Ecological site F156AY380FL
Subtropical Hardwood Hammocks of Miami Ridge / Atlantic Coastal Strip

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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): 156A–Florida Everglades and Associated Areas

This area makes up about 7,749 square miles (20,071 square kilometers) and is entirely in Florida. It is located at the southern tip of the State and has shoreline on both the Atlantic Ocean and the Gulf of Mexico. Lake Okeechobee borders the MLRA to the north. Aside from sugar cane plantations in the north, the Everglades National Park, Big Cypress National Preserve, and the Big Cypress Seminole Indian Reservation comprise this area. Historical ditching, berming, and canals prevent natural water flow through this delicate ecosystem. To mitigate this, extensive restoration efforts have been implemented. Urban sprawl from Miami and cities to its north on the Atlantic Ridge has encroached along the eastern boundary of this area. Most of the MLRA has resisted urbanization because of a water table that is at or near the surface, a considerable acreage of unstable organic soils, and its identity as a national treasure.

About one-third of this area is in Native American reservations, national parks, game refuges, or other large holdings. Cypress forests are extensive in the area, but mangrove forests are widespread along the eastern and southern coasts. A large part of the area is open marsh. Much of the area is used for hunting, fishing, and other recreational activities. The cropland in the area is used mainly for winter vegetables, but citrus fruits, avocado, and papaya are grown on the better drained soils. Sugarcane is an important crop on the organic soils south of Lake Okeechobee. The acreage of improved pasture is increasing. Beef cattle are the principal kind of livestock, but dairying is an important enterprise locally. Urbanization is extensive along the eastern coast.

The major soil resource concerns are wind erosion, maintenance of the content of organic matter and productivity of the soils, and management of soil moisture and soil subsidence. Conservation practices on cropland generally include conservation crop rotations, cover crops, nutrient management, pest management, water-control structures, surface drainage systems (field ditches, mains, and laterals), pumping plants, and irrigation water management (including micro irrigation systems and surface and subsurface irrigation systems). Conservation practices on pasture and rangeland generally include prescribed grazing, brush management, pest management, prescribed burning, and watering facilities. Conservation practices on forestland generally include forest stand improvement, firebreaks, pest management, prescribed burning, and management of upland and wetland wildlife habitat.

LRU notes

There is not an official LRU for the MLRA 156A area. For the time being the technical team recommended to add the four terrestrial physiographic provinces ecoregions (Big Cypress, Everglades, Southern Coast and Islands, and Miami Ridge / Atlantic Coastal Strip) and one subaqueous ecoregion (Coastal Marine and Estuarine) on this section. This PES occurs within the Miami Ridge / Atlantic Coastal Strip ecoregion.

The Miami Ridge/Atlantic Coastal Strip Ecoregion, sea level to 20 m (0 to 66 ft) in elevation, is a heavily urbanized region, with coastal ridges on the east and flatter terrain to the west that grades into the Everglades. The western side originally had wet and dry prairie marshes on marl and rockland and sawgrass marshes, but much of it is now covered by cropland, pasture, and suburbs. To the south, the Miami Ridge extends from near Hollywood south to

Homestead and west into Long Pine Key of Everglades National Park. It is a gently rolling rock ridge of oolitic limestone that once supported more extensive southern slash pine forests and islands of tropical hardwood hammocks. The northern part of the region is a plain of pine flatwoods and wet prairie, and coastal sand ridges with scrub vegetation and sand pine. There are very few natural lakes in the region, but three types of ponded surface waters occur: 1) Pits dug deep into underlying "rock" containing water that is clear, high pH and alkaline, with moderate nutrients; 2) Shallow, surficial dug drains that are darker water; and 3) flow-through lakes (e.g., Lake Osborne) that are colored and nutrient rich.

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: 76 Southern Florida Coastal Plain; 76C Miami Ridge/ Atlantic Coastal Strip (Griffith, G. E., Omernik, J. M., & Pierson, S. M., 2013)

-Florida Natural Area Inventory, 2010 Edition: Hardwood Forested Uplands (FNAI ,2010)

-Soil Conservation Service, 26 Ecological Communities of Florida: 11- Upland Hardwood Hammocks (Florida Chapter Soil and Water Conservation Society, 1989)

Ecological site concept

The Subtropical Hardwood Hammocks of the Miami Ridge / Atlantic Coastal Strip are closed canopy forests dominated by temperate and tropical evergreen tree species that is naturally protected from fire by its position on the landscape. These hammock species include mesic hammocks and xeric hammocks. This site are relatively high, flat, and dry sites where fires are rare, and flooding is excluded. These are not considered fire- adapted communities and can tolerate low intensity fires, with mature trees providing enough shade and leaf litter that retain soil moisture and allow for the establishment of other hammock species. This community has been heavily impacted by human activity, primarily clearing for agriculture and urbanization within the ecoregion and is very limited in distribution to small parks within urban complexes along the Miami Ridge/ Atlantic Coastal Strip.

Associated sites

F156AY340FL	**Subtropical Pine Flatwoods and Palmetto Prairie of Miami Ridge / Atlantic Coastal Strip** The Subtropical Pine Flatwoods and Palmetto Prairie of Miami Ridge / Atlantic Coastal Strip will be found in slightly lower landscape positions where the soil drainage is dominantly poorly drained. This will often grade into hardwood hammocks as elevation slightly increases due to better drained soils.
F156AY350FL	**Subtropical Forested Rocklands of Miami Ridge / Atlantic Coastal Strip** The Subtropical Forested Rocklands of Miami Ridge / Atlantic Coastal Strip will be found in slightly lower landscape positions and will often have limestone at or near the surface. As elevation increases the soil drainage will increase and become deeper allowing for the formation of these communities.
F156AY360FL	**Subtropical Moist Hammocks of Miami Ridge / Atlantic Coastal Strip** The Subtropical Moist Hammocks of Miami Ridge / Atlantic Coastal Strip will be found in lower landscape positions where the soil drainage is dominantly poorly to very poorly drained. These may grade into hardwood hammocks as the elevation increases due to better and deeper drained soils.
F156AY390FL	**Subtropical Scrub of Miami Ridge / Atlantic Coastal Strip** The Subtropical Scrub of Miami Ridge / Atlantic Coastal Strip will be found in slightly higher landscape positions where the soil drainage is well to excessively drained. These are the oldest geologic areas and will have the deepest soils.

Similar sites

F156AY360FL	**Subtropical Moist Hammocks of Miami Ridge / Atlantic Coastal Strip** The Subtropical Moist Hammocks of Miami Ridge / Atlantic Coastal Strip may be confused with a moist hammock. Moist hammocks will be similar in vegetative structure but differ in species composition due to the drainage class. These are poorly to very poorly drained communities and will support more hydrophytic species.

F156AY390FL	**Subtropical Scrub of Miami Ridge / Atlantic Coastal Strip** The Subtropical Scrub of Miami Ridge / Atlantic Coastal Strip may be confused with the successional stage of xeric hammock. This will be similar in vegetative structure and composition but will be different in the succession of reference community.
R156AY370FL	**Subtropical Coastal Zones of Miami Ridge / Atlantic Coastal Strip** The Subtropical Coastal Zones of Miami Ridge / Atlantic Coastal Strip may be confused with the maritime hammock state. Maritime hammocks are formed along the coast and will be deep sandy soils with a shell layer reflective of storm deposition.
F156AY350FL	**Subtropical Forested Rocklands of Miami Ridge / Atlantic Coastal Strip** The Subtropical Forested Rocklands of Miami Ridge / Atlantic Coastal Strip may be confused with a rockland hammock. Rockland Hammocks will have a more diverse species assemblage and have shallow soils that will have limestone at or near the surface rather than deep sandy soils.

