Ecological site F154XA010FL
Moist Lithic Flatwoods And Hammocks

Last updated: 2/21/2024
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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

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 Hammock, Hydric Hammock, Floodplain Swamp, and Floodplain Marsh (FNAI, 2010)

Ecological site concept

The central concept of the Moist Lithic Flatwoods and Hammocks is shallow to deep, somewhat poorly drained soils that have a sandy or loamy subsoil with moderate to high pH. Limestone bedrock is close to the surface (within 60 inches) in flat landscapes (slopes < 2%). This site occurs on soils that are moderately deep, sandy or loamy, somewhat poorly drained (Aripeka, Broward, Matmon, and Redlevel series), or shallow, sandy, somewhat poorly drained (Citronelle series).

This concept is exclusively mapped in Coastal Marshes, Gulf Coastal Lowland, and the Tsala Apopka Plain physiographic units. The overall extent is approximately 9,700 acres.

Associated sites

F154XA009FL	**Moist Basic Pine Uplands** These sites are moderately well to well drained soils on higher landscape positions

F154XA011FL	**Wet Lithic Flatwoods And Hammocks** These sites are poorly drained soils on similar to slightly lower landscape positions
F154XA012FL	**Wet Rich Forests And Woodlands** These sites are poorly drained soils on similar to slightly lower landscape positions

Similar sites

F154XA011FL	**Wet Lithic Flatwoods And Hammocks** These sites are poorly drained soils with shallow soils similar to this site. Changes in depth to water table will influence the types and amount of vegetation as well as management practices of the site

Table 1. Dominant plant species

Tree	(1) *Quercus virginiana* (2) *Pinus elliottii*
Shrub	(1) *Sabal palmetto* (2) *Quercus laurifolia*
Herbaceous	(1) *Muhlenbergia capillaris*

Physiographic features

This site occurs on sandy and loamy, somewhat poorly drained soils with high fertility on uplands in central and west-central Florida. Slopes are nearly level to sloping and range from 0 to 2%. The site occurs on flats of marine deposition with underlying limestone bedrock. The soils are dominantly shallow to moderately deep.

Table 2. Representative physiographic features

Landforms	(1) Marine terrace > Flat
Runoff class	Negligible to very low
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	1–15 m
Slope	0–2%
Water table depth	30–76 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding duration	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	0–35 m
Slope	Not specified
Water table depth	Not specified

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 area of the MLRA, with typically <30 days of the year with temperatures dropping below freezing.

Precipitation in the northern area 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)	223-348 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	1,295-1,372 mm
Frost-free period (actual range)	210-365 days
Freeze-free period (actual range)	293-365 days
Precipitation total (actual range)	1,270-1,372 mm
Frost-free period (average)	277 days
Freeze-free period (average)	350 days
Precipitation total (average)	1,321 mm

