Ecological site F154XX002FL
Xeric Bicolor Sandy Uplands

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General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

MLRA notes

Major Land Resource Area (MLRA): 154X–South-Central Florida Ridge

MLRA 154 is entirely in Peninsular Florida, and contains 8,285 square miles. MLRA 154 is characterized by a series of parallel, prominent sandy ridges of Pleistocene marine origin; the larger ridge systems including the Brooksville, Mount Dora, and Lake Wales Ridges. These north to south oriented parallel ridges are interspersed with more low lying physiographic provinces, including: upland hills, plains, valleys and gaps (Puri and Vernon 1964). The extreme western portion of the MLRA consists of thin belt of coastal lowlands and marshlands.

Many of the soils in this sub-unit are Pleistocene or Holocene sands that are underlain with older, loamy Pliocene marine sediments (Cypresshead formation) or the clayey Miocene marine sediments (Hawthorne formation). A combination of marine depositional events and the dissolution of underlying limestone (karst geology) is responsible for surficial topography throughout Peninsular Florida.

Classification relationships

All portions of the geographical range of this site falls under the following ecological / land classifications including:

-Environmental Protection Agency's Level 3 and 4 Ecoregions of Florida: 75 Southern Coastal Plain; 75c Central Florida Ridges and Uplands (Griffith, G. E., Omernik, J. M., & Pierson, S. M., 2013)

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

Ecological site concept

The Xeric Bicolor Sandy Uplands site occurs in the Floridian Section of the Coastal Plain Province of the Atlantic Plain and is geographically restricted to sandy ridges of the Central Highlands and Gulf Coastal Lowlands of Central Florida (Puri and Vernon 1964, Brooks 1982). The physiographic landforms primarily associated with this site are the Tsala Apopka Plain, Osceola Plain, Lake Wales Ridge, Mount Dora Ridge, Intra-ridge Valley and the Northern Highlands Provinces. Elevations in these regions range from 8 feet (2.4 meters) above sea level along a narrow strip on the western edge of the MLRA to 160 feet (48.8 meters) on interior hills and ridges.

Geologically, this region is a young marine plain composed of surficial materials consisting of marine sands that are primarily Pliocene or Miocene epochs (2.5 to 23 million years ago) or Pleistocene and Holocene epochs (2.5 million years ago to present) in age. These sandy marine sediments are underlain by Tertiary-age rocks (Oligocene and Eocene epochs – 23 to 56 million years ago) that are dominated by very fine grained limestone and dolomite. Surficial geology is the result of a complex combination of factors ranging from deposition and/or erosion of marine sediments, and the dissolution of underlying carbonate rocks. Fluctuations of ocean levels, offshore currents, wind activity on coastal sediments, and re-deposition are associated with regional dune and ridge systems. Furthermore, the dissolution of underlying carbonate rocks (collectively referred to as karst geology) results in a variety of surficial karstic features. These range in size from karst valleys to smaller, better defined features such as sinkholes or chimneys.

The Cypresshead (Pliocene) and Hawthorne (Miocene) formations are important stratigraphic features that may be present at depths > 80 inches throughout the distribution of this site. The Cypresshead formation is composed of siliciclastics that are Pliocene-age sediments from shallow marine, near shore deposits. They are reddish brown to reddish orange, unconsolidated to poorly consolidated loamy sediments. The Hawthorne Formation contains clastic deposits from the Appalachian uplift principally sands, clays, phosphates, and carbonates.

Geomorphic position of the site ranges from summits to backslopes. Similarly, topography ranges from nearly level to gently rolling. However, areas on dunes, near sinkholes and streams are more sloping. In general, land surface is irregular in the Central Florida Ridges because of the many sinkholes that dot the area.

Associated sites

R154XX001FL	**Yellow Sands Xeric Uplands** These are excessively drained communities that occur in similar to slightly higher landscape positions within MLRA 154.
F154XA003FL	**Dry Yellow Sands Pine Woodland** These are excessively drained communities that occur in similar to slightly higher landscape positions within MLRA 154.
F154XA004FL	**Moist Sandy Pine-Hardwood Woodlands** These are excessively drained communities that occur in slightly lower landscape positions within MLRA 154.
F154XA009FL	**Moist Basic Pine Uplands** These are well drained communities that occur in slightly lower landscape positions within MLRA 154.