Table 1. Dominant plant species

Tree	(1) *Quercus*
Shrub	(1) *Callicarpa americana* (2) *Serenoa repens*
Herbaceous	(1) *Tillandsia* (2) *Panicum*

Physiographic features

This ecological community was historically and currently in lesser extent found in two topographic positions within this ecoregion: (1) on levees of rivers, and (2) midslope or ecotonal between xeric communities such as scrub and low-lying wetland communities such as strand swamps. Mesic hammocks occur on higher sites where well-drained soils are rarely inundated in ecotones between wetlands and upland communities where fires are rare, occurring as small low intensity ground fires. Xeric hammocks occur on high sites with well-drained soils with the exclusion of flooding and fire allowing an oak canopy to grow. Due to high urbanization of this ecoregion, this site is very rare to non-existent. Old growth oak species in urban parks may be representative of the reference communities.

The Miami Ridge/ Atlantic Coastal Strip falls under the Pleistocene series Miami Limestone geologic formation, also known as Miami Oolite. It forms the Atlantic Coastal Ridge and extends beneath the Everglades where it is commonly covered by thin organic and freshwater sediments, as well as extending down into the Florida Keys. To the north the Miami Limestone formation grades laterally northward into the Anastasia Formation. The Miami Limestone consists of two facies, an oolitic facies and a bryozoan facies. The oolitic facies consists of white to orangish gray, poorly to moderately indurated, sandy, oolitic limestone (grainstone) with scattered concentrations of fossils. The bryozoan facies consist of white to orangish gray, poorly to well indurated, sandy, fossiliferous limestone grainstone and packstone). Beds of quartz sand are also present as unindicated sediments and indurated limey sandstones. Fossils present include mollusks, bryozoans, and corals. Molds and casts of fossils are common. The highly porous and permeable Miami Limestone forms much of the Biscayne Aquifer of the surficial aquifer system.

Table 2. Representative physiographic features

Geomorphic position, terraces	(1) Tread
Geomorphic position, flats	(1) Rise (2) Talf
Landforms	(1) Coastal plain (2) Marine terrace > Hammock (3) Marine terrace > Flat (4) Marine terrace > Knoll (5) Marine terrace > Ridge (6) Marine terrace > Rise
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 very rare
Ponding frequency	None
Elevation	0–33 ft
Slope	0–5%
Ponding depth	0 in
Water table depth	30–70 in
Aspect	Aspect is not a significant factor

Climatic features

The climate of MLRA 156A is subtropical, with mild winters and hot wet summers. The average annual precipitation of this MLRA is 37 to 62 inches (950 to 1,565 millimeters). About 60 percent of the precipitation occurs from June through September. Most of the rainfall occurs during moderate intensity, tropical storms that produce large amounts of rain from late spring through early autumn. Late autumn and winter are relatively dry. The average annual temperature of the MLRA is 74 to 78 degrees F (23 to 26 degrees C). The freeze-free period of the MLRA averages 355 days and ranges from 345 to 365 days.

The following tables and graphs consist of specific climate stations found within the range of this ecological site within this MLRA.

Table 3. Representative climatic features

Frost-free period (characteristic range)	365 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	57-64 in
Frost-free period (actual range)	365 days
Freeze-free period (actual range)	365 days
Precipitation total (actual range)	51-67 in
Frost-free period (average)	365 days
Freeze-free period (average)	365 days
Precipitation total (average)	61 in