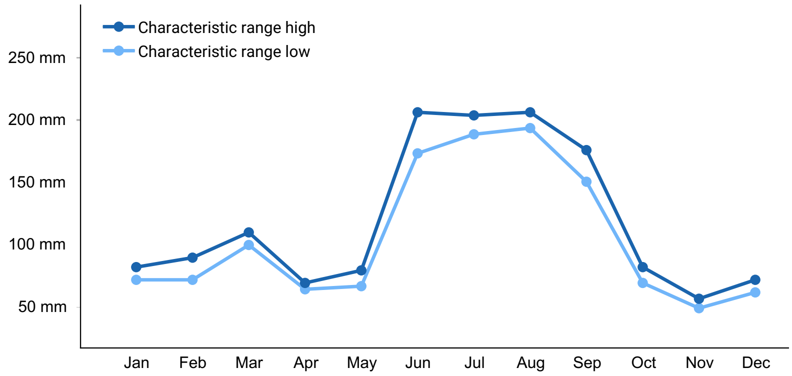

Figure 1. Monthly precipitation range

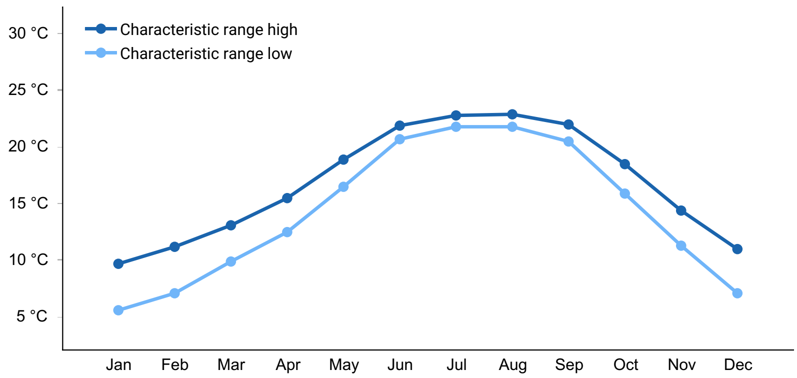

Figure 2. Monthly minimum temperature range

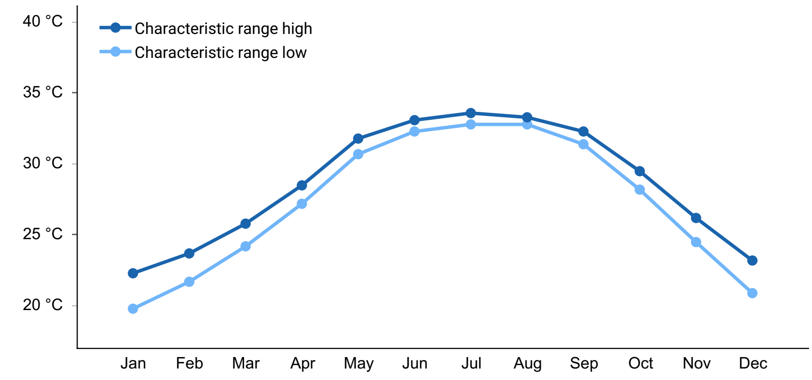

Figure 3. Monthly maximum temperature range

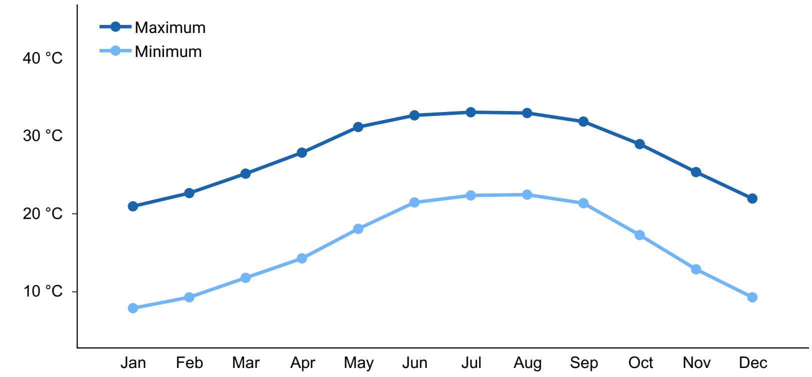

Figure 4. Monthly average minimum and maximum temperature

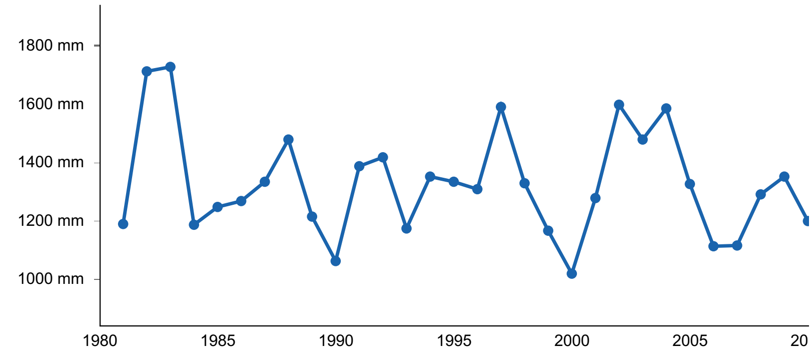

Figure 5. Annual precipitation pattern

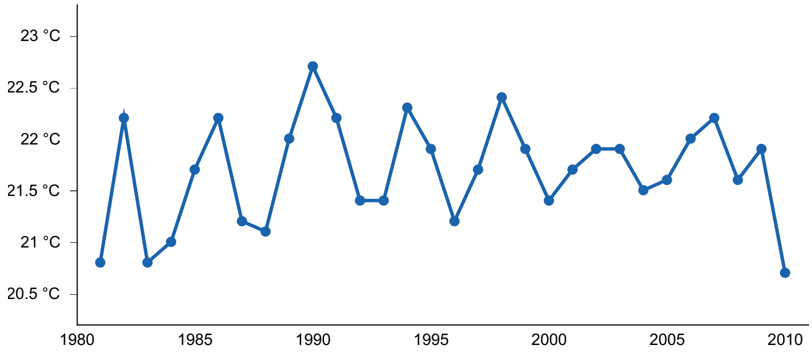

Figure 6. Annual average temperature pattern

Climate stations used

- (1) SAINT LEO [USC00087851], San Antonio, FL
- (2) TARPON SPGS SEWAGE PL [USC00088824], Tarpon Springs, FL
- (3) BROOKSVILLE CHIN HILL [USC00081046], Brooksville, FL

