USDA Natural Resources Conservation Service

Ecological site F155XY210FL
Deep Sandy over Loamy Maritime Forests

Last updated: 2/14/2025
Accessed: 05/13/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 155X–Southern Florida Flatwoods

This MLRA makes up about 19,973 square miles (51,731 square kilometers) and is entirely in Florida. It stretches across the mid-section of the State, from the Gulf of Mexico to the Atlantic Ocean, and north and south from the Everglades (MLRA 156A) to Jacksonville. This MLRA consists of a young sandy marine plain of Pleistocene age that is underlain by Tertiary-age limestone bedrock. The terrain is nearly level to gently sloping with large areas of swamp and marsh. Sinkholes affect land use and management.

The landscape consists of nearly level to gently sloping marine terraces that have large areas of wetlands and marshes. Streams and lakes are common. Low-lying wet areas are flat with some hummocks that rise 3 feet (1 meter) above the general level of the landscape. Coastal areas consist of low beach ridges and dunes that rise 6 to 10 feet (2 to 3 meters) above the lower inland areas. Elevation ranges from sea level to less than 196 feet (60 meters), increasing gradually from the coast to inland areas.

This MLRA is underlain by sediments of the Quaternary Period (present to 2.58 million years ago) which overlie Neogene (2.53 to 23.03 million years ago) and Paleogene (23.03 to 66 million years ago) formations, including those of the Hawthorn Group. The older rocks are exposed in the north-central part of this area. The Quaternary sediments are largely undifferentiated marine deposits consisting of fine to coarse sands that are poorly to moderately sorted with variable admixtures of clay and organic material. Undifferentiated Holocene (present to 0.0117 million years ago) sediments, which include quartz sands, marls, organic material, and minor carbonate sands and mud, are in the northeast part of this MLRA. The sediments may also include freshwater gastropods. Near the southeastern coastline, the Anastasia Formation and Miami Limestone are exposed. The Anastasia Formation is made up of a variably lithified coquina of shells and sands and unlithified fossiliferous sand. The Miami Limestone is white to light gray, variably fossiliferous, oolitic and pelletal with variable percentages of quartz sand, ranging from sandy limestone to calcareous quartz sand (Scott, 1993a, 1993b; Duncan, 1993a, 1993b). Quaternary beach ridge and dune sediments, which are mapped based on topographic expression, occur throughout the MLRA, becoming more abundant toward the coast.

The average annual precipitation is 38 to 61 inches (973 to 1,559 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 is 69 to 76 degrees F (21 to 24 degrees C). The freeze-free period averages 335 days and ranges from 300 to 365 days.

The dominant soil orders are Alfisols, Entisols, and Spodosols. The soils in the area dominantly have a hyperthermic temperature regime, an aquic moisture regime, and siliceous mineralogy. They generally are deep or very deep; poorly drained, very poorly drained, or somewhat poorly drained; and sandy or loamy, or both. Anthroportic soils throughout the area are a result of cut-and-fill activities associated with construction and urbanization.

This area supports flatwood forest vegetation. Slash pine, longleaf pine, loblolly pine, cabbage palm, bald cypress, laurel oak, water oak, and live oak are the main species. Saw palmetto, wax myrtle, gallberry, and grasses such as bluestems, threeawns, maidencane, and wiregrasses characterize the understory. Along the coastline and around the city of Orlando, this MLRA has been heavily urbanized. However, a significant acreage remains in agriculture for the production of citrus, specialty crops, and cattle. Surface water runoff from agriculture and urbanization are carefully monitored to help mitigate sinkhole development.

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. Conservation practices on cropland generally include conservation crop rotations, cover crops, irrigation water management (including micro irrigation systems), nutrient management, and pest management. 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, forest site preparation, prescribed burning, firebreaks, establishment of trees and shrubs, pest management, and management of upland wildlife habitat.

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 ,75d Eastern Florida Flatwoods (Griffith, G. E., Omernik, J. M., & Pierson, S. M., 2013)

-Florida Natural Area Inventory, 2010 Edition: Maritime Hammock (FNAI, 2010)

-Soil Conservation Service, 26 Ecological Communities of Florida: 1- North Florida Coastal Strand (Florida Chapter Soil and Water Conservation Society, 1989)

-LandFire Existing Vegetation Type, 2020: Southern Atlantic Coastal Plain Maritime Forest

-LandFire Biophysical Settings, 2020: Southern Atlantic Coastal Plain Maritime Forest

-Myers and Ewel, 1990: Maritime Forest

Ecological site concept

This ecological site is associated with shallow to moderately deep, well drained, sandy over loamy soils on ridges on marine terrace landforms. Soils will have 20 inches to 40 inches of sandy and loamy textured materials over limestone (coquina) bedrock at depths between 40 and 60 inches or deeper. Diagnostic subsurface horizons may include an argillic below 40 inches. The presences of this subsurface horizon at the given depths will attribute to specific production values in managed grasslands compared to similar soils.

Reference plant community 1.1 is primarily composed of mature maritime forests of evergreen hardwoods and palm species. These communities are driven by light and gap dynamics, often influenced by major storm events such as hurricanes. These communities will often be less influenced from the ocean compared to other coastline communities but may still reflect pruned canopies from wind-driven salt spray. These communities are susceptible to influence from salt intrusion during infrequent intense storm events and may reflect temporary ghost forests until the salt is flushed from the system via rainfall. These communities are highly urbanized due to desirable location in coastal communities and highly susceptible to degradation via fragmentation.

Associated sites

F155XY200FL	**Shallow to Moderately Deep Sandy over Loamy Maritime Forests** These sites are well drained communities that occur in similar landscape positions.
R155XY230FL	**Sandy Scrub on Ridges, Knolls, and Dunes of Xeric Uplands** These sites are excessively well drained communities that occur in higher, drier landscape positions.

R155XY070FL	**Sandy Freshwater Isolated Marshes and Swamps** These sites are very poorly drained communities that occur in lower, wetter depressional landscape positions.
F155XY150FL	**Sandy Flatwoods and Hammocks on Rises and Knolls of Mesic Uplands** These sites are somewhat poorly to moderately well drained communities that occur in similar to slightly lower, wetter landscape positions.
R155XY180FL	**Sandy Scrub on Rises, Ridges, and Knolls of Mesic Uplands** These sites are somewhat poorly to moderately well drained communities that occur in slightly lower, wetter landscape positions.

Similar sites

F155XY140FL	**Loamy and Clayey Flats and Hammocks** These sites will have slightly different community structure and composition and occur on different landforms. Due to the poorly drained loamy and clayey soils close to the surface, this site will have higher seasonal and total forage production values than Site 210.
R155XY230FL	**Sandy Scrub on Ridges, Knolls, and Dunes of Xeric Uplands** These sites will have slightly different naturalized vegetative communities on slightly different landforms. Due to the excessively well drained sandy soils, this site will have lower seasonal and total forage production values than Site 210, due to the absence of loamy subsurface textures.
R155XY170FL	**Sandy Coastal Grasslands and Forests** These sites have similar vegetative community composition and structure but will occur along more active fluctuating coastal landscapes. Soils materials will often be very deep sandy marine deposits rather than sandy and loamy marine deposits over coquinoid limestone. Changes in soils materials and depths to finer textured materials will affect the production of vegetation in altered managed states.
F155XY200FL	**Shallow to Moderately Deep Sandy over Loamy Maritime Forests** These sites have similar vegetative community composition and structure as well as occurring on similar landforms. Soils materials will often be shallow to moderately deep sandy and loamy marine deposits over shallow (20 to 40 inches) coquinoid limestone. Changes in depth to finer materials and bedrock will affect the production of vegetation in altered managed states.

Table 1. Dominant plant species

Tree	(1) *Quercus virginiana* (2) *Magnolia grandiflora*
Shrub	(1) *Serenoa repens* (2) *Psychotria*
Herbaceous	(1) *Tillandsia* (2) *Pleopeltis polypodioides*

Physiographic features

This ecological site and its associated plant communities on ridges on marine terrace landscapes. These areas are found overlying the Anastasia Formation, a Quaternary period geological formation created in the Late Pleistocene (129,00 to 11,700 years ago) (Scott, 2001). This formation is composed of interbedded sands and coquinoid limestones, most commonly recognized by an orangish brown, unindurated to moderately indurated, coquina of whole and fragmented mollusk shells in a matrix of sand often cemented by sparry calcite. Sands occur as light gray to tan and orangish brown, unconsolidated to moderately indurated, unfossiliferous to very fossiliferous beds (Scott, 2001).