Similar sites

R155XY180FL	**Sandy Scrub on Rises, Ridges, and Knolls of Mesic Uplands** These are somewhat poorly to well drained soils that will occur on similar landscape positions on smaller ridgelines within the bordering MLRA 155. These sites may also occur as newer ridgelines of Pleistocene deposits along coastlines and will commonly be referred to as “coastal scrub” rather than the “interior scrub” of MLRA 154. They will have similar vegetative structure but will differ slightly in native vegetative composition and management strategies. In altered managed states such as pastureland and cropland, this site may produce different production values.
R155XY230FL	**Sandy Scrub on Ridges, Knolls, and Dunes of Xeric Uplands** These are well to excessively well drained soils that will occur on similar to slightly higher landscape positions on smaller ridgelines within the bordering MLRA 155. These sites may also occur as newer ridgelines of Pleistocene deposits along coastlines and will commonly be referred to as “coastal scrub” rather than the “interior scrub” of MLRA 154. They will have similar vegetative structure but will differ slightly in native vegetative composition and management strategies. In altered managed states such as pastureland and cropland, this site may produce different production values.
R154XX001FL	**Yellow Sands Xeric Uplands** These are excessively drained communities that occur in similar to slightly higher landscape positions within MLRA 154. Soils will be sand generally yellow in color and will have more than 200 centimeters of yellow rather than sand dominantly white or bicolored. This change influences the soil chemistry, resulting in different natural vegetative communities (scrub) and corresponding management strategies.
F154XA003FL	**Dry Yellow Sands Pine Woodland** These are excessively drained communities that occur in similar to slightly higher landscape positions within MLRA 154. Soils will be sand generally yellow in color and will have less than 200 centimeters of yellow sand rather than sand dominantly white or bicolored. This change influences the soil chemistry, resulting in different natural vegetative communities (sandhills) and corresponding management strategies.

Table 1. Dominant plant species

Tree	(1) *Pinus clausa*

Shrub	(1) *Quercus myrtifolia* (2) *Quercus chapmanii*
Herbaceous	(1) *Rhynchospora megalocarpa* (2) *Cladina*

Physiographic features

This ecological site occurs on sandy, moderately well to excessively drained uplands on marine terraces of coastal plains in central and west-central Florida. Slopes are nearly level to sloping (0 to 12%, but may range up to 20%). The site occurs on ridges, knolls, and uplands of eolian marine deposition. The soils are sandy to > 80 inches.

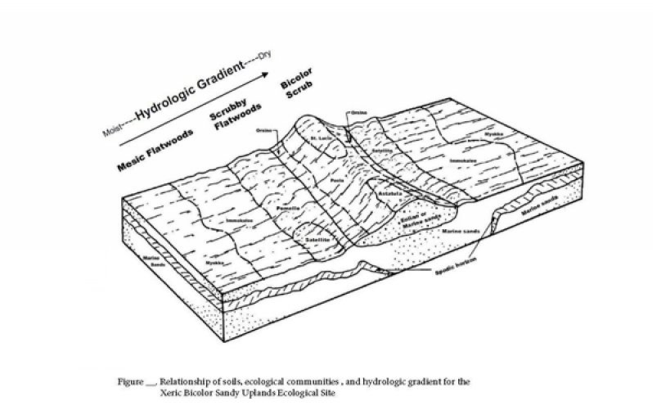


Figure 1. Landscape diagram for Xeric Bicolor Sandy Uplands

Table 2. Representative physiographic features

Hillslope profile	(1) Backslope (2) Summit (3) Shoulder
Landforms	(1) Marine terrace > Ridge (2) Marine terrace > Knoll
Runoff class	Negligible
Flooding frequency	None
Ponding frequency	None
Elevation	2–49 m
Slope	0–12%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to very low
Flooding frequency	None
Ponding frequency	None
Elevation	0–65 m
Slope	0–20%
Water table depth	137–203 cm

Climatic features

The climate varies considerably across the latitudinal gradient of MLRA 154. The north to south orientation of MLRA 154 spans three USDA plant hardiness zones in the Florida Peninsula (USDA-ARS). Similarly, the geographic distribution of this site spans approximately 150 miles, extending across two land divisions known as Land Resource Units (LRU's) in MLRA 154 (USDA-NRCS 2006).

The climate is characterized by humid subtropical with long hot summers and mild winters. In the winter months, Canadian air masses move across Peninsular Florida and produce cool, cloudy, rainy weather. Below freezing temperatures are occasional in the northern LRU (154-1), but very rare in the southern LRU (154-2). Overall, there are typically fewer than 30 days of the year with below freezing temperatures in MLRA 154.