- (4) GAINESVILLE 11 WNW [USC00083322], Gainesville, FL
- (5) INVERNESS 3 SE [USC00084289], Inverness, FL
- (6) PLANT CITY [USC00087205], Plant City, FL
- (7) LISBON [USC00085076], Leesburg, FL
- (8) ORANGE SPRINGS 2SSW [USC00086618], Fort Mc Coy, FL

Influencing water features

Hydrology of this site is largely determined by its relationship to the Gulf of Mexico and underlying karst features, including solution cavities, sinkholes, and chimneys. This site occurs mainly along the Coastal Lowlands adjacent to the Gulf of Mexico and is surrounded by higher topography to the east. This site is situated on somewhat poorly drained soils that have limestone bedrock dominantly shallow or moderately deep to limestone, in areas of flats. 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, Gulf of Mexico, or adjacent sites.

Hydrogeomorphically, this upland landscape receives water through only local precipitation, and discharging water through the soil into the Florida Aquifer, Gulf of Mexico, or to adjacent wetter sites. Low slope gradient, moderate to rapid infiltration and moderately slow to rapid saturated hydraulic conductivity results in negligible to very high surface runoff. The combination of high pH, restricted rooting depth, and very low to moderate available water are the keys to this site’s plant community.

Soil features

Soils are somewhat poorly drained, loamy Aquic Hapludalfs (Aripeka, Matmon), somewhat poorly drained, sandy Aquic Quartzipsamments (Broward, Redlevel), or somewhat poorly drained, sandy Lithic Quartzipsamments (Citronelle). These soils formed in sandy over loamy, or sandy marine sediments over limestone bedrock. The dominant representative slope for the correlated soil components ranges from 0 to 2%. Clay content is dominantly 2 to 30%. Soil mineralogy of the argillic horizon (where present) is siliceous.

These shallow to moderately deep soils 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.

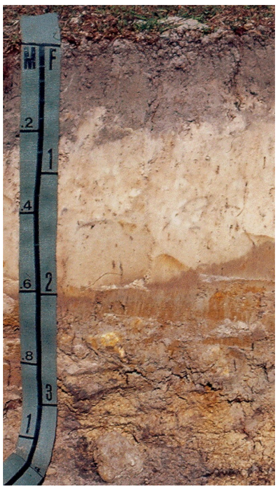

Figure 7. Example Soil Profile: Aripeka soils

Table 5. Representative soil features

Parent material	(1) Marine deposits (2) Phosphatic limestone
Surface texture	(1) Fine sand
Drainage class	Somewhat poorly drained

Permeability class	Moderately slow to rapid
Soil depth	23–140 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	1.78–8.13 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	1–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	1–15
Soil reaction (1:1 water) (0-101.6cm)	5.8–7.5
Subsurface fragment volume <=3" (0-101.6cm)	0–5%
Subsurface fragment volume >3" (0-101.6cm)	0–25%

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)	1.27–13.97 cm
Calcium carbonate equivalent (0-101.6cm)	0–60%
Electrical conductivity (0-101.6cm)	0–10 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	4.5–8.4
Subsurface fragment volume <=3" (0-101.6cm)	Not specified
Subsurface fragment volume >3" (0-101.6cm)	Not specified

Ecological dynamics

The Moist Lithic Flatwoods and Hammocks concept includes a very broad range natural community vegetation and environment. In general, plant community structure and composition are influenced by flooding and fire regimes, and depth of limestone substrate. These vary considerably across the range of this site.

The presence of limestone substrate with shallow surface soils unifies this site concept. Somewhat poorly drained soils over limestone support high soil moisture and periodic ponding from precipitation. Vegetation structure and composition varies with frequency and depth of inundation, with closed canopy forests of hydrophytic hardwoods inhabiting wettest conditions. Conversely, drier (and higher elevation) sites may support woodlands of pines and cabbage palms. Intermediate moisture and elevation conditions may support forests with pine-oak canopies.

In general, soils are acidic to slightly alkaline, with alkaline materials comprising the substrate (FNAI, 2010). Limestone, calcium carbonate and shell fragments encourage growth of calciphytic plants in hydric hammock forests and cabbage palm-pine flatwoods.