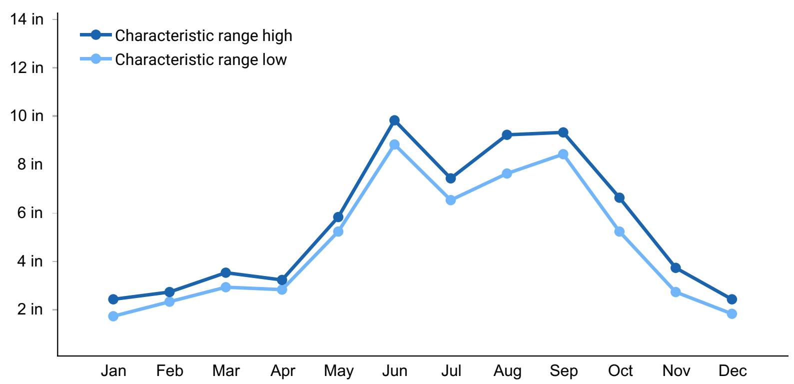


Figure 1. Monthly precipitation range

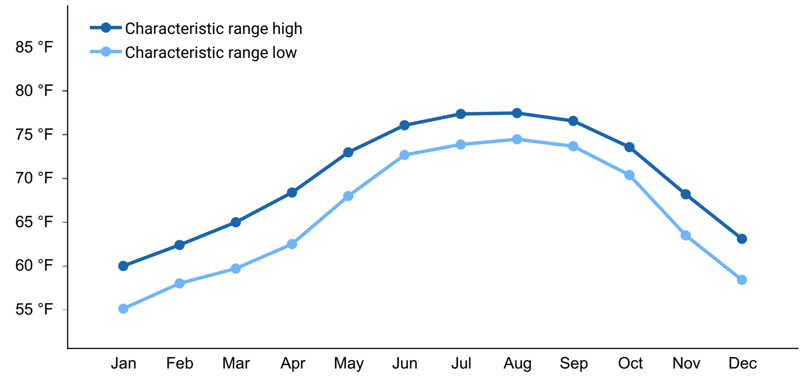


Figure 2. Monthly minimum temperature range

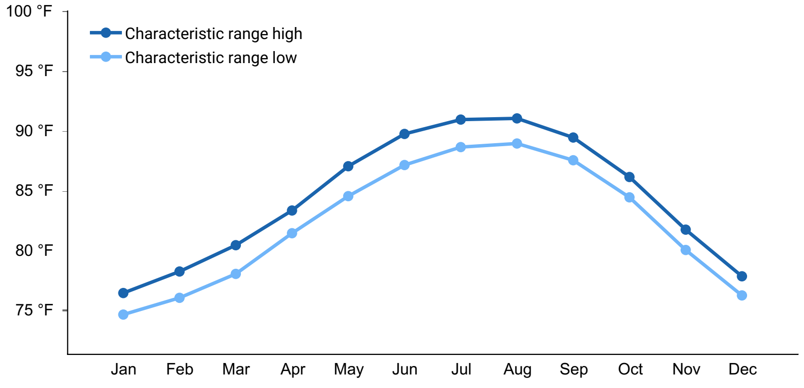


Figure 3. Monthly maximum temperature range

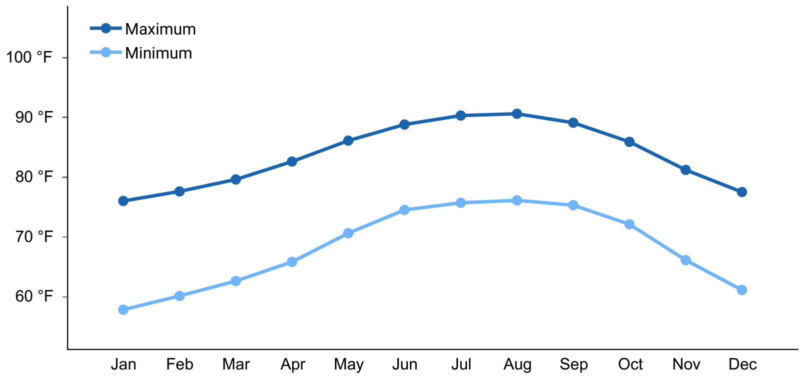


Figure 4. Monthly average minimum and maximum temperature

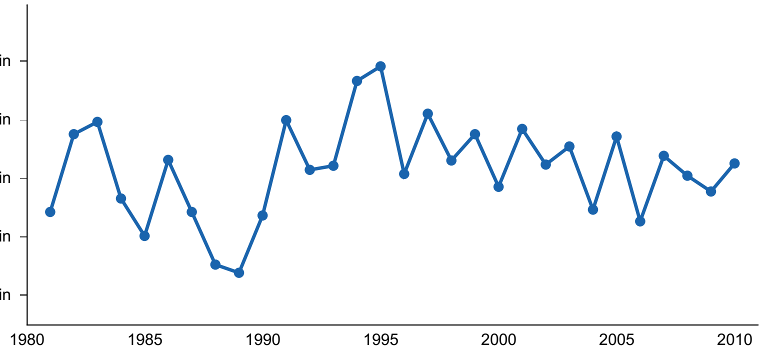


Figure 5. Annual precipitation pattern

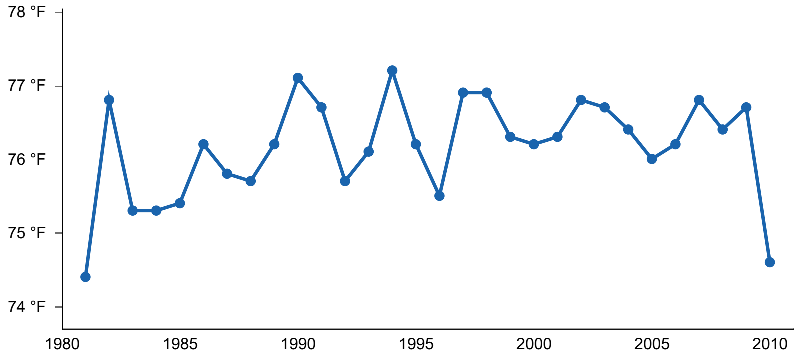


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ROYAL PALM RS [USC00087760], Homestead, FL
- (2) HOMESTEAD GEN AVIATION [USC00084095], Homestead, FL
- (3) PERRINE 4W [USC00087020], Miami, FL
- (4) MIAMI KENDALL TAMIAMI EXEC AP [USW00012888], Miami, FL
- (5) CAPE FLORIDA [USC00081306], Key Biscayne, FL
- (6) MIAMI WSO CITY [USW00012859], Miami, FL
- (7) MIAMI NWSFO [USC00085667], Miami, FL
- (8) MIAMI INTL AP [USW00012839], Miami, FL
- (9) HIALEAH [USC00083909], Miami, FL
- (10) MIAMI BEACH [USW00092811], Miami Beach, FL
- (11) MIAMI OPA LOCKA AP [USW00012882], Opa Locka, FL
- (12) NORTH MIAMI BEACH #2 [USC00086315], Miami, FL
- (13) HOLLYWOOD NORTH PERRY AP [USW00092809], Hollywood, FL
- (14) WESTON [USC00089511], Fort Lauderdale, FL
- (15) FT LAUDERDALE [USC00083163], Fort Lauderdale, FL
- (16) LOXAHATCHEE NWR [USC00085184], Boynton Beach, FL

Influencing water features

This ecological site is mainly influenced by freshwater and frequently occur on ridges or knoll in a wetland matrix or adjacent to floodplain wetlands. Given the isolated setting and hydrologic differences of the surrounding areas, this site has very abrupt ecotones which can dramatically shift species composition from hardwood hammocks to wetter sites within short distances (Hardwood swamp forests, marshes and wet prairies). Increases in hydroperiods including fluctuations in streamflow, artificially elevated high-water levels, and prolonged hydroperiods may weaken or kill some of the hammock trees as well as changes in the understory, shifting a mesic hammock towards a hydric hammock community and allowing more hydrophytic species to establish. Decreases in hydroperiods from water table drawdown may shift a mesic hammock towards a xeric hammock and allow the invasion of some non-native exotic species. Drawdowns in the water table may also render hardwood hammocks more susceptible to catastrophic fires. These hammocks can tolerate a large gradient of soil moisture conditions and can range from xeric to somewhat hydric conditions based off of landscape position.

Wetland description

NA

Soil features

Soils associate with this ecological site occur in the isohyperthermic soil temperature regime of MLRA 156A. The isohyperthermic soil temperature regime has mean annual soil temperatures of 22 °C (72^{0}F) or more and a difference between mean summer and mean winter soil temperatures of less than 5 °C (41^{0}F) at 50 cm (20 inches) below the surface.

The soils associated with hammock vegetation are nearly level and moderately well drained to excessively well drained deep acidic sands mixed with organic matter and may have a thick layer of leaf litter. Limestone outcrops are uncommon in this site, differentiating them from Rockland Hammocks. Soils ranged from slightly acid to mildly alkaline. These were fertile soils due to deposition of organic matter from leaf litter and the absence of fire. This area has undergone extreme urbanization efforts and much of the historic representative soils in this area have been replaced with an "Urban Complex" phase or have been completely altered to the extent of being "Urban Land", and the representative soil destroyed. Present soils include udorthents and urban land as main soil components. This requires future projects focusing on human altered / human transported soils and will need to be remapped to show historic communities. Representative soils may still include Flagami and Ravenwood.

Table 4. Representative soil features

Parent material	(1) Marine deposits (2) Residuum–limestone
Surface texture	(1) Gravelly fine sand
Drainage class	Moderately well drained to well drained
Permeability class	Moderately rapid to very rapid
Depth to restrictive layer	0–35 in
Soil depth	27–35 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-35in)	1.2–3.2 in
Calcium carbonate equivalent (0-35in)	0%
Electrical conductivity (0-35in)	0–1 mmhos/cm
Sodium adsorption ratio (0-35in)	1
Soil reaction (1:1 water) (0-35in)	4.9–7.6
Subsurface fragment volume <=3" (0-35in)	5–15%
Subsurface fragment volume >3" (0-35in)	0%

Ecological dynamics

The information presented in this ecological site description (ESD) and state-and-transition model (STM) were developed using archaeological and historical information, published and unpublished scientific reports, professional experience, consultation with technical experts, and NRCS inventories and studies. The information presented represents a complex set of plant community dynamic and environmental variables. Not all scenarios or plants are represented and included. Key indicator plants, animals, and ecological processes are described to help guide land management decisions and actions.

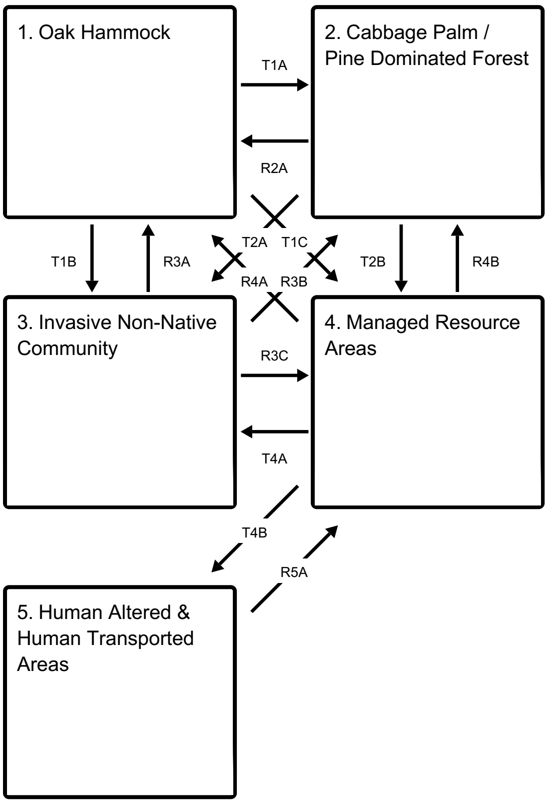
The Subtropical Hardwood Hammocks of Miami Ridge ecosite are hammocks with a closed canopy, dominated by primarily temperate and some tropical evergreen tree species that is naturally protected by fire by its position within the landscape. Mature hammock are able to keep soil moisture levels high through sufficient shading via canopy cover and leaf litter accumulation to prevent fires from destroying their environment. Fires may be rare or occasional depending on several factors including how often the surrounding community burns and the size of the oak hammock. Fire is not considered an important component in oak hammocks, but can burn occasionally, with species adapted to low intensity fires, protected by thick bark. When fire is suppressed in the surrounding community, often by human activities, oak hammocks may expand into the surrounding communities. In hammocks where fires are present, low intensity ground fires during the winter months may assist in oak regeneration by reducing the number of competing species that are fire intolerant.

