# Ecological site F154XA005FL
# Poorly Drained Upland Pine-Hardwood Forests

Last updated: 5/13/2025
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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: Upland Pine, Upland Mixed Woodland, and Upland Hardwood Forest (FNAI, 2010)

## Ecological site concept

Map unit components associated with this concept occur on 2 to 12% slopes. Soils include very deep, poorly drained, loamy and clayey subsoils with low base saturation map units (Blicthon, Kanapaha, Wacahoota, Wacahoota Variant). Also included are very deep, poorly drained, loamy and clayey subsoils with high base saturation map units (Bivan, Boardman, Fellowship, Fellowship Variant, Flemington). This site is extensively mapped in the Northern Highlands, Fairfield Hills, Ocala Hills, Sumter Uplands, and Brooksville Ridge physiographic provinces of Central Florida.

Reference site vegetation include various upland hardwood plant communities. These are closed canopy forests of mainly hardwood species (pine may be present but not dominant). Included are some hardwood species typical of wet habitat. Understory vegetation is sparse.

## Associated sites

| | |
|---|---|
| F154XA007FL | **Moist Sandy Wet-Mesic Flatwoods**<br>These are poorly drained communities that occur in slightly lower, wetter landscape positions |
| F154XA008FL | **Moist Sandy Scrubby Flatwoods**<br>These sites are somewhat poorly drained communities that occur in higher, drier landscape positions |
| F154XA010FL | **Moist Lithic Flatwoods And Hammocks**<br>These are poorly drained communities that occur in slightly lower, wetter landscape positions |
| F154XA011FL | **Wet Lithic Flatwoods And Hammocks**<br>These are poorly drained communities that occur in slightly lower, wetter landscape positions |
| F154XA012FL | **Wet Rich Forests And Woodlands**<br>These are poorly drained communities that occur in slightly lower, wetter landscape positions |
| F154XA004FL | **Moist Sandy Pine-Hardwood Woodlands**<br>These sites are somewhat poorly drained communities that occur in higher, slightly drier landscape positions |

## Similar sites

| | |
|---|---|
| F154XA007FL | **Moist Sandy Wet-Mesic Flatwoods**<br>These sites occur on slightly lower landscapes (lowland flats) with similar soil drainage and sandy family particle size class. These sites will have slightly longer hydroperiods on more level landforms which will result in different plant community composition and structure. |

| | |
|---|---|
| F154XA011FL | **Wet Lithic Flatwoods And Hammocks**<br>These sites occur on slightly lower landscapes (lowland flats) with similar soil drainage and loamy family particle size class. These sites will have slightly longer hydroperiods on more level landforms which will result in different plant community composition and structure. |
| F154XA012FL | **Wet Rich Forests And Woodlands**<br>These sites occur on slightly lower landscapes (lowland flats) with similar soil drainage and clayey family particle size class. These sites will have slightly longer hydroperiods on more level landforms which will result in different plant community composition and structure. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Quercus virginiana*<br>(2) *Pinus taeda* |
| Shrub | (1) *Carya glabra*<br>(2) *Ilex opaca* |
| Herbaceous | (1) *Chasmanthium laxum var. sessiliflorum*<br>(2) *Oplismenus hirtellus* |

## 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 in within the Floridian Section of the Coastal Plain Province of the Atlantic Plain. Elevations of this concept ranges from 40 to 230 feet (12 to 70 meters). This site occurs on upland rises with loamy and clayey, poorly drained soils. Slopes are nearly level to strongly sloping and range from 0 to 12%.

The isolated distribution of this site is restricted to several distinct regions of the Northern Highlands, Fairfield Hills, Ocala Hills, Sumter Uplands, and Brooksville Ridge physiographic provinces. All of these disjunct highlands appear to be dis-severed remnants of a once continuous residual highland of older Miocene sediments (Hawthorne Group).

