USDA Natural Resources Conservation Service

Ecological site F154XA007FL
Moist Sandy Wet-Mesic Flatwoods

Last updated: 2/21/2024
Accessed: 05/13/2025

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: Mesic Flatwoods, Wet Flatwoods, Mesic Hammock, and Hydric Hammock (FNAI, 2010)

Ecological site concept

Moist Sandy Wet-Mesic Flatwoods occur on very deep, poorly drained and nearly level soils that have a sandy or sandy over loamy subsoil. In general, the soils are moist sands with or without spodic horizons. Soil series include very deep, poorly drained, sands (Basinger, Immokalee, Myakka, Ona, Placid, Pompano, Pottsburg, Smyrna, St. Johns), and the sands over loamy soil (Delks, EauGallie, Ft. Green, Holopaw, Lynne, Malabar, Oldsmar, Palmetto, Plummer, Pomona, Riviera, Sapelo, Wabasso, Wauberg, Wauchula, Winder). This concept is predominantly mapped in the Central Valley, Gulf Coastal Lowlands, St. Johns River Offset, Tsala Apopka Plain, and Western Valley physiographic units, and to a lesser extent in the Duval Uplands, Marion Uplands, and the Northern Highlands.

Associated sites

F154XA005FL	**Poorly Drained Upland Pine-Hardwood Forests** These are poorly drained sites on upland flats rather than lowland flats, resulting in slightly drier natural vegetative communities

F154XA010FL	**Moist Lithic Flatwoods And Hammocks** These are somewhat poorly drained sites that have a water table deeper than 30 cm and lithic contact within 152 cm
F154XA011FL	**Wet Lithic Flatwoods And Hammocks** These are poorly drained sites on similar landforms that will have lithic contact within 40 inches of the soil surface
F154XA012FL	**Wet Rich Forests And Woodlands** These are poorly drained sites on similar landforms that will have a higher subsoil clay percentage
F154XA014FL	**Histic Wetland Depressions** These are very poorly drained organic soils that pond frequently and will support wetland habitats
F154XA015FL	**Mineral Depressional Wetlands** These are very poorly drained mineral soils that pond frequently and will support wetland habitats

Similar sites

F154XA005FL	**Poorly Drained Upland Pine-Hardwood Forests** These sites will have similar drainage on slightly higher landscape positions, resulting in different types of vegetation and management strategies
F154XA008FL	**Moist Sandy Scrubby Flatwoods** These sites will have slightly better drainage (depth to seasonal high water table >30 to 91 cm) and will occur on similar soils, resulting in a drier species composition
F154XA012FL	**Wet Rich Forests And Woodlands** These sites will have similar soil drainage and landscape positions, but will have a higher percentage of subsoil clay (greater than 10%) which will influence species composition and production

Table 1. Dominant plant species

Tree	(1) *Pinus palustris* (2) *Pinus elliottii*
Shrub	(1) *Serenoa repens* (2) *Ilex 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 of this site varies between sea level and 213 feet (0 to 65 meters). This site occurs on very deep, sandy, or sandy over loamy, poorly drained soils on lowlands in central and west-central Florida. Slopes are nearly level and typically range from 0 to 2%, but up to 5%, on flats and interfluves surrounded by high ridges and depressions.

Table 2. Representative physiographic features

Landforms	(1) Marine terrace > Flat (2) Marine terrace > Interfluve
Runoff class	Very low to high
Flooding frequency	None
Ponding duration	Brief (2 to 7 days)
Ponding frequency	None to frequent
Elevation	0–65 m
Slope	0–2%
Ponding depth	0–20 cm

Water table depth	0–30 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding duration	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–5%
Ponding depth	Not specified
Water table depth	0–122 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 section 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 northern MLRA is 12.7°C in January, and prolonged freezing temperatures are common in the winter months. In contrast, the southern area 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 45 to 55 inches (114 to 140 cm). The highest monthly precipitation occurs from June through October, with June through August being the wettest period. However, the northern area receives 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 two to four time per century. Strong winds and heavy rainfall affect the interior peninsula (MLRA 154); 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)	246-365 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	1,295-1,346 mm
Frost-free period (actual range)	215-365 days
Freeze-free period (actual range)	324-365 days
Precipitation total (actual range)	1,270-1,372 mm
Frost-free period (average)	317 days
Freeze-free period (average)	357 days