While species composition varies based off of landscape position, the community generally has a closed canopy of oaks and palms, an open understory, and a sparse to a moderate groundcover of grasses and ferns. Abundant epiphytes are characteristic features of hardwood hammocks found on canopy trees and include Spanish moss (*Tillandsia usneoides*) and other air-plants (Tillandsia spp.), resurrection fern (*Pleopeltis polypodioides* var. michauxiana), golden polypody (*Phlebodium aureum*), and shoestring fern (*Vittaria lineata*). Vines may also be present on canopy trees and include muscadine (Vittis rotundifolia), sarsaparilla vine (*Smilax pumila*), greenbriers (Smilax spp.), yellow jessamine (*Gelsemium sempervirens*), eastern posion ivy (*Toxicodendron radicans*), crossvine (*Bignonia capreolata*) and Virginia creeper (*Parthenocissus quinquefolia*). This community provides important habitat for wildlife, but has been highly sought out for prime rangeland, agriculture and urbanization. And within this ecoregion is very limited in distribution due to the rapid urbanization of the 20th century, remaining stands of these communities occur as small, isolated parks within the larger urban complex.

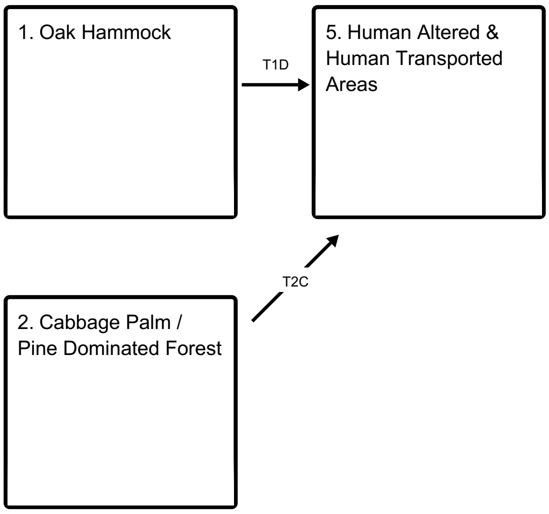
Oak hammocks provide valuable habitat to animals depending on mature oaks for shelter and sustenance, as well as the aesthetic value for recreation and ecotourism. However, disturbances such as selective logging remove canopy trees affecting the canopy structure, which can influence species composition as well as increasing the amount of light on the forest floor, making the area more susceptible to fires. This community is considered the preferred habitat of feral hogs (Sus scrofa), which causes major soil disturbances from rooting that decreases diversity of native ground species. Soil disturbances and canopy openings allow for the spread of exotic species including Brazilian pepper (*Schinus terebinthifolius*), skunk vine (*Paederia foetida*), camphor tree (*Cinnamomum camphora*), Japanese climbing fern (*Lygodium japonicum*), old world climbing fern (*L. microphyllum*), white-flowered wandering jew (*Tradescantia fluminensis*), sword fern (*Nephrolepis cordifolia*), Caesar’s weed (*Urena lobata*), and cogon grass (*Imperata cylindrica*).

State and transition model

Ecosystem states



States 1, 5 and 2 (additional transitions)



T1A - Catastrophic Fire

T1B - Invasion of Non-Native / Exotic Species

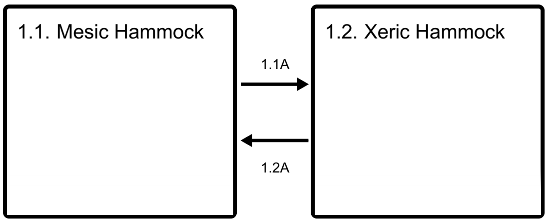
T1C - Modified for Desired Land Use

T1D - Human Alteration / Transportation of Materials

R2A - Hammock Reestablishment

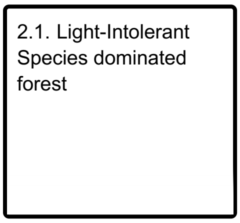
T2A - Invasion of Non-Native/ Exotic Species
T2B - Modify for Desired Land Use
T2C - Human Alteration / Transportation of Materials
R3A - Mechanical / Biological / Chemical Removal
R3B - Mechanical / Biological / Chemical Removal
R3C - Mechanical / Biological / Chemical Removal
R4A - Landscape and Habitat Restoration
R4B - Landscape and Habitat Restoration
T4A - Invasion of Non-Native / Exotic Species
T4B - Human Alteration / Transportation of Materials
R5A - Modified Land Reclamation

State 1 submodel, plant communities

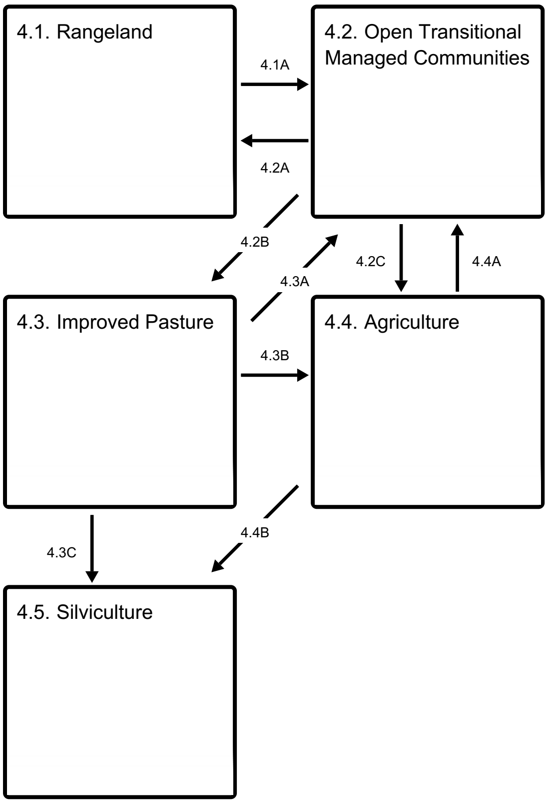


1.1A - Decreased Hydroperiod or Reduction of Ground Fires
1.2A - Increased Hydroperiod or Reintroduction of Ground Fires

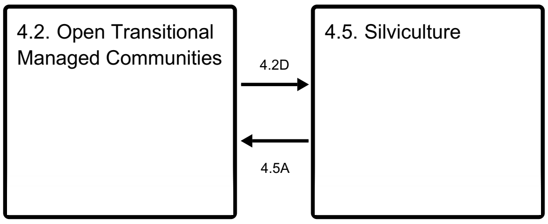
State 2 submodel, plant communities



State 4 submodel, plant communities



Communities 2 and 5 (additional pathways)