Similarly, average temperatures vary considerably from north to south over the range of the Site. Average seasonal low temperature in LRU 154-1 is 55°F (12.7°C) in January, and prolonged freezing temperatures are common in the winter months. In contrast, LRU 154-2 has more uniformity of seasonal temperatures and winter freezes are rare.

Precipitation in MLRA 154 is distributed fairly evenly throughout the year. Average annual precipitation ranges from 45 to 55 inches (114 to 140 cm). The highest monthly precipitation occurs from June through October, with June through August being the wettest period. However, LRU 154-1 receives substantially more precipitation during the winter months compared to LRU 154-2. Winter rainfall is associated with seasonal cold fronts, which tend to disintegrate before reaching the southern reaches of MLRA 154.

Hurricanes and tropical storms affect much of MLRA 154. Catastrophic hurricanes make landfall along the Atlantic coast of Peninsular Florida on the order of two to four times per century. Strong winds and heavy rainfall affects the interior peninsula (MLRA 154); rainfall from hurricanes and tropical systems vary widely but can exceed 20 inches (51 cm) from one event. Hurricanes are most likely to occur between June and November, and are most common in August and September.

Table 4. Representative climatic features

Frost-free period (characteristic range)	226-365 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	1,295-1,346 mm
Frost-free period (actual range)	213-365 days
Freeze-free period (actual range)	314-365 days
Precipitation total (actual range)	1,270-1,372 mm
Frost-free period (average)	296 days
Freeze-free period (average)	356 days
Precipitation total (average)	1,321 mm