Table 2. Representative physiographic features

Geomorphic position, hills	(1) Interfluve
Geomorphic position, terraces	(1) Riser
Slope shape across	(1) Linear
Slope shape up-down	(1) Convex

Landforms	(1) Marine terrace > Ridge
Runoff class	Negligible to very low
Flooding frequency	None
Ponding frequency	None
Elevation	0–9 m
Slope	0–5%
Ponding depth	0 cm
Water table depth	152–203 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of central and south Florida is warm to hot and temperate to subtropical, with this site getting an average annual precipitation of 50 to 53 inches (1270 to 1346.2 millimeters). About 60 percent of the precipitation occurs from June through September. Most rainfall occurs during moderate 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 is 69 to 76 degrees F (21 to 24 degrees C).

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)	323-365 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	1,270-1,346 mm
Frost-free period (actual range)	302-365 days
Freeze-free period (actual range)	365 days
Precipitation total (actual range)	1,270-1,372 mm
Frost-free period (average)	342 days
Freeze-free period (average)	365 days
Precipitation total (average)	1,321 mm

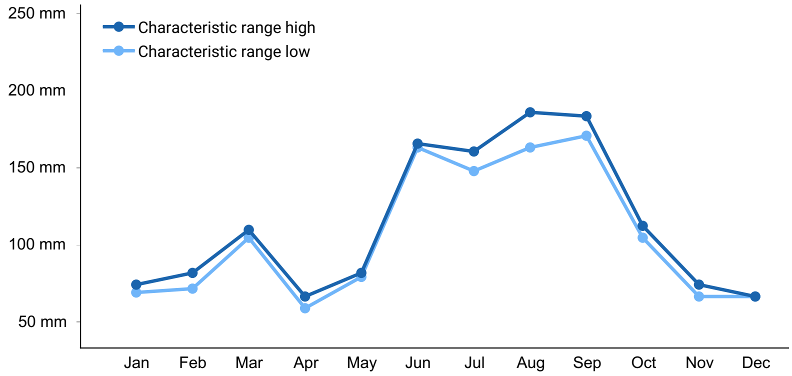


Figure 1. Monthly precipitation range

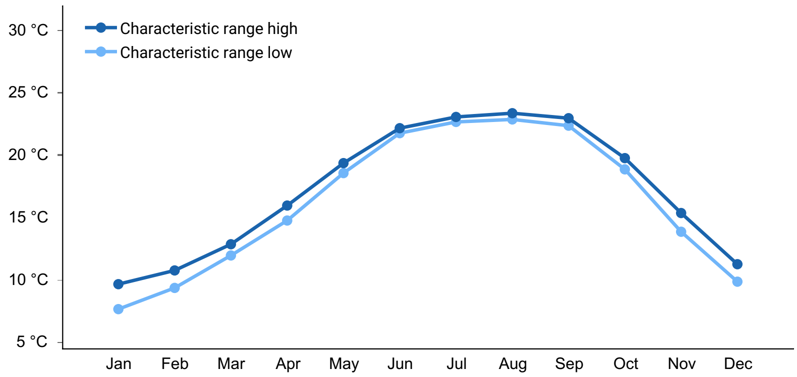


Figure 2. Monthly minimum temperature range

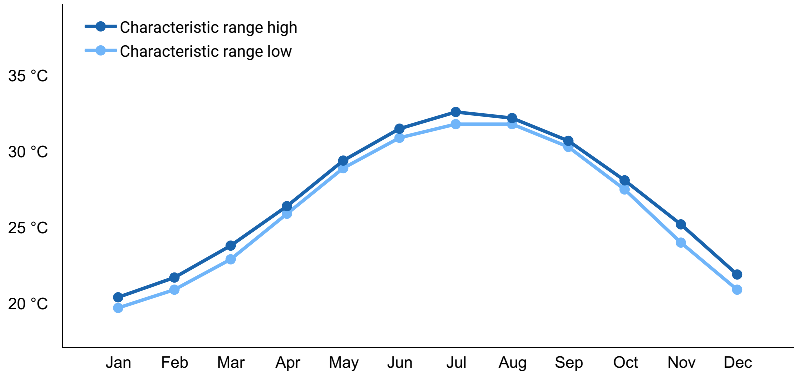


Figure 3. Monthly maximum temperature range

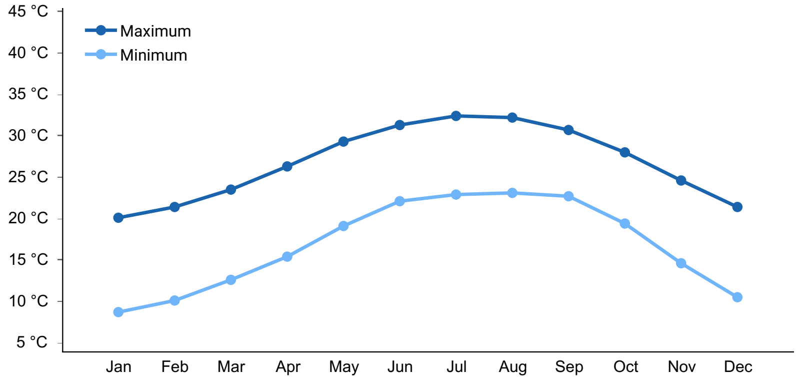


Figure 4. Monthly average minimum and maximum temperature

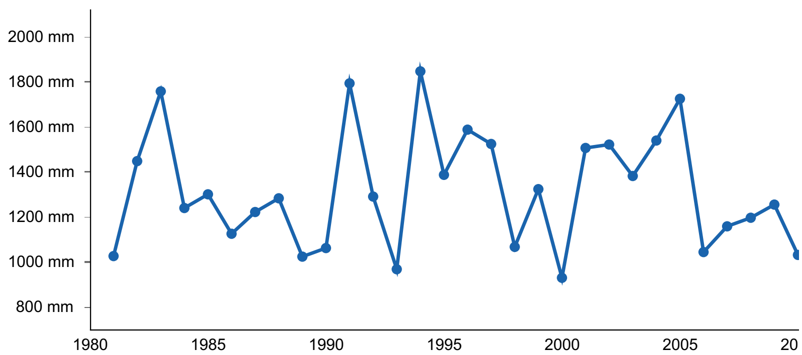


Figure 5. Annual precipitation pattern

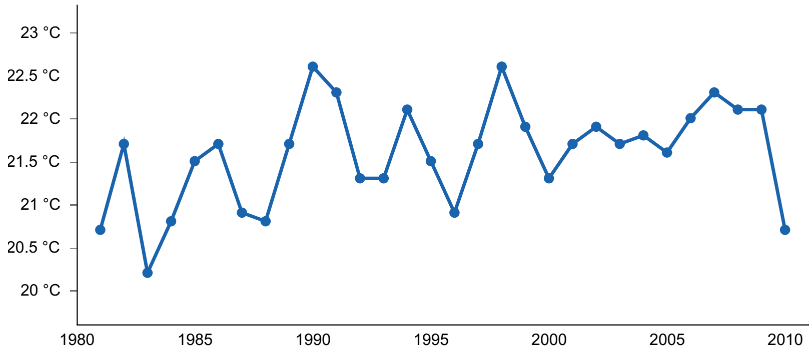


Figure 6. Annual average temperature pattern

Climate stations used

- (1) PALM COAST 6NE [USC00086767], Palm Coast, FL
- (2) DAYTONA BEACH [USC00082150], Daytona Beach, FL
- (3) DAYTONA BEACH INTL AP [USW00012834], Daytona Beach, FL
- (4) PONCE INLET [USC00087261], Port Orange, FL
- (5) TITUSVILLE [USC00088942], Titusville, FL

Influencing water features

These vegetative communities are entirely dependent on rainfall for their supply of freshwater.