4.1A - Land Clearing Practices

4.2A - Habitat Restoration

4.2B - Pasture Preparation

4.2C - Agriculture Preparation

4.2D - Silviculture Preparation

4.3A - Land Clearing Practices

4.3B - Agricultural Preparation

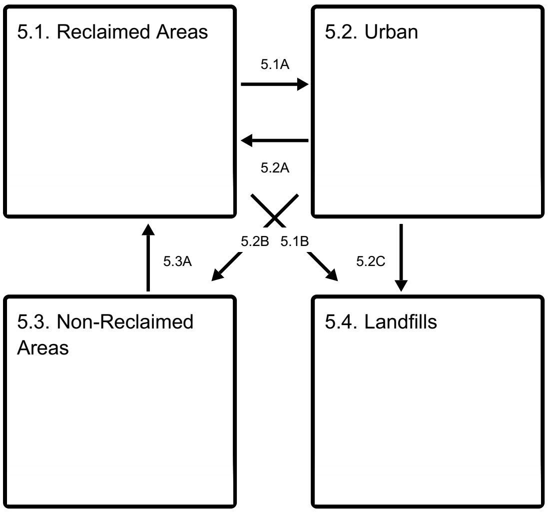
4.3C - Silvicultural Preparation

4.4A - Land Clearing Practices

4.4B - Silvicultural Preparation

4.5A - Land Clearing Practices

State 5 submodel, plant communities



5.1A - Urban Development
5.1B - Waste Accumulation
5.2A - Land reclamation
5.2B - Industrial / Urban Development
5.2C - Waste Accumulation
5.3A - Land Reclamation

State 1
Oak Hammock

This state described mesic or xeric forests dominated mainly by hardwood trees. These communities are typically found on well drained soil on knolls within the landscape. They are not typically pyrogenic but can tolerate low ground fires which maintain species diversity and community structure.

Community 1.1
Mesic Hammock

Mesic hammocks are well-developed evergreen hardwood and / or palm forests on soils that are rarely inundated. The low closed canopy is usually dominated by oaks and cabbage palms, with occasional subtropical species present in the canopy as well. The shrub layer can be either dense or open, tall or short, depending on the time since the last fire. This community forms on "islands" on higher grounds within wetter habitats such as prairies or marshes, and along higher ecotones. The higher landscape position makes flooding rare in this community and is protected from fires on most sides, but often borders on pyrogenic community.

Resilience management. This community is maintained by natural disturbances which maintain vegetative structure and composition. Common natural disturbances which help maintain community composition and structure include wind from storm events which open the canopy to successive growth, ground fires to control the growth of the sub canopy, or infrequent flooding which may kill less flood tolerant species.

Dominant plant species

- live oak (*Quercus virginiana*), tree
- cabbage palmetto (*Sabal palmetto*), tree
- water oak (*Quercus nigra*), tree
- laurel oak (*Quercus laurifolia*), tree
- pignut hickory (*Carya glabra*), tree
- southern magnolia (*Magnolia grandiflora*), tree
- gumbo limbo (*Bursera simaruba*), tree
- Florida slash pine (*Pinus elliottii var. densa*), tree
- saw palmetto (*Serenoa repens*), shrub
- American beautyberry (*Callicarpa americana*), shrub
- American holly (*Ilex opaca*), shrub
- large gallberry (*Ilex coriacea*), shrub
- hog plum (*Prunus umbellata*), shrub
- common persimmon (*Diospyros virginiana*), shrub
- stopper (*Eugenia*), shrub
- panicgrass (*Panicum*), grass
- rosette grass (*Dichanthelium*), grass
- basketgrass (*Oplismenus hirtellus*), grass
- woodoats (*Chasmanthium*), grass
- nutrush (*Scleria*), grass
- brackenfern (*Pteridium*), other herbaceous

Community 1.2
Xeric Hammock

Xeric Hammocks are evergreen forests on well-drained sandy soils. Like mesic hammocks they are characterized by low closed canopy dominated by oaks. An emergent canopy of pine species may be present. This community develops when fire has been excluded from the community as well as decreases in hydrology while allow for the establishment of drier species. These communities usually form as small pockets within mesic hammocks and other drier communities such as scrub habitats. While more commonly found along ridgelines in the central peninsula, xeric hammocks were once present along the Miami Ridge in conjunction with scrub habitats along high sandy ridges.

Resilience management. This community is maintained by natural disturbances which maintain vegetative structure and composition. Common natural disturbances which help maintain community composition and structure include wind from storm events which open the canopy to successive growth, ground fires to control the growth of the sub canopy, or infrequently flooding which may kill less flood tolerant species.

Dominant plant species

- sand live oak (*Quercus geminata*), tree
- Chapman oak (*Quercus chapmanii*), tree
- laurel oak (*Quercus laurifolia*), tree
- live oak (*Quercus virginiana*), tree
- sand pine (*Pinus clausa*), tree
- Florida slash pine (*Pinus elliottii var. densa*), tree
- saw palmetto (*Serenoa repens*), shrub
- rusty staggerbush (*Lyonia ferruginea*), shrub
- American beautyberry (*Callicarpa americana*), shrub
- common persimmon (*Diospyros virginiana*), shrub
- scrub palmetto (*Sabal etonia*), shrub
- sand heath (*Ceratiola ericoides*), shrub

- pineland threeawn (*Aristida stricta*), grass
- beaksedge (*Rhynchospora*), grass
- witchgrass (*Panicum capillare*), grass
- goldenrod (*Solidago*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

Decreases in the natural hydrological regimes by draining or ditching or by excessive pumping of ground water has lowered the water table and shifted species composition in some hammocks toward xeric hammock composition. Reduction of ground fires may also change community composition to more xeric species.

Pathway 1.2A
Community 1.2 to 1.1

Increases in hydroperiods will shift the community structure to more mesic species composition due to more hydric conditions of the soil. Fire reintroduced into the system can also shift the species composition to more fire tolerant mesic species.

State 2
Cabbage Palm / Pine Dominated Forest

This state describes the hammock community after a catastrophic fire burns through the duff layer and kills the roots of less fire tolerant species such as oaks. While oaks are tolerant of low intensity ground fires, high intensity fires can kill these species. The remaining vegetation are species that are tolerant of high intensity fires, and will remain as dominant species until the shade-tolerant species such as oak can become reestablished over time.

Community 2.1
Light-Intolerant Species dominated forest

Trees and shrubs that are able to rapidly recolonize an area after a destructive fire are those which are pyrogenic light intolerant species such as cabbage palms and pine species. These species can grow fairly rapidly whereas light intolerant species such as oaks take longer to grow.

State 3
Invasive Non-Native Community

This state consists of Florida Department of Agriculture and Consumer Services (FDACS) Non-Native Category 1 Species list . More information on these species list can be found: https://www.fdacs.gov/content/download/63140/file/Florida%E2%80%99s_Pest_Plants.pdf or by contacting the UF / IFAS Center for Aquatic and Invasive Plants (http://plants.ifas.ufl.edu/), the UF / IFAS Assessment of Non-native Plants in Florida's Natural Areas (https://assessment.ifas.ufl.edu/), or the FWC Invasive Plant Management Section (http://myfwc.com/wildlifehabitats/invasive-plants/). This community will not represent every possibility of invasive species but rather the most common in these areas.

Characteristics and indicators. Non-native species include species that exist outside of Florida's native range and introduced to the state by people, weather, or any other means.

Resilience management. This state can be found as a part of any other state and can completely destroy the native habitat if not properly managed. Restoration to natural communities after exotic invasion include practices such as mechanical, biological, and chemical removals.

State 4
Managed Resource Areas

The following communities comprise the major land uses in the United States and the land uses receiving the majority of the conservation treatment that address soil, water, air, plant, and animal resources within the USDA.