**Table 2. Representative physiographic features**

| | |
|---|---|
| Hillslope profile | (1) Footslope |
| Landforms | (1) Marine terrace > Rise |
| Runoff class | Low to very low |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 40–230 ft |

| | |
|---|---|
| Slope | 0–12% |
| Water table depth | 3–12 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 | 30–260 ft |
| Slope | Not specified |
| Water table depth | 0–18 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 part of MLRA 154, with typically < 30 days of the year with temperatures dropping below freezing.

Precipitation is distributed fairly evenly throughout the year. Average annual precipitation ranges from 50 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 2 to 4 times 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) | 255-365 days |
| Freeze-free period (characteristic range) | 365 days |
| Precipitation total (characteristic range) | 50-53 in |
| Frost-free period (actual range) | 215-365 days |
| Freeze-free period (actual range) | 303-365 days |
| Precipitation total (actual range) | 50-54 in |

| | |
|---|---|
| Frost-free period (average) | 312 days |
| Freeze-free period (average) | 354 days |
| Precipitation total (average) | 52 in |

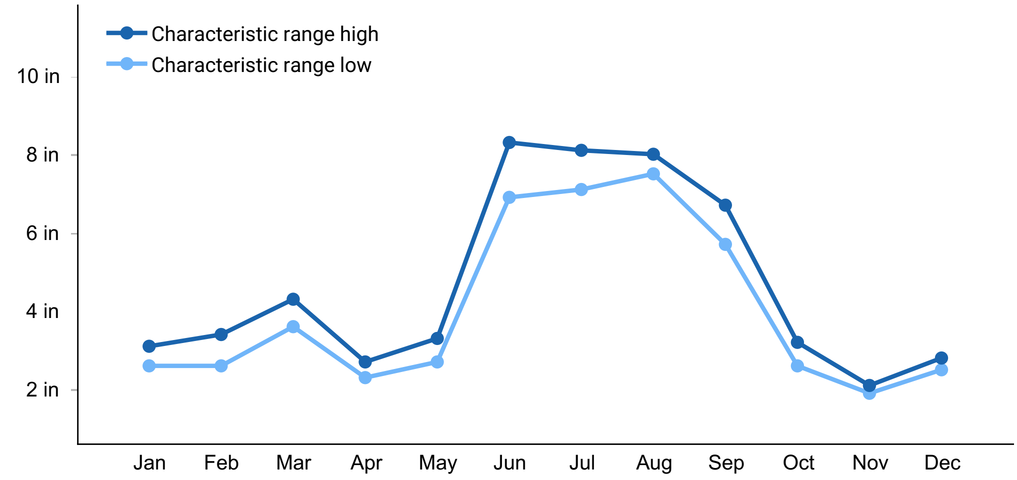


**Figure 1. Monthly precipitation range**

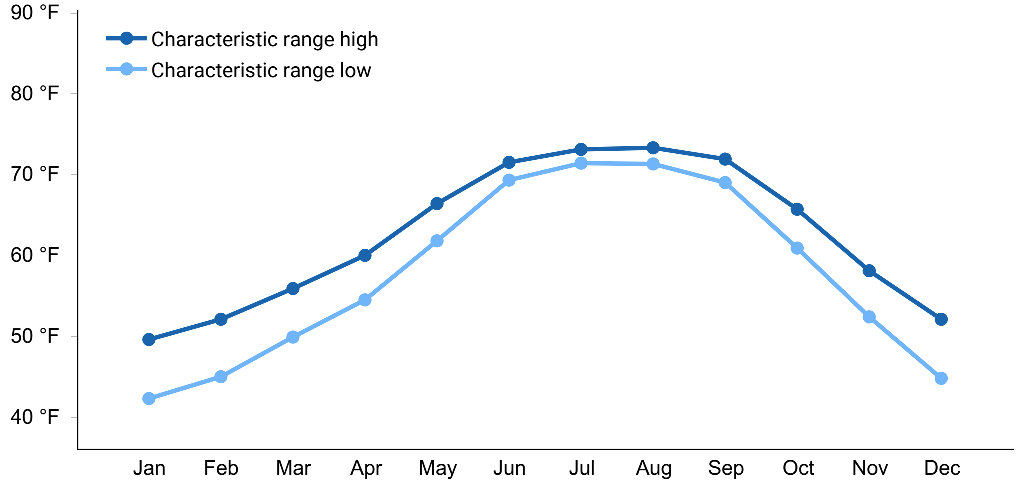