Wetland description

NA

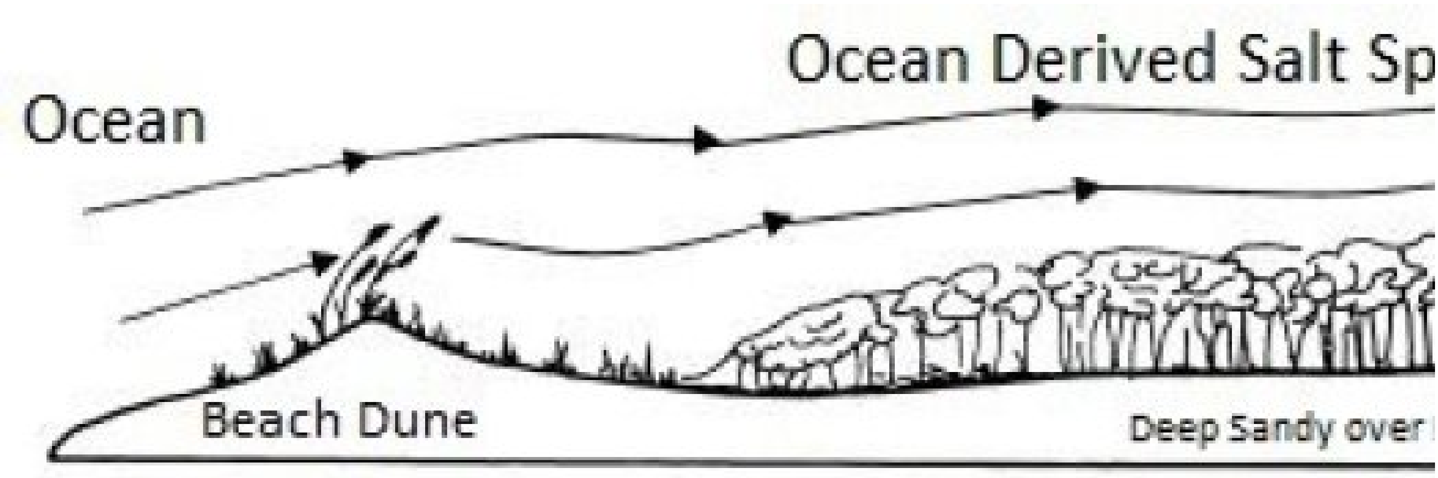


Figure 7. Exaggerated Diagram of Salt Spray affecting the canopy structure of the site. Image modified by Bellis 1995.

Soil features

These soils consist of deep well drained soils formed in marine deposits coquina limestone. Typical soils will have an argillic horizon below 40 inches. Lithic bedrock consisting of coquina limestone, occurs at deep to very deep depths (42 to 60 inches). The pH of this soil ranges from slightly acidic to neutral. Soils include Arenic Hapludalfs (Bulow). Soil mineralogy is siliceous.

Table 4. Representative soil features

Parent material	(1) Marine deposits (2) Limestone

Surface texture	(1) Sand
Drainage class	Well drained
Permeability class	Rapid
Depth to restrictive layer	107–152 cm
Soil depth	107–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	2.29–5.33 cm
Calcium carbonate equivalent (25.4-101.6cm)	0%
Electrical conductivity (25.4-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	1
Soil reaction (1:1 water) (0-101.6cm)	5.1–7.3
Subsurface fragment volume <=3" (0-101.6cm)	0%
Subsurface fragment volume >3" (0-101.6cm)	0%

Ecological dynamics

Water Table Dynamics

These areas are influenced by both freshwater and saltwater dynamics. Rainfall during the summer rainy season will replenish the shallow surficial aquifer system (coquina limestone) and provide well water for these areas. Low available water capacity and rapid permeability of the well drained soils results in a deep water table that can be below 60 inches. These fluctuations between seasonal water availability will often cause moisture stress on plants, and many of the herbaceous and arboreal epiphytes will become dormant during the dry season. These closed canopy forests provide high ground cover shading, resulting in a sparse understory of shade tolerant plants. High shading also creates more moist conditions in the understory, mitigating some seasonal stress created by the absence of rainfall in the dry season.

Due to their proximity to the Atlantic Coast, community structure may also be influenced by regular sea spray or salt spray from easterly winds. While not as intense as sites closer to the coastline, the spray may often kill the upper buds of the canopy species, producing a smooth, pruned look of the canopy. Further away from the sprays influence, these communities canopies gradually assume a more uneven surface similar to an inland forest communities as individual tree height becomes more of an expression of species growth potential rather than a growth response to an inhibitory environmental factor. See Figure 7 for a cross section diagram of the influence of salt spray on structure. During the dry season, droughts and salt spray as well as the poor moisture retention of may create highly stressful conditions for vegetative growth.

Community Dynamics

These are predominantly temperate evergreen hardwood forests dominated by oaks, magnolias and palms. They are characterized by a dense closed canopy uneven aged forests which often have no clear distinction between distinction in the overstory and understory stratums. They will often form low, streamlined canopies that serve to deflect wind and prevent uprooting. Reproduction primarily occurs through canopy gaps. Canopy gaps may be created through wind disturbance events such as hurricanes or tropical storms. Canopy gaps will allow light to reach the ground surface and create space for new growth. Barring natural death, the absence of large-scale disturbances will limit the amount and size of canopy gaps., decreasing understory species composition.

Fire is absent to highly rare in these communities, due to the highly incombustible leaf litter produced by the oaks as well as high shading conditions and constant wind. When fire does enter the system, it will act as low intensity fires to maintain understory structure. Even though fire is very rare, these species are well adapted to fire. Live oaks are protected by its thick, ridged bark, while cabbage palms are protected by its sheathing leaf bases. If fire makes its way into the canopy cabbage palms will be protected from crown fires due to the terminal bud being surrounded by woody, flame-resistant petioles (Carey, 1992; Van Deelen, 1991). While understory species such as wax myrtle, bays, and holly are less resistant to fire, will resprout from underground root systems. In periods of drought, intense fires may act similarly to creating gaps in the canopy for new growth and allow for less shade tolerant species such as pine to become established. Freeze events are rare and may lead to temporary loss in species richness.

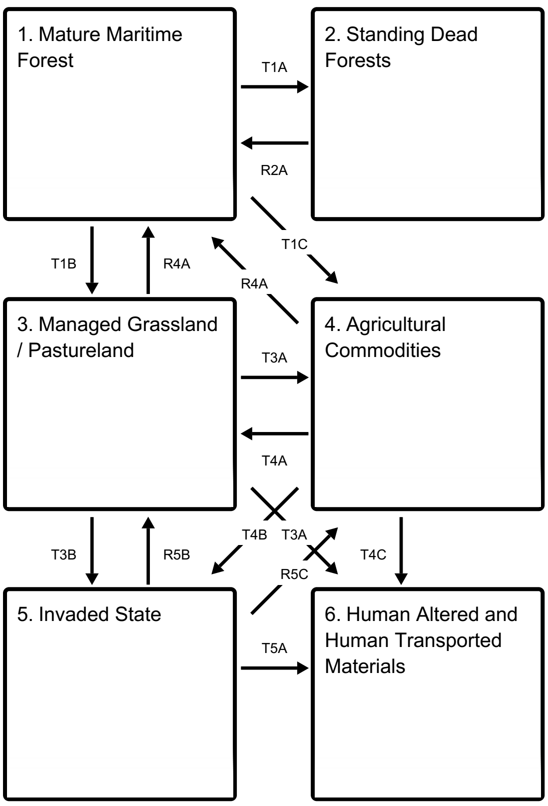
While no ponding or flooding is noted in the soil mapunits, these areas may experience coastal flooding during intense storm events such as hurricanes for brief periods. While the dominant overstory species are extremely tolerant to salt spray, high soil salinities, and occasional flooding (Carey, 1992; Van Deelen, 1991), prolonged saturation from salt intrusion may kill the community and create pockets of standing dead forests and localized deposition of marine sands. Seasonal precipitation will dilute the excess deposited salt over time (dependent on yearly precipitation patterns), allowing for new growth of shrubby saline tolerant species. Composition of these maritime thickets will be dependent on localized forest compositions and may mature to a closed canopy forest over time following the absence of disturbances.

Anthropogenic Activities

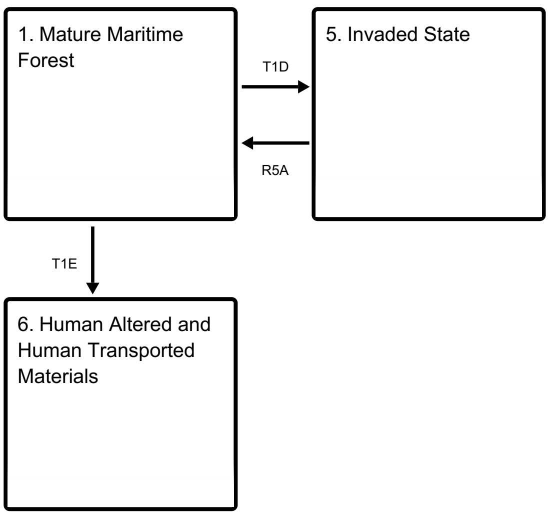
With recent rapid increases in Florida's population, many of these areas have been threatened by fragmentation and urbanization. Excessive withdrawals from the freshwater lense and coastal aquifer will lower the water table and intensity localized drought conditions. This may allow for the introduction of invasive species and increased probability of community altering disturbance events such as fire or salt intrusion.