Precipitation total (average)	1,321 mm

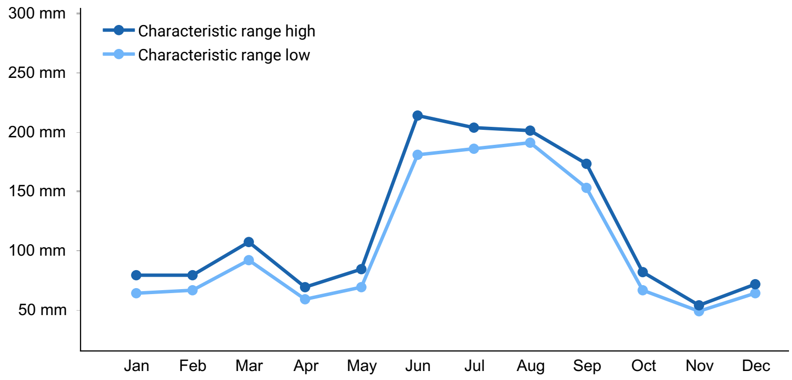

Figure 1. Monthly precipitation range

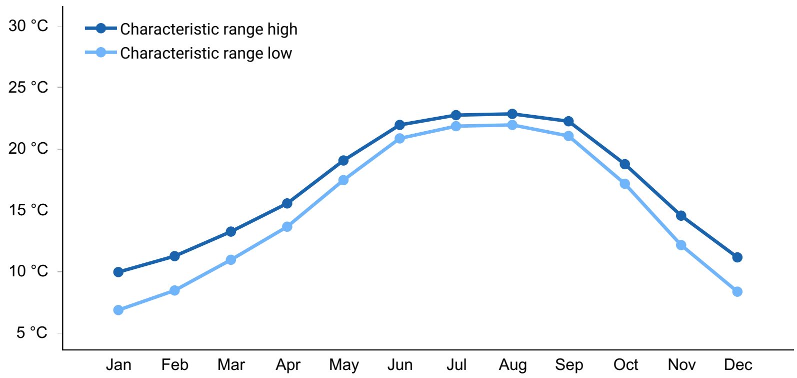

Figure 2. Monthly minimum temperature range

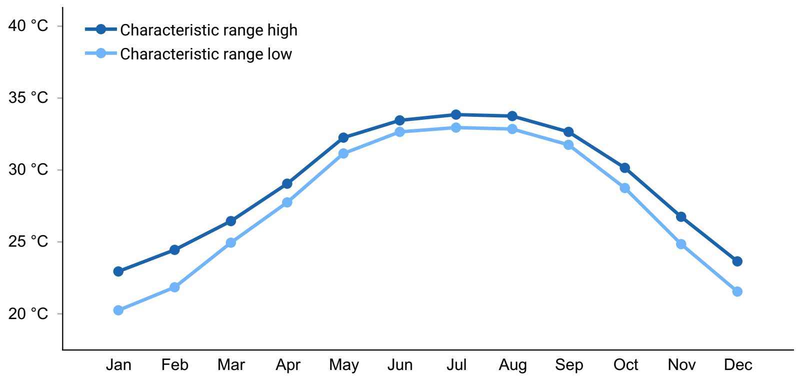

Figure 3. Monthly maximum temperature range

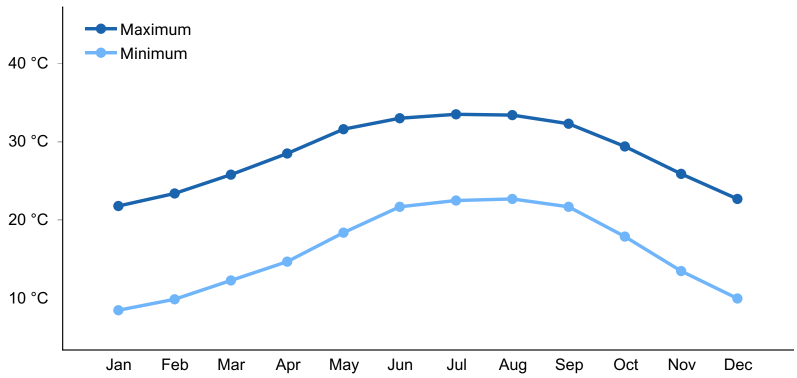

Figure 4. Monthly average minimum and maximum temperature

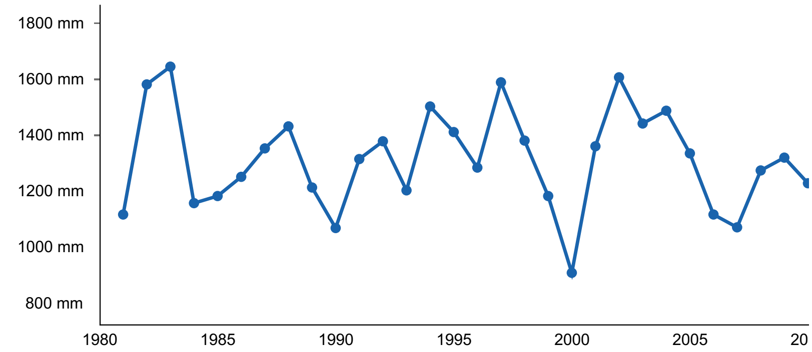

Figure 5. Annual precipitation pattern

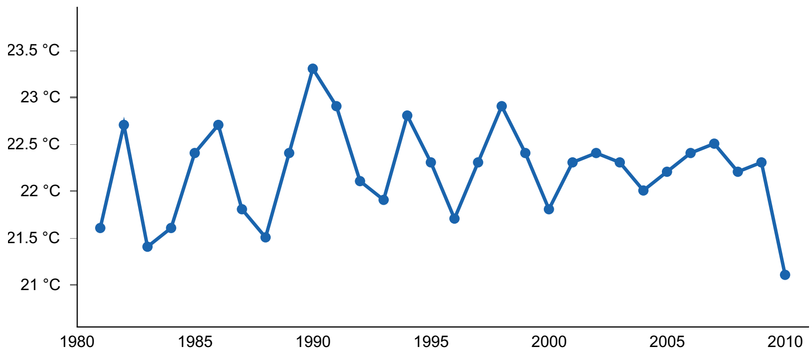

Figure 6. Annual average temperature pattern

Climate stations used

- (1) CLERMONT 9 S [USC00081641], Clermont, FL
- (2) INVERNESS 3 SE [USC00084289], Inverness, FL
- (3) LAKE ALFRED EXP STN [USC00084707], Haines City, FL
- (4) LISBON [USC00085076], Leesburg, FL
- (5) PLANT CITY [USC00087205], Plant City, FL
- (6) BROOKSVILLE CHIN HILL [USC00081046], Brooksville, FL
- (7) ORANGE SPRINGS 2SSW [USC00086618], Fort Mc Coy, FL
- (8) SAINT LEO [USC00087851], San Antonio, FL
- (9) TARPON SPGS SEWAGE PL [USC00088824], Tarpon Springs, FL
- (10) GAINESVILLE 11 WNW [USC00083322], Gainesville, FL
- (11) WINTER HAVEN [USC00089707], Winter Haven, FL
- (12) AVON PARK 2 W [USC00080369], Avon Park, FL
- (13) MTN LAKE [USC00085973], Lake Wales, FL
- (14) LAKELAND [USW00012883], Lakeland, FL

Influencing water features

Most of this site occurs as extensive, consolidated matrix of mesic or hydric flatwoods that are influenced by micro-topographic lows and highs. The modal concept for this site is areas of flats and interfluves. On a moisture gradient, this site is intermediate between the Moist Sandy Scrubby Flatwoods (F154XA008FL) and the Mineral Depressional Wetlands (F154XA015FL) ecological site concepts.

The concept is situated on soils that have a shallow seasonal high water table (0 to 12 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 distribution and hydrologic differences of surrounding communities, this site may have an abrupt ecotone which dramatically shifts species composition from flatwoods to wetter or drier sites within short distances.

Local precipitation drains through the soil to the Florida Aquifer or runs off to surrounding lower areas. Low slope gradient, rapid or very rapid infiltration, and moderately slow to very rapid saturated hydraulic conductivity results in negligible to medium surface runoff.