**Figure 2. Monthly minimum temperature range**

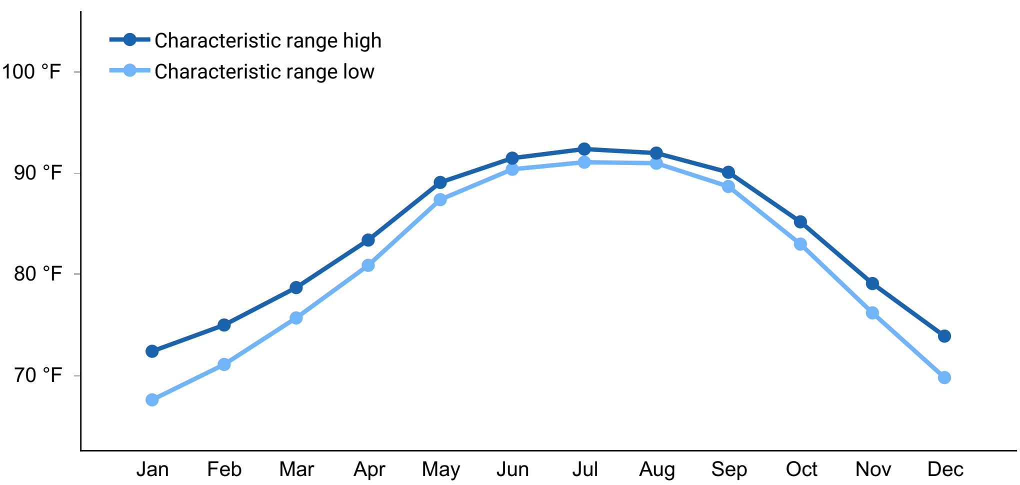


**Figure 3. Monthly maximum temperature range**

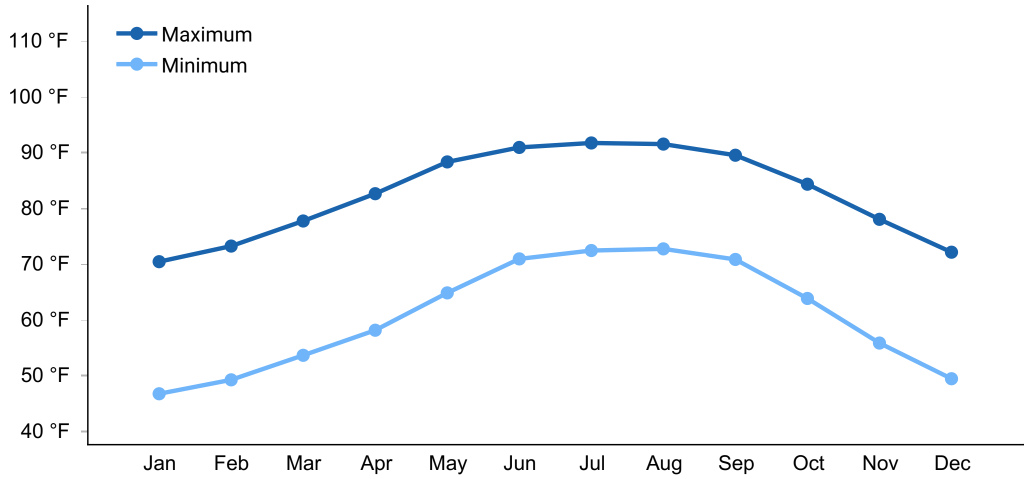


**Figure 4. Monthly average minimum and maximum temperature**

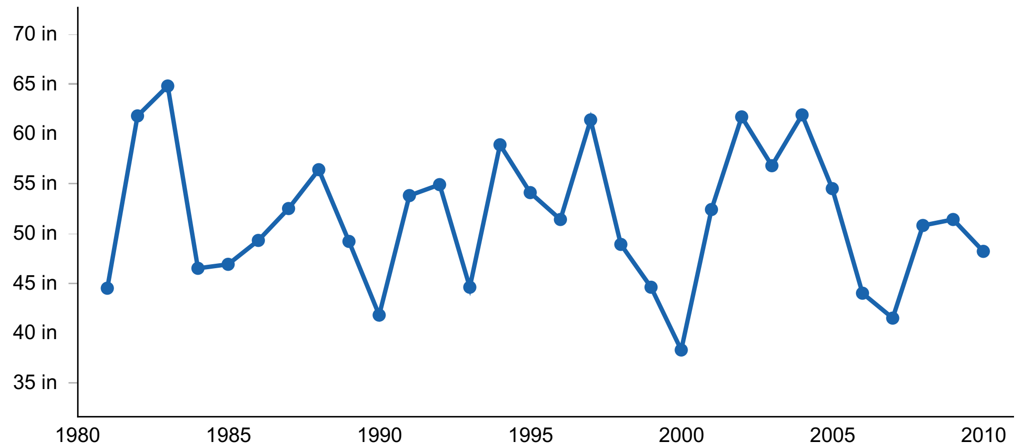


**Figure 5. Annual precipitation pattern**

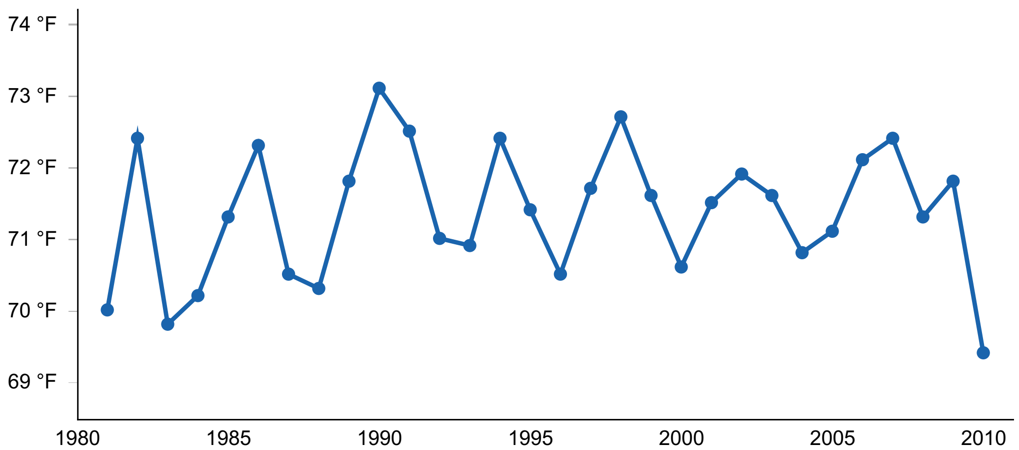


**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) BROOKSVILLE CHIN HILL [USC00081046], Brooksville, FL
- (2) CLERMONT 9 S [USC00081641], Clermont, FL
- (3) INVERNESS 3 SE [USC00084289], Inverness, FL
- (4) PLANT CITY [USC00087205], Plant City, FL

