13/2025

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	02/23/2024
Approved by	
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:**