Characteristics and indicators. These land uses consist of areas that are not completely naturalized (i.e. native habitat) but are not completely altered by anthropogenic means.

Community 4.1
Rangeland

Rangelands are described as lands on which the indigenous vegetation is predominately grasses, grass-like plants, forbs, and possibly shrubs or dispersed trees. Existing plant communities can include both native and introduced plants. Primary export from Florida ranges are cattle and have been present in the state since their first introduction by Spanish explorers in 1521. This is the reference community for this state because it requires very little alterations to the landscape for grazing species. Rangelands provide a diversity of ecosystems and also provide a diverse and significant production of economic benefits and ecosystem goods and services. Livestock production along with sustainable wildlife populations provide for the major direct economic benefits, but also tourism, recreational uses, minerals/energy production, renewable energy, and other natural resource uses can be very significant. Vital ecosystem contributions include clean water, clean air, fish/wildlife habitat, as well as intangible considerations such as historical, cultural, aesthetic and spiritual values.

Resilience management. Grazing, by both domestic livestock and wildlife, is the most common ecological management process, with fire and weather extremes also being significant ecological factors. For information regarding specific cattle grazing techniques please contact your local NRCS office.

Community 4.2
Open Transitional Managed Communities

This is an area that is managed to maintain open land before shifting to another community. These communities are often used as transitional periods from one practice to another and could lead to an abandoned / fallow field.

Community 4.3
Improved Pasture

Pasture is a land use type having vegetation cover comprised primarily of introduced or enhanced native forage species that is used for livestock grazing. Pasture vegetation can consist of grasses, legumes, other forbs, shrubs or a mixture. The majority of these forages are introduced, having originally come from areas in other states or continents. Most are now naturalized and are vital components of pasture based grazing systems. Pasture lands provide many benefits other than forage for livestock. Wildlife use pasture as shelter and for food sources. Well managed pasture captures rainwater that is slowly infiltrated into the soil which helps recharge groundwater. Many small pasture livestock operations are near urban areas providing vistas for everyone to enjoy. Pasture is the basis of any livestock operation that is truly sustainable. It is especially important as livestock grazers continues to experience extraordinarily high fuel and other input costs.

Resilience management. Pastures receive periodic renovation and cultural treatments such as tillage, fertilization, mowing, weed control, and may be irrigated. For more information regarding specific pasture management please contact your local NRCS office.

Community 4.4
Agriculture

The agriculture industry includes cultivated crops, aquaculture, and apiculture. Cultivated cropland includes areas used for the production of adapted crops for harvest. These areas comprises land in row crops or close-grown crops that are in a rotation with row or close-grown crops. Primary export from Florida consists of fruits, greenhouse and nursery products, sugar cane, and the signature export of citrus. Aquaculture includes the cultivation and maintenance of aquatic plants, aquatic reptiles, crustaceans, food/ ornamental fish, shellfish, and other miscellaneous species for harvesting. Apiculture includes the maintenance of honeybees and hives to provide beeswax, honey/ other edible bee products, crop pollination services, and sales of bees to other beekeepers. These areas have been modified resulting in land clearing practices and hydrologic management to fit the growers needs.

Resilience management. Major natural resource concerns facing agricultural lands include: (1) erosion by wind and water, (2) maintaining and enhancing soil quality, (3) water quality from nutrient and pesticides runoff and leaching, and (4) managing the quantity of water available for irrigation. For more specific information regarding cropland please contact your local NRCS office.

Community 4.5
Silviculture

Silviculture is land used in controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society such as wildlife habitat, timber, water resources, restoration, and recreation on a sustainable basis. These are forestry practices that include thinning, harvesting, planting, pruning, prescribed burning and site preparation, for managed goals such as wildlife habitat creation or harvesting. Many managed silvicultural lands in Florida include tree plantations for growth of tropical ornamental species such as palms; and lumber, pulp, and paper species such as slash pine, longleaf pine, cypress, and eucalyptus. This community also include management practices of agroforestry, the intentional mixing of trees and shrubs into crop and/or animal production systems to create environmental, economic and social benefits. This is included in this community and not any other state because the primary management is for tree species. This may include practices such as riparian forest buffers, windbreaks, forest farming, silvopasture, and alley cropping.

Resilience management. Management of silvicultural lands require specific prescriptions based on the management goals for the stand, and may include thinning, harvesting, planting, pruning, prescribed burning and site preparation. For more information regarding specific management for silviculture practices please contact your local NRCS office.

Pathway 4.1A
Community 4.1 to 4.2

This pathway is driven by land clearing practices that consists of removing the existing vegetation from the habitat and altering the habitat to prepare for modified land use.

Pathway 4.2A
Community 4.2 to 4.1

This pathway is driven by the restoration of the native habitat for the use of rangeland. This includes restoration of both the hydrology and landscape in advance of replanting native species. This is a time-consuming process and often results in second-hand community structure. Once restored to a natural capacity the introduction of grazing species to the system creates a managed rangeland.

Pathway 4.2B
Community 4.2 to 4.3

This pathway is driven by preparing the land for pasteurization. This includes the planting of vegetation consisting of grasses, legumes, other forbs, shrubs or a mixture that will provide preferred forage for managed grazing species.

Pathway 4.2C
Community 4.2 to 4.4

This pathway is driven by the preparation of land for agricultural uses. This change is dependent on the type of agricultural community is being created, but often depends on the growing, maintenance, and cultivation of an agricultural product for consumers. This community may require modification to the land to fit the hydrologic requirement of the growing crop.

Pathway 4.2D
Community 4.2 to 4.5

This pathway is driven by the preparation of the land for silvicultural purposes. This change is dependent on the type of silvicultural product being cultivated, as many different practices require different growth requirement.

Pathway 4.3A
Community 4.3 to 4.2

This pathway is driven by land clearing practices that consists of removing the existing vegetation from the habitat and altering the habitat to prepare for modified land use.

Pathway 4.3B
Community 4.3 to 4.4

This pathway is driven by the preparation of land for agricultural uses. This change is dependent on the type of agricultural community is being created, but often depends on the growing, maintenance, and cultivation of an agricultural product for consumers. This community may require modification to the land to fit the hydrologic requirement of the growing crop.

Pathway 4.3C
Community 4.3 to 4.5

This pathway is driven by the preparation of the land for silvicultural purposes. This change is dependent on the type of silvicultural product being cultivated, as many different practices require different growth requirements.

Pathway 4.4A
Community 4.4 to 4.2

This pathway is driven by land clearing practices that consists of removing the existing vegetation from the habitat and altering the habitat to prepare for modified land use.

Pathway 4.4B
Community 4.4 to 4.5

This pathway is driven by the preparation of the land for silvicultural purposes. This change is dependent on the type of silvicultural product being cultivated, as many different practices require different growth requirements.

Pathway 4.5A
Community 4.5 to 4.2

This pathway is driven by land clearing practices that consists of removing the existing vegetation from the habitat and altering the habitat to prepare for modified land use.

State 5
Human Altered & Human Transported Areas

These areas include soils that were intentionally and substantially modified by humans for an intended purpose, commonly for terraced agriculture, building support, mining, transportation, and commerce. The alteration is of sufficient magnitude to result in the introduction of a new parent material (human-transported material) or a profound change in the previously existing parent material (human-altered material). They do not include soils modified through standard agricultural practices or formed soils with unintended wind and water erosion. When a soil is on or above an anthropogenic landform or microfeature, it can be definitely be associated with human activity and is assigned to a unique taxa, usually found as an "Urban land complex" within that communities natural soil properties (e.g., Flagami-Ravenwood-Urban land complex, 0-5% slopes).