Soil features

This site is most influenced by hydrologic regime of seasonal water table fluctuations. Accordingly, there is a diverse set of soil taxa associated with this site. Generally, soils are very deep, poorly drained Alaquods (Immokalee, Leon, Lynn Haven, Myakka, St. Johns, Smyrna, Oldsmar, Pineda, Wabasso, Delks, Lynne, Pomona), Endoaqualfs (Ft. Green, Holopaw, Malabar, Meadowbrook), Psammaquents (Basinger, Osier, Pompano, Scranton), and to a lesser extent Albaqualfs (Wauberg), Glossaqualfs (Riviera), Paleaqults (Palmetto, Rains), and Humaquepts (Placid). These soils formed in sandy, sandy over loamy, or sandy over clayey marine sediments with slopes of 0 to 2% but may range up to 5%. Clay content in the upper part of the subsoil is low (1 to 10%). Soil mineralogy is siliceous.

These very deep, porous sands do not restrict rooting depth. These soils have a dynamic water table with extreme fluctuations between winter and summer. Without sufficient, periodic precipitation, shallower rooted species may develop moisture stress during the hot summers.

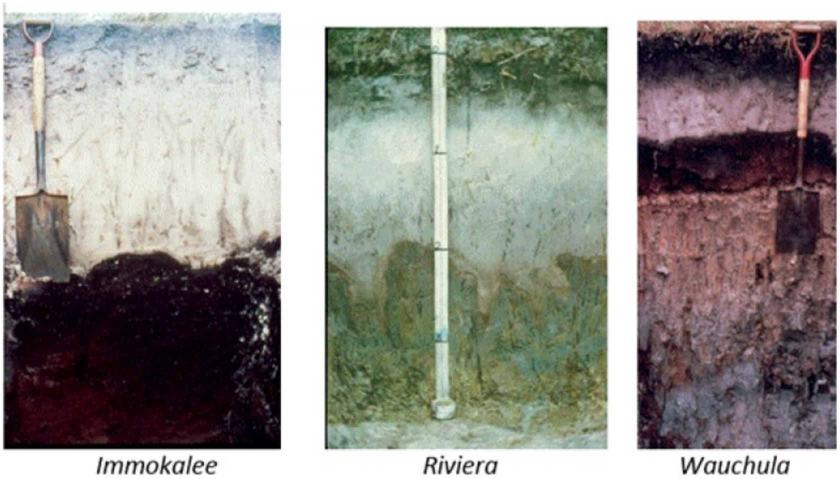

Figure 7. Soil profiles associated with this site

Table 5. Representative soil features

Parent material	(1) Marine deposits
Surface texture	(1) Fine sand (2) Sand
Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Very slow to rapid
Soil depth	152–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	4.57–10.92 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–1 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	1

Soil reaction (1:1 water) (0-101.6cm)	4.4–6.2
Subsurface fragment volume <=3" (0-101.6cm)	1–2%
Subsurface fragment volume >3" (0-101.6cm)	1–2%

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 (0-101.6cm)	Not specified
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	3.5–8.4
Subsurface fragment volume <=3" (0-101.6cm)	0–8%
Subsurface fragment volume >3" (0-101.6cm)	0–5%

Ecological dynamics

This concept encompasses (all or in part) four natural community types: Mesic Flatwoods, Wet Flatwoods, Mesic Hammock, and Hydric Hammock (FNAI, 2010). Small variations in hydrology drive the distribution of mesic flatwoods vs. wet flatwoods (the two “reference site” communities in this site). Presumably, this is related to differences in depth and duration of seasonal high water tables. Although water table variations affect very different plant composition and ecological dynamics, these subtle differences are generally not captured in the soil map units of MLRA 154. Thus, we include both mesic and wet flatwoods “State 1” reference site conditions in this single concept, with the caveat that wet and mesic flatwoods are NOT successional stages of the same site.

The unifying concept for this site is the nature of edaphic environment: poorly drained and nearly level course sandy soils with Spodosol subsoil horizons, or a loamy subsoil.