State and transition model

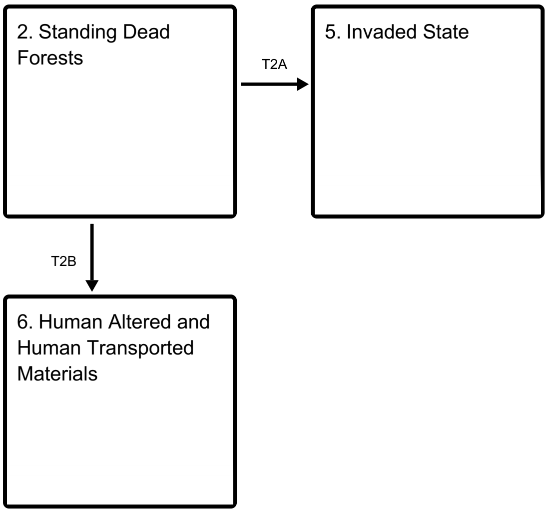
Ecosystem states



States 1, 5 and 6 (additional transitions)

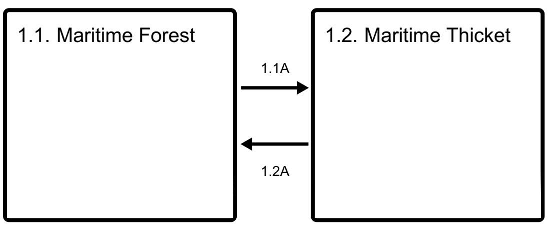


States 2, 5 and 6 (additional transitions)



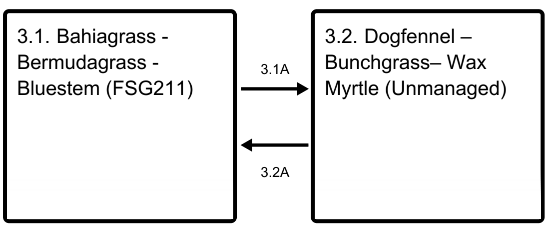
T1A - Intense Saline Intrusion
T1B - Land Use Conversion and Pasture Development
T1C - Land Use Conversion and Agricultural Development
T1D - Introduction and Establishment of Invasive / Non-Native / Undesirable Species
T1E - Human Alteration & Human Transportation of Soil Materials
R2A - Dilution of Salt / Species Regrowth
T2A - Introduction and Establishment of Invasive / Non-Native / Undesirable Species
T2B - Human Alteration & Human Transportation of Soil Materials
R4A - Hydrologic and Natural Vegetation Reestablishment
T3A - Land Use Conversion and Agricultural Field/ Grove Development
T3B - Introduction and Establishment of Invasive / Non-Native / Undesirable Species
T3A - Human Alteration & Human Transportation of Soil Materials
R4A - Hydrologic and Natural Vegetation Reestablishment
T4A - Land Use Conversion and Pasture Development
T4B - Introduction and Establishment of Invasive / Non-Native / Undesirable Species
T4C - Human Alteration & Human Transportation of Soil Materials
R5A - Invaded / Non-Native/ Undesirable Removal & Restoration
R5B - Invaded / Non-Native/ Undesirable Removal & Restoration
R5C - Invaded / Non-Native/ Undesirable Removal & Restoration
T5A - Human Alteration and / or Human Transportation of Soil Materials

State 1 submodel, plant communities



1.1A - Gap Disturbances
1.2A - Succession over Time

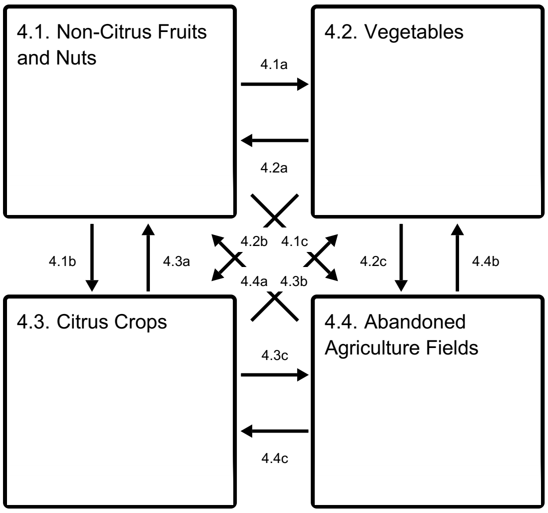
State 3 submodel, plant communities



3.1A - Absence of Pasture Management

3.2A - Pasture Management Strategies Implemented

State 4 submodel, plant communities



4.1a - Non-Citrus Fruit and Nut Crops to Vegetable Crops

4.1b - Non-Citrus Fruit and Nut Crops to Citrus Crops

4.1c - Field Abandonment

4.2a - Vegetable Crops to Non-Citrus Fruit and Nut Crops

4.2b - Vegetable Crops to Citrus Crops

4.2c - Field Abandonment

4.3a - Citrus Crops to Non-Citrus Fruit and Nut Crops

4.3b - Citrus Crops to Vegetable Crops

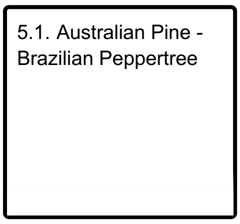
4.3c - Grove Abandonment

4.4a - Field Reestablishment

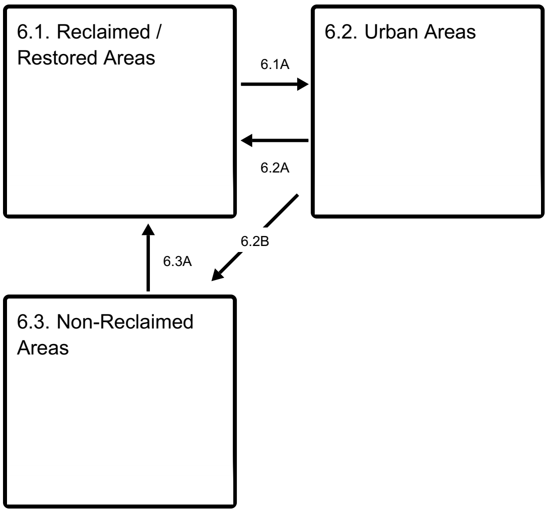
4.4b - Field Reestablishment

4.4c - Grove Reestablishment

State 5 submodel, plant communities



State 6 submodel, plant communities



6.1A - Urbanization

6.2A - Land Restoration

6.2B - Industrialization / Urbanization to Non-Reclaimed Area

6.3A - Land Reclamation

Sandy over Loamy Maritime Forests STM Key

I. Natural Stable Reference States- the ecological state that is most resistant to change, offers the most options to achieve management objectives, and reflects a defined “natural” disturbance regime.

A. Closed canopy mature maritime forests are the reference state on these soils along the Atlantic coast. The composition and structure of these evergreen hardwood forests are largely dependent on disturbance history as well as its distance to the coastline.

1 These are closed canopy uneven aged forests which often have no clear distinction between distinction in strata. They can be identified by a low, evenly pruned closed canopy which gradually increases in height from the distance to the ocean due to intense sea spray killing terminal buds. Dominant trees found in the canopy include live oak and cabbage palm. The shrub layer may be dense to open, herbaceous layer sparse to open.

B. This state represents a maritime forest which has been killed via a storm event which has deposited sand and salt through storm surges and extreme winds. While these species of maritime forests are tolerant of the influence of sea spray, prolonged salt exposure may kill the root system, leaving behind the standing dead tree, often giving the appearance of a standing dead forest.

C. This state represents an early succession to a maritime forest and is often characterized by salt tolerant shrub species. These may form either when natural primary succession of stabilized dune systems over time or can be secondary succession in a standing dead forest. Over time, excess salt in the soil is diluted by precipitation and flushed from the system, which may allow for new growth.

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B. This state represents a maritime forest which has been killed via a storm event which has deposited sand and salt through storm surges and extreme winds. While these species of maritime forests are tolerant of the influence of sea spray, prolonged salt exposure may kill the root system, leaving behind the standing dead tree, often giving the appearance of a standing dead forest.

C. This state represents an early succession to a maritime forest and is often characterized by salt tolerant shrub species. These may form either when natural primary succession of stabilized dune systems over time or can be secondary succession in a standing dead forest. Over time, excess salt in the soil is diluted by precipitation and flushed from the system, which may allow for new growth.

Sandy over Loamy Maritime Forests STM Key

I. Natural Stable Reference States- the ecological state that is most resistant to change, offers the most options to achieve management objectives, and reflects a defined “natural” disturbance regime.