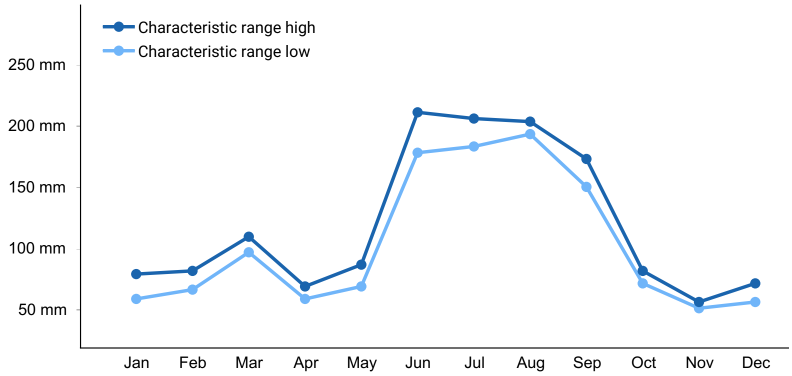


Figure 2. Monthly precipitation range

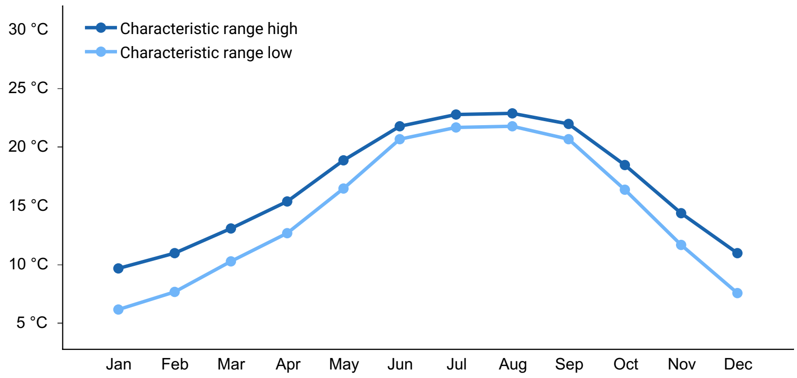


Figure 3. Monthly minimum temperature range

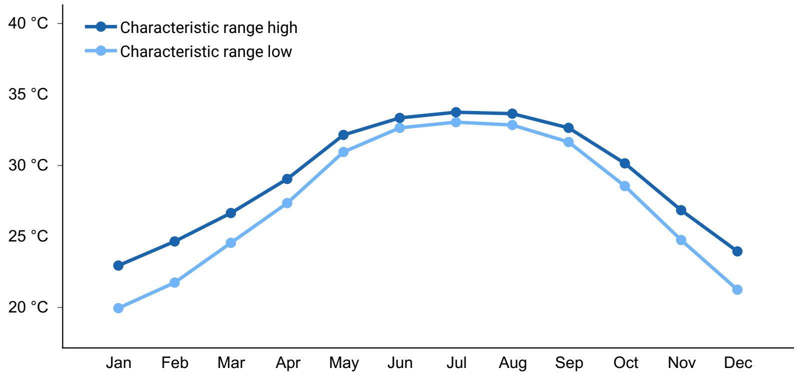


Figure 4. Monthly maximum temperature range

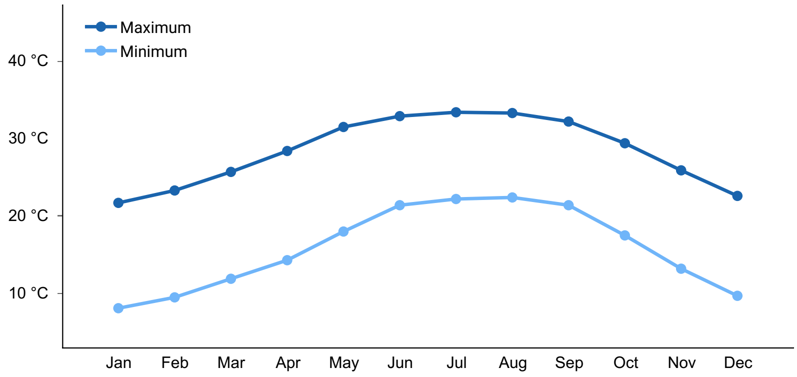


Figure 5. Monthly average minimum and maximum temperature

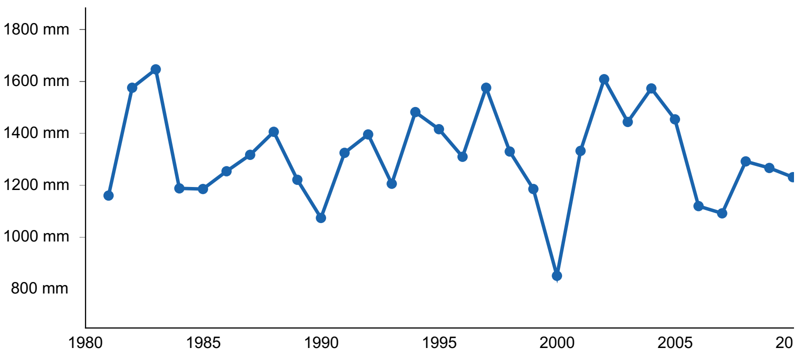


Figure 6. Annual precipitation pattern

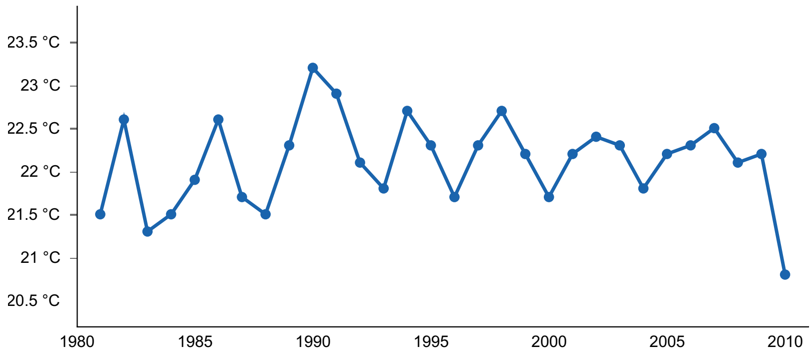


Figure 7. Annual average temperature pattern

Climate stations used

- (1) LAKE ALFRED EXP STN [USC00084707], Haines City, FL
- (2) LISBON [USC00085076], Leesburg, FL
- (3) ARCHBOLD BIO STN [USC00080236], Venus, FL
- (4) AVON PARK 2 W [USC00080369], Avon Park, FL
- (5) ORANGE SPRINGS 2SSW [USC00086618], Fort Mc Coy, FL
- (6) CLERMONT 9 S [USC00081641], Clermont, FL
- (7) GAINESVILLE 11 WNW [USC00083322], Gainesville, FL
- (8) INVERNESS 3 SE [USC00084289], Inverness, FL
- (9) BROOKSVILLE CHIN HILL [USC00081046], Brooksville, FL
- (10) MTN LAKE [USC00085973], Lake Wales, FL
- (11) SAINT LEO [USC00087851], San Antonio, FL
- (12) TARPON SPGS SEWAGE PL [USC00088824], Tarpon Springs, FL

Influencing water features

This site generally occurs as isolated, fragmented scrublands on isolated knolls and ridges surrounded by wetter environments. The site is situated on soils that have very deep seasonal high water tables (usually > 80 inches [203 cm]). Low slope gradient, rapid infiltration and saturated hydraulic conductivity results in negligible surface runoff. Subsurface water flow is dependent on the presence or absence of an aquitard (loamy or clayey layer that retards water movement). The presence, depth, and orientation of this restrictive layer affects subsurface water movement.