Structure and composition of forests/woodlands are also variably affected by fire regimes as well. Pine woodlands of drier sites burn with much greater frequency. Pre European-settlement fire return intervals for wet flatwoods (including the wet cabbage palm flatwoods) are estimated on the order two to three fires per decade (FNAI, 2010). A combination of drier site conditions and the presence of fine fuels support frequent fires in pine woodlands. Conversely, fire is very rare in the wetter environments of this site. Frequent flooding, high soil moisture, and closed canopy forests of hydrophytic hardwoods are inhospitable to fire ignition and spread.

State and transition model

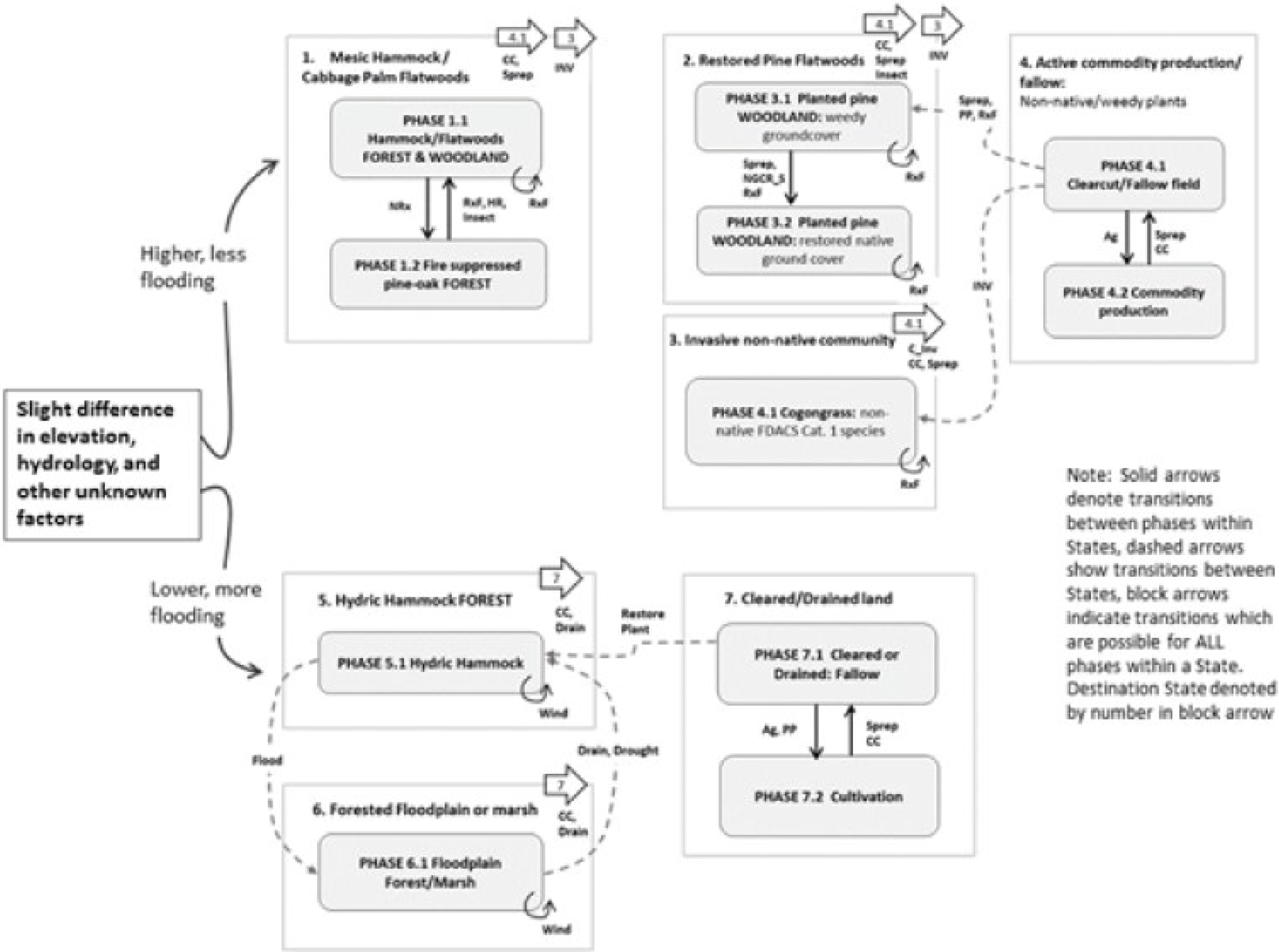

Figure 8. State and Transition model

RxF	Frequent interval prescribed 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
Drain	Permanent drainage via mechanical methods
Drought	Severe and prolonged drought capable of invoking succession to flood intolerant vegetation
Flood	Severe and persistent flooding, invoking natural succession to flood tolerant plant communities
Wind	Tree mortality and regeneration from strong winds and storms
Restore	Restoration of hydrology and landscape features in advance of planting
Plant	Artificial planting of native hardwood species
Ag	Various agricultural practices for crop cultivation