A. Closed canopy mature maritime forests are the reference state on these soils along the Atlantic coast. The composition and structure of these evergreen hardwood forests are largely dependent on disturbance history as well as its distance to the coastline.

1 These are closed canopy uneven aged forests which often have no clear distinction between distinction in strata. They can be identified by a low, evenly pruned closed canopy which gradually increases in height from the distance to the ocean due to intense sea spray killing terminal buds. Dominant trees found in the canopy include live oak and cabbage palm. The shrub layer may be dense to open, herbaceous layer sparse to open.

B. This state represents a maritime forest which has been killed via a storm event which has deposited sand and salt through storm surges and extreme winds. While these species of maritime forests are tolerant of the influence of sea spray, prolonged salt exposure may kill the root system, leaving behind the standing dead tree, often giving the appearance of a standing dead forest.

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B. This state represents a maritime forest which has been killed via a storm event which has deposited sand and salt through storm surges and extreme winds. While these species of maritime forests are tolerant of the influence of sea spray, prolonged salt exposure may kill the root system, leaving behind the standing dead tree, often giving the appearance of a standing dead forest.

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Sandy over Loamy Maritime Forests STM Key

I. Natural Stable Reference States- the ecological state that is most resistant to change, offers the most options to achieve management objectives, and reflects a defined “natural” disturbance regime.

A. Closed canopy mature maritime forests are the reference state on these soils along the Atlantic coast. The composition and structure of these evergreen hardwood forests are largely dependent on disturbance history as well as its distance to the coastline.

1 These are closed canopy uneven aged forests which often have no clear distinction between distinction in strata. They can be identified by a low, evenly pruned closed canopy which gradually increases in height from the distance to the ocean due to intense sea spray killing terminal buds. Dominant trees found in the canopy include live oak and cabbage palm. The shrub layer may be dense to open, herbaceous layer sparse to open. ... Community 1 – Maritime Forest

B. This state represents a maritime forest which has been killed via a storm event which has deposited sand and salt through storm surges and extreme winds. While these species of maritime forests are tolerant of the influence of sea spray, prolonged salt exposure may kill the root system, leaving behind the standing dead tree, often giving the appearance of a standing dead forest. ... State 2 – Standing Dead Forests

C. This state represents an early succession to a maritime forest and is often characterized by salt tolerant shrub species. These may form either when natural primary succession of stabilized dune systems over time or can be secondary succession in a standing dead forest. Over time, excess salt in the soil is diluted by precipitation and flushed from the system, which may allow for new growth.

1 These will often consist of similar species with maritime forests but will often be in a stunted shrub thicket. These thickets are often very dense stands and similar to the canopies of maritime forests will have low, even, sea spray pruned tops increasing in height away from the coast. ... Community 2 – Maritime Thicket

II. Alternative Ecological States- one of several potential states of an ES that is functionally different from the reference state in terms of important ecological processes, kinds and amounts of ecosystem services, and management requirements.

A. Managed Grassland / Pastureland - 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.

1 This phase represents the natural community that has been converted to managed grassland / pastures in excellent conditions ... Community 1 – Bahiagrass - Bermudagrass - Bluestem (FSG211)

2 This phase represent the succession of pastureland and/or open grassland to unmanaged conditions ... Community 2 – Dogfennel – Bunchgrass– Wax Myrtle (Unmanaged)

B. Agricultural Commodities - cultivated crops, aquaculture, and apiculture. Cultivated cropland includes areas used for the production of adapted crops for harvest.

1 This phase describes the growth and harvest of non-citrus fruits and nuts ... Community 1 – Non-Citrus Fruits and Nuts

2 This phase describes the growth and harvest of vegetables ... Community 2 – Vegetables

3 This phase describes the growth of citrus crops, dominantly identified as oranges and grapefruit ... Community 3 – Citrus Crops

4 This phase describes the absence of management from agriculture fields, often resulting in overgrowth of woody shrubs and vines as well as invasive weeds ... Community 4 – Abandoned Agriculture Fields

C. Invaded State - consists of Florida Department of Agriculture and Consumer Services (FDACS) Non-Native Category 1 Species list.

1 This phase describes the introduction and establishment of common invasive species to this ecological site; Australian pine (Casuarina equisetifolia) and Brazilian Peppertree (Schinus terebinthifolius) are the two most common species. ... Community 1 – Australian Pine - Brazilian

terebinthifolia) are the two most common species ... Community 1 – Australian Pine - Brazilian Peppertree

D. Human Altered and Human Transported Areas - areas 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).

1 Areas that have been modified through anthropogenic means that are restored to a natural or second-hand natural community ... Community 1 – Reclaimed / Restored Areas

2 Areas developed for human use. These 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 ... Community 2 – Urban Areas

3 Areas that have been modified through anthropogenic means that are unable to be restored to a natural or semi-natural community (Active mines / mined areas before Phosphate Land Reclamation Act in 1975) ... Community 3 – Non-Reclaimed Areas

State 1
Mature Maritime Forest

Closed canopy mature maritime forests are the reference state on these soils along the Atlantic coast. Classic succession is generally accepted as long-term stabilized dune ridges which with periods of glacial formation and recession, led to a shifting Florida coastline and allowed for a maritime forest to develop. It is highly unlikely that these forests will ever transition with increased sea level rise to an active dune system, and with intense disturbance events will transition to a ghost forest or shrub thicket.

Resilience management. The main threats to these habitats include intense fragmentation and urbanization, as well as intense disturbance events which may change community structure. Management of these habitats should be directed primarily towards reducing forest fragmentation and protecting its ecological integrity.

Community 1.1
Maritime Forest

Mature maritime forests are evergreen hardwood forests. These will often be found along the Atlantic coastline. Species composition changes slightly from north to south with temperate and tropical species and will often consist of both temperate and tropical species. This community correlates with the Florida Natural Area Inventory community "Maritime Hammock" (FNAI, 2010).

Forest overstory. The forest overstory often forms a dense canopy of live oak (Quercus virginiana), cabbage palm (Sabal palmetto), and red bay (Persea borbonia). Other overstory canopy species may include pignut hickory (Carya glabra), southern magnolia (Magnolia grandiflora), gumbo limbo (Bursera simaruba), false mastic (Sideroxylon foetidissimum), inkwood (Exothea paniculata), strangler fig (Ficus aurea), and seagrape (Coccoloba uvifera). These will often be low in height (60 to 80 feet). Arboreal epiphytes such as airplants (Tillandsia spp.) and resurrection fern (Pleopeltis polypodiodes) are abundant on overstory species. Resurrection ferns will often go dormant during the winter months when there is little rainfall and can be found on the limbs primarily of Quercus spp. Airplants are abundant on all overstory species and can be found draped over limbs or attached to trunks.

Forest understory. The forest understory is often highly shaded due to the dense overstory. This will often limit growth of species to slow growing shade tolerant species. Subshrubs will often grow into the subcanopy and include red cedar (Juniperus virginiana) and American holly (Ilex opaca), as well as early developed overstory species such as cabbage palm and pignut hickory. Sparse shrubs may include Yaupon (Ilex vomitoria), tough bully (Sideroxylon tenax), wax myrtle (Myrica cerifera), saw palmetto (Serenoa repens), stopper (Eugenia spp.) and wild coffee (Psychotria nervosa). The herbaceous layer is sparse to absent. There is abundant leaf litter dominantly from the overstory oaks which is often moist due to the highly shaded conditions. Downed woody debris is common from previous disturbance events.

Dominant plant species

- live oak (*Quercus virginiana*), tree
- southern magnolia (*Magnolia grandiflora*), tree
- cabbage palmetto (*Sabal palmetto*), tree
- redbay (*Persea borbonia*), tree
- pignut hickory (*Carya glabra*), tree
- sand pine (*Pinus clausa*), tree
- eastern redcedar (*Juniperus virginiana*), shrub
- American holly (*Ilex opaca*), shrub
- yaupon (*Ilex vomitoria*), shrub
- tough bully (*Sideroxylon tenax*), shrub
- wax myrtle (*Morella cerifera*), shrub
- saw palmetto (*Serenoa repens*), shrub
- stopper (*Eugenia*), shrub
- wild coffee (*Psychotria*), shrub
- airplant (*Tillandsia*), other herbaceous
- resurrection fern (*Pleopeltis polypodioides*), other herbaceous
- greenbrier (*Smilax*), other herbaceous

Community 1.2
Maritime Thicket

Maritime thickets are evergreen shrub communities. These will often consist of similar species with maritime forests but will often be in a stunted shrub structure. These thickets are often very dense stands and similar to the canopies of maritime forests will have low, even, sea spray pruned tops increasing in height away from the coast.