Given the isolated settings and hydrologic differences of surrounding communities, this site has a very abrupt moisture ecotones. Some deep rooted plants are able to tap into the very deep seasonal high water table.

Water inputs of this site come from precipitation only. Water filters through the soil into the Florida Aquifer or flows to lower areas. The combination of infertile sand, very low available water, and very rapid saturated hydraulic conductivity are hallmarks of this site concept.

Soil features

Typical soils of Xeric Bicolor Sandy Uplands are very deep, sandy marine sediments with little soil development. Loamy marine sediments may be present below 80 inches (203 cm). Paola and Orsino soils are excessively drained and moderately well drained, respectfully. They are infertile, and taxonomically classify as uncoated, Spodic Quartzipsamments with a hyperthermic temperature regime. The predominant parent materials of these series are sandy marine deposits, eolian deposits, or eolian over marine deposits.

Paola and Orsino soils are sand or fine sand throughout, with very low concentrations of finer texture particles (silt and clay, < 5%). Organic content of the soils is very low (< 1% in all subsurface horizons), although surface accumulations of organic matter may be present, depending on vegetation and disturbance regimes.

Typically, Paola sands have an ochric epipedon (A and E horizons) of variable thickness ranging between 8 to 65 inches (20 to 65 cm). The A horizon is 2 to 5 inches (5 to13 cm) thick, and the E horizon (eluvial) ranges from 6 to 60 inches (20 to 152 cm) thick. Silt, clay, and iron compounds of the E horizon have been leached from the sand grains, resulting in the bright, white appearance of quartz sand grains. Below these horizons is a B/E horizon that ranges from 12 to greater than 50 inches (30 to greater than 127 cm) thick. The B/E horizon contains fragments of spodic materials that do not meet the taxonomic requirement for a spodic horizon. In some pedons, a C horizon may be present.

Paola surface layer colors range from dark gray (10YR 4/1) to gray (10YR 6/1). The E horizon has colors that range from 10YR 5/1 to 10YR 8/3. The B/E horizon has colors that range from 7.5YR 5/8 to 10YR 7/4 that are interspersed with spodic materials ranging in color from 5YR 3/3 to 10YR 5/4.

Typically, Orsino sands have an ochric epipedon (A and E horizons) of variable thickness ranging from 8 to 42 inches (20 to 107 cm). The A horizon is 2 to 8 inches (5 to 20 cm) thick, and the E horizon (eluvial) ranges from 6 to 34 inches (15 to 86 cm). Silt, clay, and iron compounds of the E horizon have been leached from the sand grains, resulting in the bright, white appearance of quartz sand grains. Below these horizons is a B/E horizon that ranges from 6 to greater than 50 inches (15 to greater than127 cm) thick. The B/E horizon contains fragments of spodic materials that do not meet the taxonomic requirement for a spodic horizon. Redoximorphic features (concentrations or depletions of iron) are present in the lower horizons. In some pedons, a C horizon may be present.

Orsino surface layer colors range from dark gray (10YR 4/1) to gray (10YR 6/2). The E horizon has colors that range from 2.5Y 6/1 to 10YR 7/3. The B/E horizon has colors that range from 7.5YR 4/3 to 10YR 7/8 that are interspersed with spodic materials ranging in color from 5YR 2/2 to 10YR 4/4.

Both soils have a surface soil reaction (pH in water) ranges from extremely acid (3.5) to slightly acid (6.5). Similarly, subsurface soils are extremely acid to neutral. Soil moisture regimes are udic (moisture control section is not dry in any part for as long as 90 cumulative days in normal years).

Typical soil profile of Paola (left photo) and Orsino (right photo). Note the striking contrast in color between the upper and lower subsoil and the thin Bh horizon at the color interface.