Fire regimes are primary influencers of plant community structure and composition of Moist Sandy Wet-Mesic Flatwoods. Mesic and hydric hammocks replace wet and mesic flatwoods in the absence or reduction of frequent fire, forming closed canopy forests. Hydrology also influences the intensity and frequency of fires; wetter areas may not burn as frequently when inundated.

Depending on the availability of fine fuels and patchiness of vegetation, and the geography of flatwoods vegetation, native fire regimes vary considerably. It is estimated that pre-European settlement flatwoods burned on the order three to five times per decade.

Mesic and wet flatwoods are open woodlands with scatter pines: either longleaf pine (*P. palustris*) or slash pine (P. elliottii) depending on soil moisture and fire history. South Florida slash pine (P. elliottii var. densa) replaces longleaf pine in southern portions of MLRA 154. Midstory vegetation is sparse, particularly in flatwoods which are frequently burned. Again, the composition of midstory vegetation varies with site hydrology.

State and transition model

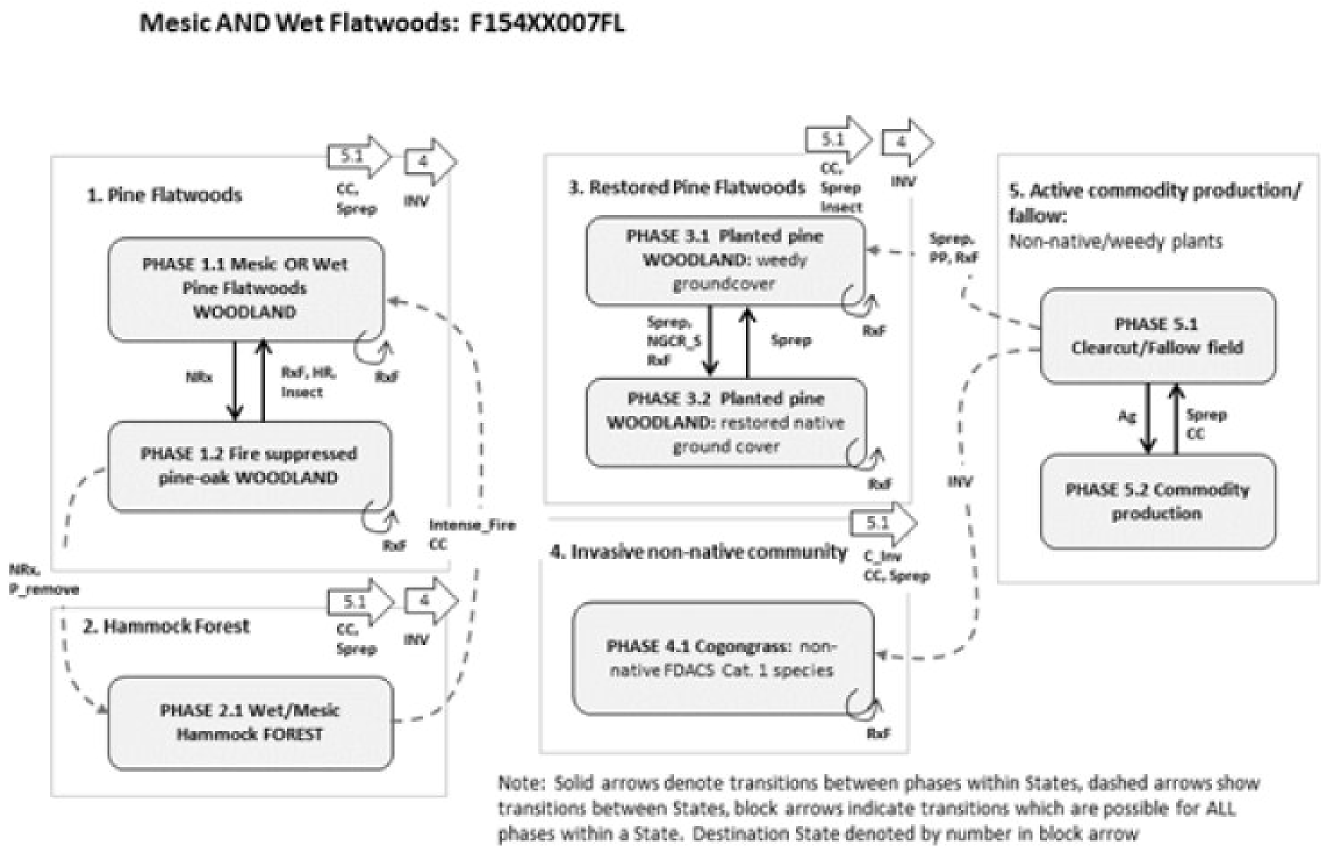

Figure 8. State and Transition Model

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
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. legend for STM