Forest overstory. Common species include with dense saw palmetto (Serenoa repens) and scattered dwarfed cabbage palm (Sabal palmetto) closer to the ocean, which are gradually joined inland by taller shrubs, including tough bully (Sideroxylon tenax), yaupon (Ilex vomitoria), Hercules' club (Zanthoxylum clava-herculis), and shrubby forms of red bay (Persea borbonia), red cedar (Juniperus virginiana), and live oak (Quercus virginiana). These thickets will typically not reach a great enough height and will often be stunted and less than 6 feet.

Pathway 1.1A
Community 1.1 to 1.2

This transition is driven by gap disturbances in which the overstory is opened and natural reseeding occurs. This can be a result of of natural mortality or anthropogenic influences such as selective logging.

Pathway 1.2A
Community 1.2 to 1.1

Over time a maritime thicket will succeed into a maritime forest. As the shrub and dwarf tree species begin to grow into the canopy, it will begin to form a low closed canopy maritime forest. As this thicket matures into a forest, a sheared, pruned canopy will form along with forest growth. Time to full restoration will be dependent on localized environmental factors.

State 2
Standing Dead Forests

This state represents a standing dead maritime forest in which a storm event has deposited excessive sand and salt through storm surges and extreme winds. While these species of maritime forests are tolerant of the influence of sea spray, prolonged salt exposure may kill the root system, leaving behind the standing dead tree, often giving the appearance of a standing dead forest. This may also be seen along the edge of fragmented areas (i.e. road cutting through the maritime forest) as sea spray from onshore winds may kill the exposed edge, creating a standing dead forest of the canopy species until shearing and regrowth form a early successional maritime thicket. These areas are characterized by standing dead trees with little to no living vegetation. Arboreal epiphytes such as airplants (Tillandsia spp.) may be present on the limbs.

State 3
Managed Grassland / Pastureland

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 slowly infiltrates into the soil which helps recharge groundwater. Many small pasture livestock operations are near urban areas providing vistas for everyone to enjoy. It is especially important as livestock managers continues to experience extraordinarily high fuel and other input costs. Overgrazed pastures can lead to soil compaction and numerous bare spots, which may then become focal points of accelerated erosion and colonization sites of undesirable plants or weeds. It is strongly advised that consultation with State Resource Conservationist and District Conservationists at local NRCS Service Centers be sought when assistance is needed in developing management recommendations or prescribed grazing practices. This grassland / pastureland state correlates with the 2013 Florida Forage Suitability Group G155XB211FL (Sandy over Loamy Soils on Knolls and Ridges of Mesic Uplands).

Resilience management. Due to the effect from wind-borne sea spray, saline tolerant grass species may be utilized to get maximum production out of these areas.

Community 3.1
Bahiagrass - Bermudagrass - Bluestem (FSG211)

This community phase represents commonly planted forage species on pasturelands, haylands, and open grasslands found in drained areas of this natural community. The suite of plants established on any given site may vary considerably depending upon purpose, management goals, and usage (e.g., horses vs. cattle). Most systems include a mixture of grasses and legumes that provide forage throughout the growing season. Warm season perennial forage species often include bahiagrass (*Paspalum notatum*), bermudagrass (*Cynodon dactylon*), chalky bluestem (*Andropogon virginicus*), splitbeard bluestem (*Andropogon ternarius*), yellow indiangrass (*Sorghastrum nutans*), rhizoma perennial peanut (*Arachis glabrata*), and switchgrass (*Panicum virgatum*). Warm season annual forage species often include browntop millet (*Urochloa ramosa*), pearl millet (*Pennisetum glaucum*), sorghum (*Sorghum bicolor*), hairy indigo (*Indigofera hirsuta*), alyceclover (*Alysicarpus vaginalis*), and cowpea (*Vigna unguiculata*). Several additional plants and/or species combinations may be present depending on the objectives and management approaches of the land manager/owner.

Resilience management. Although depth to seasonal water table is in excess of 6 feet for the soils in this state, loamy sands occur at a depth of 20 to 40 inches below the surface. This makes the water holding capacity of the soils in this ecosite somewhat higher than those in F155XY200FL. This will mitigate drought effects somewhat, but total annual production is still driven largely by rainfall. However reduced production can occur in years with below average rainfall. Irrigation is not recommended for these soils due to poor water holding capacity. Establishment of both annual and perennial warm season forages may be delayed due to limited rainfall in the spring although short term drought periods in the summer months should be less severe. Growth curves for warm season perennial forages will still be weighted more towards the later part of the growing season. Cool season forage production is very limited due to decreased and sporadic rainfall during winter months (November-March) and depth to water table, therefore no cool season forages are recommended and no production data is given.

Dominant plant species

- bahiagrass (*Paspalum notatum*), grass
- Bermudagrass (*Cynodon dactylon*), grass
- broomsedge bluestem (*Andropogon virginicus*), grass
- splitbeard bluestem (*Andropogon ternarius*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- browntop millet (*Urochloa ramosa*), grass
- pearl millet (*Pennisetum glaucum*), grass
- sorghum (*Sorghum bicolor*), grass

- switchgrass (*Panicum virgatum*), grass
- rhizoma peanut (*Arachis glabrata*), other herbaceous
- hairy indigo (*Indigofera hirsuta*), other herbaceous
- white moneywort (*Alysicarpus vaginalis*), other herbaceous
- cowpea (*Vigna unguiculata*), other herbaceous

Community 3.2
Dogfennel – Bunchgrass– Wax Myrtle (Unmanaged)

This phase represent the succession of pastureland and/or open grassland to unmanaged conditions. Duration of this phase is dependent on former and future management, use, and impacts. The early pioneer shrub thicket phase will be dependent on the available seedbank present. This unmanaged phase will most often consist of the shrub wax myrtle (*Morella cerifera*) and dogfennel (*Eupatorium capillifolium*), an aggressive native perennial that is characteristic of unimproved, unmanaged, or overgrazed pastures, where it adds the decline of forage yield and quality. Pasture grass present will enter a reproductive phase and have woody stems that are undesirable forage species. Other undesirable species may be present in this community that have not been mentioned,

Dominant plant species

- wax myrtle (*Morella cerifera*), shrub
- dogfennel (*Eupatorium capillifolium*), other herbaceous

Pathway 3.1A
Community 3.1 to 3.2

This pathway occurs when pasture management activities include overgrazing, overstocking, etc., natural succession of the once managed site leads to this stage.

Pathway 3.2A
Community 3.2 to 3.1

This pathway represents renovation of the unmanaged condition back to managed pastureland, forage production, or open grassland. Management activities likely include mechanical removal of the larger, woody vegetation followed by herbicide treatment / prescribed burning and establishment of desired seeding mixtures.

State 4
Agricultural Commodities

The agriculture industry includes cultivated crops, aquaculture, and apiculture. Cultivated cropland includes areas used for the production of adapted crops for harvest. These areas comprise of land in row crops or close-grown crops that are in a rotation with row or close-grown crops. Primary exports from Florida consist 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. It is strongly advised that consultation with State Agronomist and District Conservationists at local NRCS Service Centers be sought when assistance is needed in developing management recommendations.

Resilience management. Major natural resource concerns facing cropland 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 4.1
Non-Citrus Fruits and Nuts

This phase describes the growth and harvest of non-citrus fruits. Land conversion is necessary to create fields suitable for crop growth. Common fruits grown in these soils include watermelons. Due to the year-round warm climate Florida has, fruits can often be harvested in both winter and summer seasons. Dependent on the distance to saline influence, specific management and timing of planting and harvesting need to be studied.

Resilience management. Selection of species and varieties is critical for fruit production, as plants that are not adapted to local conditions will generally fail to produce regardless of how much care and attention they receive. Weather is perhaps the single most important factor that determines where fruit crops can be grown. Winters may be too cold for some fruit or too short for others. Still other fruit may suffer from summer's heat and humidity. Consequently, species and varieties of fruits should be chosen on the basis of historical weather patterns. It is strongly advised that consultation with State Agronomist and District Conservationists at local NRCS Service Centers besought when assistance is needed in developing management recommendations.

Community 4.2
Vegetables

This phase describes the growth and harvest of vegetables. Land conversion is necessary to create fields suitable for crop growth. Common vegetables grown in these soils include cabbage, corn, cucumbers, peppers, and tomatoes. Due to the year-round warm climate Florida has, vegetables can often be harvested in both winter and summer seasons. Dependent on the distance to saline influence, specific management and timing of planting and harvesting need to be studied.