- (5) TARPON SPGS SEWAGE PL [USC00088824], Tarpon Springs, FL
- (6) GAINESVILLE 11 WNW [USC00083322], Gainesville, FL
- (7) MTN LAKE [USC00085973], Lake Wales, FL
- (8) BARTOW [USC00080478], Bartow, FL
- (9) LISBON [USC00085076], Leesburg, FL
- (10) ORANGE SPRINGS 2SSW [USC00086618], Fort Mc Coy, FL

## Influencing water features

Hydrology of this site is largely determined by landform position and surface morphometry. The modal concept for this site is areas of ridges, knolls, and side slopes on elevated landforms that are typically surrounded by drier ecological sites (Moist Rich Uplands, Moist Yellow Woodlands). The site is situated on poorly drained soils that dominantly have a perched water table at less than 12 inches (30.5 cm) during wet periods. A few soils have an apparent seasonal high water table.

Hydrogeomorphically, this concept includes uplands which receive water from local precipitation only, and discharge water through the soil to the Florida Aquifer or through surface runoff to adjacent sites. Seepage zones are common on hillslope positions. The slope gradient, moderate to slow infiltration, and moderately slow to very slow saturated hydraulic conductivity results in medium to very rapid surface runoff. The combination of high fertility, moderate to high available water, and moderately slow to very slow saturated hydraulic conductivity are the keys to this site's plant community.

## Soil features

Soils are generally poorly drained, loamy Arenic Plinthic Paleaquults (Blichton), Arenic Paleaquults (Wacahoota, Wacahoota Variant), Grossarenic Paleaquults (Kanapaha), Typic Endoaqualfs (Boardman) or as poorly drained, clayey Umbric Endoaqualfs (Fellowship) and Typic Albaqualfs (Bivans). These soils formed in sandy over loamy, loamy, or clayey marine sediments. The dominant representative slope for the correlated soil components is 2 to 12%. However, a few map units range from 0 to 2%. Clay content of the argillic horizon is dominantly 25 to 65%.

The extreme wetting and drying cycle of these soils along with parent materials high in iron and phosphates result in the development of plinthite, ironstone, or phosphatic nodules. Bivans, Blichton, Flemington and Kanapaha soils have a nodule content of 0 to 5%. Nodule content of Boardman, Fellowship, Wacahoota and Wacahoota Variant soils is 5 to 25%, and Fellowship Variant ranges from 35 to 60%.

Mineralogy is either siliceous or mixed on the loamy soils (Blichton, Boardman, Kanapaha, Wacahoota, and Wacahoota Variant) and the clayey soils (Bivans, Fellowship) are smectitic. These very deep soils will not restrict plant roots, although root distribution may be limited to cleavage planes in the clayey soils.

Blichton    Fellowship

**Figure 7. Poorly drained upland hardwood forest soils**

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Marine deposits |
| Surface texture | (1) Fine sand<br>(2) Sand<br>(3) Loamy fine sand<br>(4) Loamy sand<br>(5) Gravelly |
| Family particle size | (1) Loamy |
| Drainage class | Poorly drained |
| Permeability class | Very slow to moderately slow |
| Soil depth | 80 in |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-40in) | 2.8–5.8 in |
| Calcium carbonate equivalent (0-40in) | 0% |
| Electrical conductivity (0-40in) | 0 mmhos/cm |
| Sodium adsorption ratio (0-40in) | 0–1 |
| Soil reaction (1:1 water) (0-40in) | 4.5–5.3 |
| Subsurface fragment volume <=3" (0-40in) | 0–20% |

| | |
|---|---|
| Subsurface fragment volume >3" (0-40in) | 0–2% |

**Table 6. Representative soil features (actual values)**

| | |
|---|---|
| Drainage class | Not specified |
| Permeability class | Very slow to rapid |
| Soil depth | Not specified |
| Surface fragment cover <=3" | Not specified |
| Surface fragment cover >3" | Not specified |
| Available water capacity (0-40in) | Not specified |
| Calcium carbonate equivalent (0-40in) | Not specified |
| Electrical conductivity (0-40in) | 0–2 mmhos/cm |
| Sodium adsorption ratio (0-40in) | 0–4 |
| Soil reaction (1:1 water) (0-40in) | Not specified |
| Subsurface fragment volume <=3" (0-40in) | Not specified |
| Subsurface fragment volume >3" (0-40in) | Not specified |