Characteristics and indicators. Evidence of these areas include soils with manufactured items (e.g. artifacts) present in the profile, human altered-materials (e.g., deeply excavated or deeply plowed soil) or human-transported material (e.g., fill), and position on or above anthropogenic landforms (e.g., flood-control levees) and microfeatures (e.g., drainage ditches). Detailed criteria regarding the identification of anthropogenic (artificial) landforms, human-altered materials, and human-transported material are in the "Keys to Soil Taxonomy" (Soil Survey Staff, 2014).

Community 5.1
Reclaimed Areas

Reclaimed areas are areas that have been modified through anthropogenic means that are restored to a natural or second-hand natural community. Areas that can be reclaimed are any intensely urbanized areas, and may be required to be reclaimed after urban use (e.g., active mines must be reclaimed). Examples of reclaimed lands may be shut down phosphate mining operations, superfund sites, or brownfields. These practices include the identification, removal, and stockpiling soil materials before altering the land, and revegetation and replacement of soil materials after altering the land. This also applies to nearby urban areas that have been adversely affected by the anthropogenic activities.

Community 5.2
Urban

This urban community consists of development for human use. Urban areas include a variety of land uses, e.g., inner city or urban core, industrial and residential areas, cemeteries, parks, and other open spaces; the overall function which may benefit the quality of human life. These often form an urban soil mosaic, where the natural landscape has been fragmented into parcels with distinctive disturbance and management regimes and, as a result, distinctive characteristic soil properties. Within this community there are three different levels of urbanization, based off population dynamics, residential density, and intensity of development. These are labeled as low-intensity, medium-intensity, and high-intensity urban areas, which can eventually be split apart into its own separate state. Low-intensity urban areas may consist of single dwelling homes with little impact on the surrounding community which still somewhat represents the natural community (e.g., represents natural landscape, hydrology, and vegetation) , other examples of this are urban parks, cemeteries, or campgrounds with little urban development. Medium-intensity urban areas consist of larger urban dwellings with some natural features, but have been modified to meet urban needs (e.g., towns). High-intensity urban areas are areas of heavily modified areas with complete alterations of the natural landscape, hydrology, and vegetation to support a very large population, which once constructed is permanently altered (e.g., metropolis areas).

Community 5.3
Non-Reclaimed Areas

Non-reclaimed areas are areas that have been modified through anthropogenic means that are unable to be restored to a natural or second-hand natural community. Areas that cannot be reclaimed are areas under active mining status or mined areas before the Phosphate Land Reclamation Act in 1975, which leaves shut down operations alone. These areas also include fallow mines that have been flooded and are now permanent bodies of water.

Community 5.4
Landfills

This is an anthropogenic site for the disposal of waste material. It includes manufactured layers (artificial, root limiting layer below the soil surface) that are representative of human altered and human transported sites. These layers are often alternative between natural fill material and geotextile liners, asphalt, concrete, rubber or plastic that are built up and can rise above the surrounding landscape by 30 meters or more often impeding water, gas, or roots from moving through the profile.

Pathway 5.1A
Community 5.1 to 5.2

This shift in communities is driven by clearing and developing the land for the desired community.

Pathway 5.1B
Community 5.1 to 5.4

This transition is driven by the deposition of manufactured layers along with anthropogenic waste which is consistently built upon.

Pathway 5.2A
Community 5.2 to 5.1

This transition is driven by the revegetation, reestablished hydrology, and replacement of displaced soil materials after altering the land.

Pathway 5.2B
Community 5.2 to 5.3

This transition is driven from heavy industrial or urban development which causes the land to become non-reclaimable. This transition is rare due to the many environmental laws and regulations that must be followed when developing.

Pathway 5.2C
Community 5.2 to 5.4

This transition is driven by the deposition of manufactured layers along with anthropogenic waste which is consistently built upon.

Pathway 5.3A
Community 5.3 to 5.1

This transition is driven by the revegetation, reestablished hydrology, and replacement of displaced soil materials after altering the land.

Transition T1A
State 1 to 2

This transition is driven by a catastrophic fire that may occur due to decreased hydroperiods or in periods of extreme drought which burns the duff layer and kills the roots of fire intolerant species. While oaks can tolerate low intensity ground fires, high intensity fires may kill the root system of the oaks, transitioning the community to a cabbage palm / pine forest while the oak species resprout.

Transition T1B
State 1 to 3

The invasion of non-native or exotic species can be driven by a multitude of different environmental factors such as changes in natural hydroperiods or in fire regimes. Typically once a change in one of the two factors mentioned above occurs, non-native or exotic invasive species become established and begin to compete with native species for habitat and nutrients.

Constraints to recovery. Recovery from non-native or exotic invasive species may be difficult due to many adaptations which allow them to outcompete and survive in altered conditions. Localized knowledge for each species must be known for best removal of it without harming the native environment, and often different treatments must be applied over one given area.

Context dependence. Growth of non-native and exotic invasive species can be rapid following a change in a natural stressor such as fire frequency or natural hydroperiods which might have once kept the invasive species at bay.

Transition T1C
State 1 to 4

Modify the land for the desired land use. This may include the establishment of grazing species or the modification of land for the cultivation of crops of other desired products.

Transition T1D
State 1 to 5

This transition is driven by the alteration and/ or transportation of materials via anthropogenic means.

Restoration pathway R2A
State 2 to 1

Time is the restoration strategy for the transition back to oak hammocks if the seed stock hasn't been destroyed in the catastrophic fire. Oak are light intolerant species which can filter sunlight in shaded conditions, allowing them to grow slowly. Over time they can become reestablished as part of the overstory, creating a low closed canopy with an emergent layer of pine species and cabbage palms. As the oaks mature in the hammock, the shaded ground conditions prevent the growth of new pines, leaving the emergent pine species present until they are removed (windthrow, logging, etc.).

Transition T2A
State 2 to 3

The invasion of non-native or exotic species can be driven by a multitude of different environmental factors such as changes in natural hydroperiods or in fire regimes. Typically once a change in one of the two factors mentioned above occurs, non-native or exotic invasive species become established and begin to compete with native species for habitat and nutrients.

Constraints to recovery. Recovery from non-native or exotic invasive species may be difficult due to many adaptations which allow them to outcompete and survive in altered conditions. Localized knowledge for each species must be known for best removal of it without harming the native environment, and often different treatments must be applied over one given area.

Context dependence. Growth of non-native and exotic invasive species can be rapid following a change in a natural stressor such as fire frequency or natural hydroperiods which might have once kept the invasive species at bay.

Transition T2B
State 2 to 4

Modify the land for the desired land use. This may include the establishment of grazing species or the modification of land for the cultivation of crops of other desired products.

Transition T2C
State 2 to 5

This transition is driven by the alteration and/ or transportation of materials via anthropogenic means.

Restoration pathway R3A
State 3 to 1

Mechanical, biological, and chemical removal strategies include removing the non-native and exotic invasive species through various mechanisms. Localized knowledge for individual non-native or exotic invasive species is needed for specific management. Sometimes introduction of fire regimes may prevent or stop the growth of non-native or exotic invasive species, but many species are fire tolerant. Mechanical removal might include roller chopping, harvesting, or cutting and removal of invasive species. Chemical removal might include aerial dispersal from planes, or basal bark injection treatments.

Context dependence. Mechanical, biological, and chemical removal of non-native and exotic invasive species is a time dependent process, with both removal types taking long times to be considered effective.