Resilience management. Selection of species and varieties is critical for vegetable production, as plants that are not adapted to local conditions will generally fail to produce regardless of how much care and attention they receive. Weather is perhaps the single most important factor that determines where vegetable crops can be grown. Winters may be too cold for some vegetables or too short for others. Still other crops may suffer from summer's heat and humidity. Consequently, species and varieties of fruits should be chosen on the basis of historical weather patterns. It is strongly advised that consultation with State Agronomist and District Conservationists at local NRCS Service Centers be sought when assistance is needed in developing management recommendations.

Community 4.3
Citrus Crops

This phase describes the growth of citrus crops, dominantly identified as oranges and grapefruit within this ecological site area. This phase differs from other fruits and tree crops due to the intensive management and care needed for citrus groves. Citrus is one of the highest commercial agriculture products in the state of Florida. Dependent on the distance to saline influence, specific management and timing of planting and harvesting need to be studied.

Resilience management. Management should be based off individual groves, as different areas will require different management. It is strongly advised that consultation with State Agronomist and District Conservationists at local NRCS Service Centers be sought when assistance is needed in developing management recommendations.

Community 4.4
Abandoned Agriculture Fields

This phase describes the absence of management from agriculture fields, often resulting in overgrowth of woody shrubs and vines as well as invasive weeds. This community may occur when producers abandon a field due to any number of reasons. Many fields in the first seasons of abandonment will remain fallow until weedy and shrubby species become dominant. With proper management this community has the potential to support agricultural commodities.

Pathway 4.1a
Community 4.1 to 4.2

The conversion from non-citrus fruit and nut crops to vegetable crops would require, if applicable, the harvest of the crop before converting the land for the desired crop production. Mechanical ground preparation and chemical applications may be needed to create the desired land use conditions for the new crop.

Pathway 4.1b
Community 4.1 to 4.3

The conversion from non-citrus fruit and nut crops to citrus crops would require, if applicable, the harvest of the crop before converting the land for the desired crop production. Mechanical ground preparation and chemical applications may be needed to create the desired land use conditions for the new crop.

Pathway 4.1c
Community 4.1 to 4.4

Many fields become abandoned when a producer doesn't maintain and harvest crops against pests, diseases, rising costs of labor, or any other reason that will lead to field abandonment.

Pathway 4.2a
Community 4.2 to 4.1

The conversion from vegetable crops to non-citrus fruit and nut crops would require, if applicable, the harvest of the crop before converting the land for the desired crop production. Mechanical ground preparation and chemical applications may be needed to create the desired land use conditions for the new crop.

Pathway 4.2b
Community 4.2 to 4.3

The conversion from vegetable crops to citrus crop would require, if applicable, the harvest of the crop before converting the land for the desired crop production. Mechanical ground preparation and chemical applications may be needed to create the desired land use conditions for the new crop.

Pathway 4.2c
Community 4.2 to 4.4

Many fields become abandoned when a producer doesn't maintain and harvest crops against pests, diseases, rising costs of labor, or any other reason that will lead to field abandonment.

Pathway 4.3a
Community 4.3 to 4.1

The conversion from citrus crops to non-citrus fruit and nut crops would require, if applicable, the harvest of the crop before converting the land for the desired crop production. Mechanical ground preparation and chemical applications may be needed to create the desired land use conditions for the new crop.

Pathway 4.3b
Community 4.3 to 4.2

The conversion from citrus crops to vegetable crops would require, if applicable, the harvest of the crop before converting the land for the desired crop production. Mechanical ground preparation and chemical applications may be needed to create the desired land use conditions for the new crop.

Pathway 4.3c
Community 4.3 to 4.4

Many fields become abandoned when a producer doesn't maintain and harvest crops against pests, diseases, rising costs of labor, or any other reason that will lead to field abandonment. Major diseases affecting citrus groves include citrus canker, an infection that causes lesions on the leaves, stems and fruits of citrus crops, as well as citrus greening, often spread by the Asian citrus psyllid, a sap-sucking hemipteran bug that causes trees to produce fruits that are green, misshapen and bitter, and unsuitable for sale as fresh fruit or juice.

Pathway 4.4a
Community 4.4 to 4.1

The restoration of an abandoned field or grove to an active agriculture field often includes removal of the abandoned crop and weeds, converting the land if necessary, and replanting of desired species. Abandoned citrus groves that get converted to agriculture fields will often need complete removal of the citrus tree and the land to be flattened from furrows present in citrus groves. Once removal of undesirable species is complete and the land is converted to a flat field (if necessary), and new seedlings are planted, maintenance is required to keep the crop healthy until harvest.

Pathway 4.4b
Community 4.4 to 4.2

The restoration of an abandoned field or grove to an active agriculture field often includes removal of the abandoned crop and weeds, converting the land if necessary, and replanting of desired species. Abandoned citrus groves that get converted to agriculture fields will often need complete removal of the citrus tree and the land to be flattened from furrows present in citrus groves. Once removal of undesirable species is complete and the land is converted to a flat field (if necessary), and new seedlings are planted, maintenance is required to keep the crop healthy until harvest.

Pathway 4.4c
Community 4.4 to 4.3

The restoration of an abandoned field or grove to an active citrus grove often includes removal of the abandoned crop and weeds and replanting of desired species. In citrus groves removal of abandoned citrus trees are often either completely pulled out of the ground or cut to the stump and new seedlings are planted next to the cut stumps. Once removal of undesirable species is complete and new resets are planted, maintenance is required to keep the crop healthy until harvest.

State 5
Invaded State

This state represents the dominance of one or multiple non-native or exotic species which outcompetes the native natural community and may significantly alter the composition and structure of the invaded stand by overshading the canopy and understory components and preventing regeneration of native species.

Community 5.1
Australian Pine - Brazilian Peppertree

This phase describes the introduction and establishment of common invasive species to this ecological site; Australian pine (*Casuarina equisetifolia*) and Brazilian Peppertree (*Schinus terebinthifolius*) are the two most common species. In many areas, these species will be found along the edge habitat due to higher soil disturbances because of urbanization. These species are adapted to droughty conditions and has high salt tolerance. These may typically become prevalent following storm disturbances and will often outcompete native vegetation. Australian pines and Brazilian Peppertree may kill or displace native vegetation by creating dense shade and litter in habitats which frequently have all day sun, as well as dropping leave which have allelopathic properties which suppress the growth of other plant life. These may also displace wildlife due to the shallow root system which may affect some animal's ability to nest in the sand and displace native habitats. Less dominant invasive species may also include Periwinkle (*Catharanthus roseus*), Century Plant (*Agave neglecta*), Lantana (Lantana camera), Cat's eye (*Abrus precatorius*), and Life Plant (*Kalanchoe pinnata*). Other undesirable species may be present in this community that have not been mentioned,

Resilience management. Restoring native habitat may be very difficult with these species. These species responds to herbicide application strategies such as frill/ girdle, basal bark, foliar, and soil herbicide application methods. Mechanical removal can be used with mulchers and stump grinders to eliminate and remove these species.

Dominant plant species

- beach sheoak (*Casuarina equisetifolia*), tree
- Brazilian peppertree (*Schinus terebinthifolius*), shrub
- Madagascar periwinkle (*Catharanthus roseus*), other herbaceous
- wild century plant (*Agave neglecta*), other herbaceous
- lantana (*Lantana camara*), other herbaceous
- rosarypea (*Abrus precatorius*), other herbaceous
- cathedral bells (*Kalanchoe pinnata*), other herbaceous

State 6
Human Altered and Human Transported Materials

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 anew 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 farmed 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, Cocoa fine sand-Urban land complex, 0 to 2 percent 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 6.1
Reclaimed / Restored 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 intensity urban areas, and may be required to be reclaimed after urban use (e.g., active mines must be reclaimed). 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 6.2
Urban Areas

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.

Resilience management. 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/ active mines).

Community 6.3

Non-Reclaimed Areas

Non-reclaimed areas are areas that have been modified through anthropogenic means that are unable to be restored to a natural community. Areas that cannot be reclaimed are areas under active mining status (phosphate, sand, or gravel mines) 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.

Pathway 6.1A
Community 6.1 to 6.2

This transition is driven by clearing and developing the land for low-, medium-, or high-intensity urban areas.

Pathway 6.2A
Community 6.2 to 6.1

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

Pathway 6.2B
Community 6.2 to 6.3

This transition is driven by 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 land.