State 1
Pine Flatwoods

Mesic Flatwoods are pine woodlands with well-developed and pyrogenic ground cover vegetation, consisting of many species of grasses, forbs, sedges and shrubs. Notable ground cover shrub species include: saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), coastalplain staggerbush (*Lyonia fruticosa*), and fetterbush (*Lyonia lucida*). Oaks typical of scrubs, scrubby flatwoods and sandhills are absent. Runner oaks (Q. minima, Q. pumila) are the only common oaks generally present in mesic flatwoods, and they are confined to the ground cover. Wiregrass is the dominant bunch grass, although other common grasses include: bluestems (Andropogon spp.), lopsided Indiangrass (*Sorghastrum secundum*), panicgrasses (Dichanthelium spp.), and other three-awned grasses (i.e. *Aristida spiciformis*). Wet Flatwoods are structurally and aesthetically similar to mesic flatwoods, although they are compositionally dissimilar. Similar pine species form the woodland canopy. Midstory vegetation is sparse in frequently burned areas. If present, it may contain scattered hardwoods (but generally, not oaks), such as sweetbay (*Magnolia virginiana*), swamp bay (*Persea palustris*), loblolly bay (*Gordonia lasianthus*), dahoon (*Ilex cassine*), large gallberry (*Ilex coriacea*), fetterbush (*Lyonia lucida*), red chokeberry (Photinia pyrifolia), saw palmetto (*Serenoa repens*) and gallberry (*I. glabra*). Herbs include wiregrass (*Aristida stricta*) and many other species of hydrophytic grasses and forbs. Particularly notable is the diversity of sedge species, many belonging to the genus Rhynchospora.

State 2
Hammock Forest

State 2 describes closed canopy forests following long term fire suppression or exclusion. Mesic hammocks replace mesic flatwoods with fire exclusion, as live oaks dominate closed canopies and shade out most understory herbaceous vegetation. Wet flatwoods are similarly replaced by closed canopy hammock forests, although the tree composition differs (includes hydrophytic species). In closed canopy forests, the floor is covered with oak leaf litter which holds considerable moisture and engenders mesic conditions, further depressing native herbaceous growth, pine germination, and frequent fires (FNAI, 2010).

State 3
Restored Pine Flatwoods

This state describes a restored pine woodland with similar structure and ecological function to that of State 1 (mesic or wet flatwoods). 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, followed by artificial establishment of native clonal oaks and other scrub shrub species. Many native species are absent, and weedy or residual non-native species may persist in this restored scrub community. Herbaceous species are absent, weedy or non-native, depending on pre-restoration conditions and geography. Restoration of native oaks provides fuels for infrequent fires necessary for ecological functioning and dynamics. Once established, clonal oaks may provide habitat suitable for establishment of other native plant populations, either from artificial seeding or natural recruitment. The full complement of native species remains incomplete in State 3. Perennial grasses and forbs with seed dispersal mechanisms not conducive to colonization of distant and disturbed sites are notably absent (i.e. big seeded species which rely on animal and gravity dispersal, and long lived clonal species). However, over time, native plants may recolonize, particularly wind-dispersed native herbaceous species.

State 4
Invasive non-native community

State 4 describes a condition where one or more noxious non-native plant species has invaded and dominated the site. By far the most common invasive plant species is cogongrass (*Imperata cylindrica*). 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 is a prolific seed producer, and readily invades following soil disturbances. Once clones are established, rapid cogongrass growth will extirpate native ground cover plant populations. In addition, cogongrass may be allelopathic in some situations. In general, cogongrass may colonize conditions with plenty of sun exposure and open ground. Soil disturbance is conducive to cogongrass colonization.

State 5
Active commodity production/ fallow

This State describes commodity land uses of this site.

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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	05/13/2025

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:**