Restoration pathway R3B

State 3 to 2

Mechanical, biological, and chemical removal strategies include removing the non-native and exotic invasive species through various mechanisms. Localized knowledge for individual non-native or exotic invasive species is needed for specific management. Sometimes introduction of fire regimes may prevent or stop the growth of non-native or exotic invasive species, but many species are fire tolerant. Mechanical removal might include roller chopping, harvesting, or cutting and removal of invasive species. Chemical removal might include aerial dispersal from planes, or basal bark injection treatments.

Context dependence. Mechanical, biological, and chemical removal of non-native and exotic invasive species is a time dependent process, with both removal types taking long times to be considered effective.

Restoration pathway R3C
State 3 to 4

Mechanical, biological, and chemical removal strategies include removing the non-native and exotic invasive species through various mechanisms. Localized knowledge for individual non-native or exotic invasive species is needed for specific management. Sometimes introduction of fire regimes may prevent or stop the growth of non-native or exotic invasive species, but many species are fire tolerant. Mechanical removal might include roller chopping, harvesting, or cutting and removal of invasive species. Chemical removal might include aerial dispersal from planes, or basal bark injection treatments.

Context dependence. Mechanical, biological, and chemical removal of non-native and exotic invasive species is a time dependent process, with both removal types taking long times to be considered effective.

Restoration pathway R4A
State 4 to 1

These practices include the restoration of both the natural hydroperiods and landscape in advance of revegetating the area (if needed).

Restoration pathway R4B
State 4 to 2

These practices include the restoration of both the natural hydroperiods and landscape in advance of revegetating the area (if needed).

Transition T4A
State 4 to 3

The invasion of non-native or exotic species can be driven by a multitude of different environmental factors such as changes in natural hydroperiods or in fire regimes. Typically once a change in one of the two factors mentioned above occurs, non-native or exotic invasive species become established and begin to compete with native species for habitat and nutrients.

Context dependence. Recovery from non-native or exotic invasive species may be difficult due to many adaptations which allow them to survive and outcompete in intolerable conditions. Localized knowledge for each species must be known for best removal of it without harming the native environment, and often different treatments must be applied over one given area. Growth of non-native and exotic invasive species can be rapid following a change in a natural stressor such as fire frequency or natural hydroperiods which might have once kept the invasive species at bay.

Transition T4B
State 4 to 5

This transition is driven by the alteration and/ or transportation of materials via anthropogenic means.

Restoration pathway R5A
State 5 to 4

This transition is driven by the restoration of a reclaimed land towards a naturally managed resource such as agriculture, rangeland, silviculture, or improved pasture.

Additional community tables

Animal community

Mature hammocks are considered important to wildlife, providing cover, nesting sites, and forage for a vast amount of species. Migratory birds use hammocks for cover and forage, as well as neighboring wetland animals using hammocks for shelter during periods of high floods. Some species that may be found in oak hammocks include:

Mammals: short-tailed shrew (Blarina brevicauda), eastern mole (Scalopus aquaticus), eastern gray squirrel (Sciurus caroliniensis), eastern wood rat (Neotoma floridana), armadillo (Dasypus novemcinctus), cotton mouse (Peromyscus gossypinus), white-tailed deer (Odocoileus virginianus), raccoon (Procyon lotor), striped skunk (Mephitis mephitis), bobcat (Lynx rufus), grey fox (Urocyon cinereoargenteus), opossum (Didelphis marsupialis), seminole bat (Lasiurus borealis), eastern yellow bat (L. intermedius), flying squirrel (Glaucomys volans), and Florida weasel (Mustela frenata peninsulae).

Birds: Woodcock (Scolopax minor), Coopers hawk (Accipiter cooperii), short-tailed hawk (Buteo brachyurus), barred owl (Strix varia), barn owl (Tyto alba), great horned owl (Bubo virginianus), screech owl (Otus asio), vultures (Cathartes aura, Coragyps atratus), red-bellied woodpecker (Melanerpes carolinus), pileated woodpecker (Dryocopus pileatus), turkey (Meleagris gallopavo), blue jay (Cyanocitta cristata), flycatchers (Tyrannidae), northern cardinal (Cardinalis cardinalis), black-and-white warbler (Mniotilta varia), northern parula (Parula americana), yellow-throated warbler (Dendroica dominica), ovenbird (Seiurus aurocapillus), carolina wren (Thryothorus ludovicianus), brown thrasher (Toxostoma rufum), hermit thrush (Catharus guttatus), and ruby-crowned kinglet (Regulus calendula).

Reptiles: Florida box turtle (Terrapene carolina bauri), southeastern five-lined skink (Eumeces inexpectatus), eastern glass lizard (Ophisaurus ventralis), fence lizard (Sceloporus undulatus undulatus), green anole (Anolis carolinensis), ground skink (Seincella lateralis), mole skink (Eumeces egregius onocrepis), Florida worm lizard (Rhineura floridana), barking treefrog (Hyla gratiosa), eastern spadefoot toad (Scelophus holbrooki holbrooki), southern toad (Bufo terrestris), squirrel treefrog (Hyla squirrella), green treefrog (Hyla cinerea), Florida kingsnake (Lampropeltis getulus floridana), eastern hognose snake (Heterodon platyrhinos), ringneck snake (Diadophis punctatus punctatus), corn snake (Elaphe guttata guttata), Florida red-bellied snake (Storeria occipitomaculata), southern black racer (Coluber constrictor priapus), yellow rat snake (Elaphe obsoleta quadrivittata), rough green snake (Opheodrys aestivus), eastern coral snake (Micrurus fulvius fulvius), and pygmy rattlesnake (Sistrurus miliarius barbouri).

Hydrological functions

Hydrologic inputs vary with season. Rainfall is distributed very unevenly throughout the year with the majority of rainfall dropped in the summer months. Ground-water level in hardwood hammocks fluctuate accordingly to the amount of rainfall throughout the year. Shallow-lying permeable limestone tends to restrict the development of surface drainage, limiting rivers in this terrain to only a few tributaries. During heavy rains, sheet flow is slowed from the dense vegetation, reducing soil erosion and allowing greater absorption into the soil. In the higher mesic and xeric sites, flooding is not present in these communities, with excess runoff going down into lower communities, contributing to the hydric conditions of other ecosites such as wet flatwoods or hydric hammocks.

Recreational uses

Oak hammocks provide aesthetic values for recreation and in larger areas around the state are used for hunting and has typically been sought out for home sites, campgrounds and recreation areas. However, large areas of the understory are cleared away to make room for these sites, altering the natural community and allowing for the invasion of exotic species. Within the Miami Ridge this site has close to disappeared to the extensive urban development and what little natural areas remain have been highly influenced by the surrounding landscape, changing the hydrologic and fire regimes. Remaining hammocks of these areas have been urbanized to parks, completely removing understory vegetation and replacing it with grass or altered materials (concrete, stone walkway, etc.), while keeping the overstory intact for shade cover.

Wood products

Selective logging for mature canopy trees is a continuous disturbance to these sites and can alter the forest structure.

Other products

Many oak hammocks on public and private lands are leased for cattle ranching and are degraded by cattle grazing and trampling. These hammocks provide pockets of shade for cattle to use to during hot days and are left as small islands by ranchers when converting land to pastures. Improper grazing and trampling destroy soil structure, promotes erosion, eliminates native shrubs and herbaceous species, girdles and kills saplings, and opens up the hammock to invasion by exotic plants.

Inventory data references

Information presented was derived from NRCS clipping data, current and historical literature, field observations, and personals contacts with local, state and federal partners. This is a provisional level ESD and is subject to change as more information becomes available, for any questions please contact your local NRCS office.

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Contributors

Jack Ferrara
Craig Prink
Martin Figueroa
Jamie Bean

Approval

Charles Stemmans, 2/07/2025

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	05/11/2025
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):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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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:**