Figure 9. Legend for State and Transition Model

State 1
Mesic Hammock/Cabbage Palm Flatwoods

The drier portions of this site support pine-oak woodlands and forests resembling the Mesic Hammock and Cabbage Palm Flatwoods natural community descriptions of FNAI (FNAI, 2010). The drier variant of this site may be mosaic of closed canopy mesic hammock, dominated by live oak (*Q. virginiana*), and open pine dominated wet flatwoods with cabbage palm (*Sabal palmetto*) as a major mid- and understory dominant. These mosaics of forests and woodlands occur in areas with shallow limestone substratum, mostly along the western coast of MLRA 154. In addition to slash and longleaf pines, loblolly pine may be common in the State 1 condition of the drier regions of this site. Herbaceous vegetation is common in Cabbage Palm Flatwoods, and includes hairawn muhly (Muhlenbergia cappillipes), sawgrass (Cladium jamaicense), saltmeadow cordgrass (*Spartina patens*), black bogrush (*Schoenus nigricans*), blue maidencane, and sand cordgrass (*Spartina bakeri*). Mesic hammocks have sparse mid- and understory vegetation. Cabbage palm is frequent as a subcanopy dominant. Other hardwoods include American elm (*Ulmus americana*), sweetbay (*Magnolia virginiana*), red maple (*Acer rubrum*), sugarberry (*Celtis laevigata*), sweetgum (*Liquidambar styraciflua*), and water oak (*Q. nigra*). Fire is an important natural disturbance in State 1. The open pine woodlands of Cabbage Palm Flatwoods are maintained by frequent fire. Mesic hammock vegetation is generally inflammable, and fire may occur in these areas only in severe drought conditions.

State 2
Restored pine flatwoods

State 2 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 2 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 grasses provides fine fuels for frequent ground fires and is necessary for restoration of ecological site dynamics. State 2 woodlands may provide suitable habitat for ground nesting birds and small mammals.

State 3
Invasive non-native community

State 3 describes a condition where one or several noxious non-native species has invaded and dominated the site. In the drier portions of this site, cogongrass is the most pervasive noxious invader. Cogongrass is not common in frequently inundated areas.

State 4
Active commodity/fallow lands

This state describes commodity land uses of the drier portions of this site, including cleared land, crop production and improved pastures. All phases of State 4 describe conditions following clearing and 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.

State 5
Hydric Hammock Forest

State 5 represents closed canopy forests of flood tolerant evergreen hardwoods and palms. Hydric Hammocks are limited to moist soils with limestone close to the surface. Ponding and inundation are frequent, and related to rainfall and poorly drained and frequently saturated soils. This site does not occur in floodplains with seasonal overwash flooding. Forest composition is influenced by flooding frequency and depth of inundation. Cypress (Taxodium spp.) may be infrequently present where flooding is more pronounced. More commonly, canopy species include swamp laurel oak (*Quercus laurifolia*), live oak (*Q. virginiana*), American elm (*Ulmus americana*), swamp blackgum (*Nyssa biflora*), sweetbay (*Magnolia virginiana*), red cedar (*Juniperus virginiana*), red maple (*Acer rubrum*), sugarberry (*Celtis laevigata*), sweetgum (*Liquidambar styraciflua*), and water oak (*Q. nigra*). Cabbage palm (*Sabal palmetto*) may be abundant in all forest strata. The mid- and under-story vegetation of hydric hammocks is variable, and depend on small scale variations in hydrology and topography. Common species include many ferns and vines, as well as hardwood saplings.

State 6
Flooded Forest or Marsh

This state describes forested vegetation following long term permanent or semi-permanent flooding. Cypress and swamp blackgum may be dominant, along with other flood tolerant hardwood species. Alternatively, marshlands of perennial flood tolerant grasses and sedges may develop.

State 7
Cleared/Drained land

This state describes the condition similar to State 4. This state may follow clear-cut harvesting of hydric hammocks, and/or draining via ditching. If drained, land conversion to crop or timber production may be possible.

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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	05/16/2024
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:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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:**