## Ecological dynamics

The Poorly Drained Upland Pine-Hardwood Forests includes a range of mixed pine-hardwood and hardwood forest types. Forest composition and structure of this site is dependent on regional geography. This site is limited to the physiographic Uplands and Ridges of North and Central Florida (within MLRA 154). Many upland hardwood species reach their southern range limits in this region.

In general, the soils and forest vegetation of this site affect mesic conditions, compared to the sandy soil uplands prevalent in most of Central Florida. The higher concentrations of fine textured soils, coupled with loamy and clayey subsoils, affect relatively high nutrient and moisture availability in Poorly Drained Upland Pine-Hardwood Forests. Hardwood forest vegetation also contributes to mesic conditions of this site; dense and layered vegetation inhibits air movement and retains humidity, and leaf litter accumulation retains moisture in the topsoil.

Gap dynamics is the predominant driver of natural succession in Poorly Drained Upland Pine-Hardwood Forests. Mortality of one or more canopy trees creates forest gaps, which allow increased sunlight for seedling establishment. Wind damage creates localized canopy gaps. Similarly, winds from large hurricanes can kill large swaths of canopy hardwoods in these inland forests. Insects and other pathogens may kill single trees or groups of trees. Loblolly pines are particularly susceptible to insect mortality (i.e., Southern Pine Beetle).

Fires are infrequent in the forests of this site. Insufficient fine fuel availability, coupled with moisture laden leaf litter, inhibit fire ignition, and spread. Fire may creep into these hardwood forests from surrounding xeric uplands, but they rarely completely burn through the understory or consume much vegetation (Batista and Platt 1997). Fires may infrequently burn in upland mixed pine-hardwood forests typical of drier conditions of this Site, or in droughty weather conditions.