Pathway 6.3A
Community 6.3 to 6.1

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

Transition T1A
State 1 to 2

Intense saline intrusion may be sufficient to kill mature trees in a maritime forest. This most often happens in two ways: 1) Extreme storm events may create a breakthrough of the dune system, flooding the communities protected behind it, allowing for the storm surge to deposit sand and salt-water to enter the maritime forest. This deposit of salt into the system can kill the roots of the mature trees, leaving behind standing dead trees. 2) Fragmentation of the maritime forest may expose the forest to a more intense wind-borne sea spray which causes a shearing effect on the canopy, giving it a pruned look. This newly exposed edge may die back and leave behind the standing dead trees.

Constraints to recovery. Precipitation will dilute the salt out of the system over time, allowing for the growth of early successional maritime species, often creating a thicket of low, pruned shrubby species.

Transition T1B
State 1 to 3

Actions required to convert native habitat to pasture or forage production include herbicide application, seedbed preparation, and the establishment of desired plants. Decisions to convert native land to pastureland on this site should be made carefully and continuously evaluated before, during, and after conversion activities. This site is extremely susceptible to soil compaction and erosion. The decision to proceed with this action should be done so in close communication with and guidance from local NRCS Service Centers.

Transition T1C
State 1 to 4

Actions required to convert native habitat to agricultural land include herbicide application, seedbed preparation, and the establishment of desired plants. Decisions to convert native land to agriculture on this site should be made carefully and continuously evaluated before, during, and after conversion activities. The decision to proceed with this action should be done so in close communication with and guidance from local NRCS Service Centers

Transition T1D
State 1 to 5

This transition represents proliferation and dominance of an invasive species. Soil mechanical disturbances can compound this effect and create suitable conditions for invasive species.

Transition T1E
State 1 to 6

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

Restoration pathway R2A
State 2 to 1

As salt is diluted out of the system via seasonal precipitation, more saline tolerant shrub species are able to grow and form a maritime thicket.

Transition T2A
State 2 to 5

This transition represents proliferation and dominance of an invasive species. Soil mechanical disturbances can compound this effect and create suitable conditions for invasive species.

Transition T2B
State 2 to 6

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

Restoration pathway R4A
State 3 to 1

This mechanism is driven by restoring natural hydrologic flow to the area (dependent on level of alteration) to meet the natural hydroperiod once supported by these communities. This can be done via blocking or filling in previously made ditches used to drain and channelize water flow out of the system for pasture management. Other management practices such as replanting native grasses, shrubs, and trees must be implemented to return the to the natural state. Local site conditions and disturbances may determine existing plant seed banks and community composition of managed grasslands/ pastures. The decision to proceed with this action should be done so in close communication with and guidance from local NRCS Service Centers.

Transition T3A
State 3 to 4

Actions required to convert altered land use to agricultural land include herbicide application, seedbed preparation, and the establishment of desired plants. Decisions to convert land to agriculture on this site should be made carefully and continuously evaluated before, during, and after conversion activities. The decision to proceed with this action should be done so in close communication with and guidance from local NRCS Service Centers.

Transition T3B
State 3 to 5

This transition represents proliferation and dominance of an invasive species. Soil mechanical disturbances can compound this effect and create suitable conditions for invasive species.

Transition T3A
State 3 to 6

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

Restoration pathway R4A
State 4 to 1

This mechanism is driven by restoring natural hydrologic flow to the area (dependent on level of alteration) to meet the natural hydroperiod once supported by these communities. This can be done via blocking or filling in previously made ditches used to drain and channelize water flow out of the system for pasture management. Other management practices such as replanting native grasses, shrubs, and trees must be implemented to return the to the natural state. Local site conditions and disturbances may determine existing plant seed banks and community composition of managed grasslands/ pastures. The decision to proceed with this action should be done so in close communication with and guidance from local NRCS Service Centers.

Transition T4A
State 4 to 3

Actions required to convert altered land use to pasture or forage production include herbicide application, seedbed preparation, and the establishment of desired plants. Decisions to convert to pastureland on this site should be made carefully and continuously evaluated before, during, and after conversion activities. This site is extremely susceptible to soil compaction and erosion. The decision to proceed with this action should be done so in close communication with and guidance from local NRCS Service Centers.

Transition T4B
State 4 to 5

This transition represents proliferation and dominance of an invasive species. Soil mechanical disturbances can compound this effect and create suitable conditions for invasive species.

Transition T4C
State 4 to 6

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

Restoration pathway R5A
State 5 to 1

The establishment of, or a return to, natural habitat conditions following a previous invasive / non-native / undesirable species infestation may be possible in some areas. Successful actions will require relentless efforts that include removal of the species via chemical or mechanical or biological means. In some extreme cases, restoration attempts could result in greater erosion and worsening of local conditions. Please consult with District and Soil Conservationists at local NRCS Field Offices for advice and guidance on land restoration attempts on invaded areas.

Restoration pathway R5B
State 5 to 3

The establishment of, or a return to, altered land use conditions following a previous invasive / non-native / undesirable species infestation may be possible in some areas. Successful actions will require relentless efforts that include removal of the species via chemical or mechanical or biological means. In some extreme cases, restoration attempts could result in greater erosion and worsening of local conditions. Please consult with District and Soil Conservationists at local NRCS Field Offices for advice and guidance on land restoration attempts on invaded areas.

Restoration pathway R5C
State 5 to 4

The establishment of, or a return to, altered land use conditions following a previous invasive / non-native / undesirable species infestation may be possible in some areas. Successful actions will require relentless efforts that include removal of the species via chemical or mechanical or biological means. In some extreme cases, restoration attempts could result in greater erosion and worsening of local conditions. Please consult with District and Soil Conservationists at local NRCS Field Offices for advice and guidance on land restoration attempts on invaded areas.

Transition T5A
State 5 to 6

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

Additional community tables

Animal community

A major influence on the distribution of maritime forest plants is attributed to deposition from birds, primarily foraging acorns and other seeds. While providing habitat for both year-round and migratory species, maritime forests will often have a greater assemblage of migratory species compared to year-round species which may be found in habitats further inland. Species richness increases with the greater size of the hammock. Common species may include Black-and-white Warbler (Mniotilta varia), Ovenbird (Seiurus aurocapillus), Northern Parula (Parula americana), Northern cardinal (Cardinalis cardinalis), Summer Tanager (Piranga rubra), Mourning Dove (Zenaida macroura), Fish Crow (Curvus ossifragus), blue-gray gnatcatcher (Polioptila caerulea), Carolina wren (Thryothorus ludovicianus) and Brown-headed Cowbird (Molothrus ater).

These areas are often frequented by small mammals which are preyed upon by snakes and raptors. Though not primary habitat, these communities are often used by gopher tortoises (Gopherus polyphemus).

Recreational uses

These areas are highly recreated with large portions of this ecological site found in Washington Oaks State Park and the Tomoka Basin State Parks in Flagar and Volusia Counties. These areas are often used for hiking, picnicking, or camping and are often frequented by birdwatchers in the winter season following the path of migratory birds.

Wood products

Many maritime forests have been previously logged after the Civil War to be used for ship timbers. Many of these areas have presently been logged to create space for the rapid growth of Florida’s population and desire to live near the coastline.

Other information

Cultural Resources:

These areas are in limited extent found in Flagar and Volusia Counties, Florida. Other areas outside these sites are found on protected state or federal land or on private land and may have undergone urbanization. Native American shell mounds may be found along these coastal communities and are considered an archeological resource and protected. The formation of a shell mound is largely the result of human activities instead of natural and physical processes. Shell mounds are small hills or mounds made up almost entirely of mollusk shells discarded by Native Americans. The soils will be circumneutral to slightly alkaline, contain minimal organic material, and are very well drained. Undisturbed shell mounds can support a variety of hardwood trees and shrubs which may include white stopper (Eugenia axillaris), live oak (Quercus virginiana), cabbage palm (Sabal palmetto), red cedar (Juniperus virginiana), torchwood (Amyris elemifera), wild lime (Zanthoxylum fagara), saffron plum (Sideroxylon celastrinum), soapberry (Sapindus saponaria), snowberry (Chiococca alba), and false mastic (Sideroxylon foetidissimum). These communities are not limited to one soil component type and are often seen throughout the state within protected parks and preserves where Native American settlements once existed.

These areas are also rich in early settler history, with 13 known early plantation sites, which date back to the Early Territorial Period (1821 - 1845). The plantations produced rice, indigo, cotton and, most notably, sugar cane. The period of plantation development in the area came to an abrupt halt in 1836 at the outbreak of the Second Seminole War, when raids destroyed the plantations. Examples can be seen at Bulow Plantation Ruins Historic State Park.

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

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Approval

Marji Patz, 2/14/2025

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	05/13/2025
Approved by	Charles Stemmans
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

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

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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:**