## State and transition model

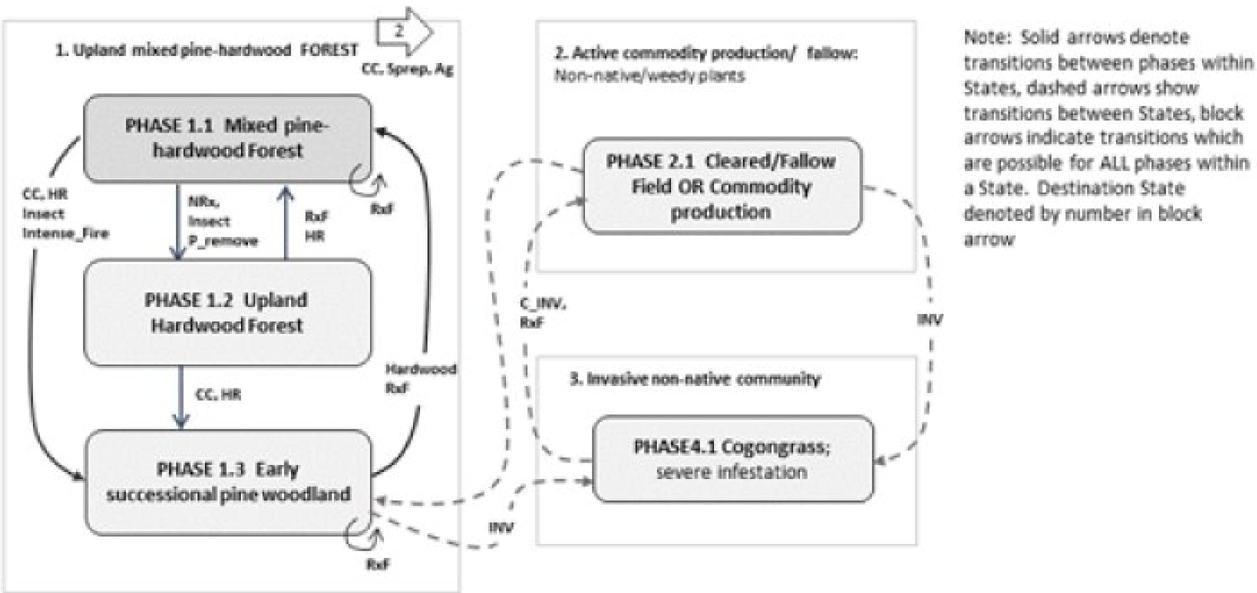


**Figure 8. Poorly Drained Upland Hardwood Forests**

| | |
|---|---|
| RxF | Regular fire regime |
| Intense_Fire | Infrequent (intense) fire, often stand replacing catastrophic fire |
| NRx | Fire suppression, or very infrequent non-catastrophic fire |
| HR | Hardwood reduction |
| PP | Planted Pine |
| P_remove | Selective logging of pines |
| CC | Clearcut |
| Sprep | Site prep (mechanical and chemical) |
| Hardwood | Natural recruitment of hardwoods |
| INV | Invasion of noxious non-native plant species |
| C_INV | Mechanical/chemical control of invasive plant species |
| Ag | Various agricultural practices for crop cultivation |
| Insect | Pine (hardwood) mortality due to insect infestation |

**Figure 9. Poorly Drained Upland Hardwood Forests Legend**

## State 1
## Upland mixed pine-hardwood or hardwood forest

Closed canopy forests characterize the State 1 (pre-settlement) vegetation of this site. These forests are comprised of mixed pine and hardwood species, or hardwoods only, depending on local moisture conditions and disturbance regimes. Characteristic canopy species include: live oak (*Quercus virginiana*), southern magnolia (*Magnolia grandiflora*), pignut hickory (*Carya glabra*), sweetgum (*Liquidambar styraciflua*), laurel oak (*Q. hemisphaerica*), swamp chestnut oak (*Q. michauxii*), southern hackberry (*Celtis occidentalis*), white ash (*Fraxinus americana*). Loblolly pine (*Pinus taeda*) may be present, particularly following canopy openings from wind or fire. Sub-canopy strata contain many seedlings and saplings of canopy hardwoods, in addition to shrubs and small tree species: (*Ilex opaca*), red bay (*Persea borbonia*), American hornbeam (*Carpinus caroliniana*), devil's walkingstick (*Aralia spinosa*), eastern hophornbeam (*Ostrya virginiana*), flowering dogwood (*Cornus florida*), eastern redbud (*Cercis canadensis*), winged elm (*Ulmus alata*), black cherry (*Prunus serotina*). Herbaceous species of the understory are shade-tolerant, and include partridgeberry (*Mitchella repens*), Virginia creeper (*Parthenocissus quinquefolia*), violets (Viola spp.), sedges (Carex spp.), sarsaparilla vine (*Smilax pumila*), ebony spleenwort (*Asplenium platyneuron*), woodsgrass (*Oplismenus hirtellus*), and longleaf woodoats (*Chasmanthium laxum* var. sessiliflorum).

## State 2
## Active commodity production

This state describes commodity land uses of the Poorly Drained Upland Pine-Hardwood Forests. The mesic soils of this site are desirable for agriculture and timber production, including annual row crops, orchards, and pine plantations. Also included in State 2 are improved pastures of bahiagrass (or other sod forming grass species). All phases of State 2 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.

## State 3
## Invasive non-native plant community

State 3 describes a condition where one or several noxious non-native species has invaded and dominated the site. The most common noxious invasive plant species of cleared areas on these soils 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). Several other noxious plant species may invade forested phases of this Site.

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## Contributors

Rick Robbins
S. Carr

## 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 | Matthew Duvall |
| 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:**