Figure 8. Paola and Orsino Sands Profiles

Table 5. Representative soil features

Parent material	(1) Eolian deposits (2) Marine deposits
Surface texture	(1) Fine sand (2) Sand
Family particle size	(1) Sandy
Drainage class	Moderately well drained to excessively drained
Permeability class	Very rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	0.08–0.18 cm

Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–1 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	1
Soil reaction (1:1 water) (0-101.6cm)	4.8–5.5
Subsurface fragment volume <=3" (0-101.6cm)	0%
Subsurface fragment volume >3" (0-101.6cm)	0%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	0–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	3.5–7.3
Subsurface fragment volume <=3" (0-101.6cm)	0%
Subsurface fragment volume >3" (0-101.6cm)	0%

Ecological dynamics

Natural Vegetation and Succession:

Scrub vegetation is resilient, and rapidly recovers following infrequent fires. There is little change in dominant species composition before or after intense fires, with the exception of sand pine (Abrahamson 1984). Dominant clonal oaks persist and re-sprout rapidly from underground parts in the post-fire environment (Abrahamson 1984). However, there are temporal patterns in post-fire scrub recovery. Myrtle oak (Q. myrtifolia) growth is most rapid immediately following fire, whereas sand live oak (Q. geminata) growth peaks years after fire. Similarly, herbaceous growth and diversity peaks two years following fire, and then dissipates as woody cover increases (Freeman and Kobziar 2011). In contrast, yellow sands scrubs of the Lake Wales Ridge region in LRU 154.2 show very little compositional turnover following fire (Abrahamson 1984).

Other common scrub plants reseed and colonize amid post-fire conditions (Johnson 1982, Menges and Hawkes 1998). The most notable seeder is the Florida peninsula variety of sand pine (*Pinus clausa* var. clausa). This pine species is short lived (< 80 years) and has serotinous cones which open after being super-heated. Seeds colonize open ground following intense fires. Sand pine seedlings are shade tolerant, thus able to grow amid dense scrub oak cover (Greenburg et al. 1995, Freeman and Kobziar 2011). Fire return intervals in excess of 80 to 90 years disfavor sand pine regeneration, leading to “oak scrub” lacking pine canopy cover. Conversely, fire return intervals of less than 15 years in scrub may prevent sand pine regeneration, as seedlings are fire intolerant (Myers 1995, Menges and Hawkes 1998).

In the long term absence of fire (greater than 100 years) scrub vegetation of Xeric Bicolor Sandy Uplands will eventually transition to xeric hammock, as sand live oak overtops other oaks and forms a closed canopy (FNAI 2010). Xeric hammock does not differ much from scrub in terms of floristic composition, although the two communities are structurally distinct (forest vs. shrubland). The closed canopy, moist ground cover litter, and almost complete absence of herbaceous vegetation of xeric hammocks precludes fire spread in all but extremely droughty conditions (Givens et al. 1984, Myers and White 1987). Under these circumstances, intense canopy fire will kill all above ground vegetation, and trigger succession to scrub vegetation.

Wind and water damage associated with hurricanes and strong storms affect the ecological dynamics and distribution of scrub vegetation. Although hurricanes usually dissipate before reaching the interior of the peninsula, large storms do affect the region on the order of two to three storms per century (Myers and Ewel 1990). Strong winds can cause widespread pine mortality in sand pine dominated scrubs. Sand pines have shallow root systems and are particularly susceptible to wind throw. Similar to catastrophic fire, large scale wind throw can affect transition from late to early successional scrubs. Fire following wind damage may be particularly intense because of the abundance of dead woody fuels.

Other natural disturbances that affect Xeric Bicolor Sandy Uplands include pine and hardwood mortality caused by insects and pathogen. Southern pine beetle (Dendroctonus frontalis; SPB) is a species of bark beetle native to the Southeastern Coastal Plain. Periodically SPB populations increase to epidemic levels and healthy pines are killed as infestations expand. Most susceptible to SPB mortality are densely planted even-aged loblolly and longleaf pine stands, which is common in community timber plantations (Schowalter et al. 1981). However, in epidemic conditions SPB will kill sand pines as well.

Biogeography/Regional variation of the Site:

The Xeric Bicolor Sandy Uplands Ecological Site has a broad geographic distribution in Peninsular Florida. Accordingly, climatic, abiotic environment and biogeography varies considerably, as does species composition, successional patterns, and ecological dynamics of the site. Furthermore, historical fire regimes differed between the north and south portions of MLRA 154 (LRU 154.1 vs. LRU 154.2); fire was differently affected by seasonal rainfall and lightening patterns, frontal systems, and prehistoric land uses (Myers and White 1987).

State and transition model

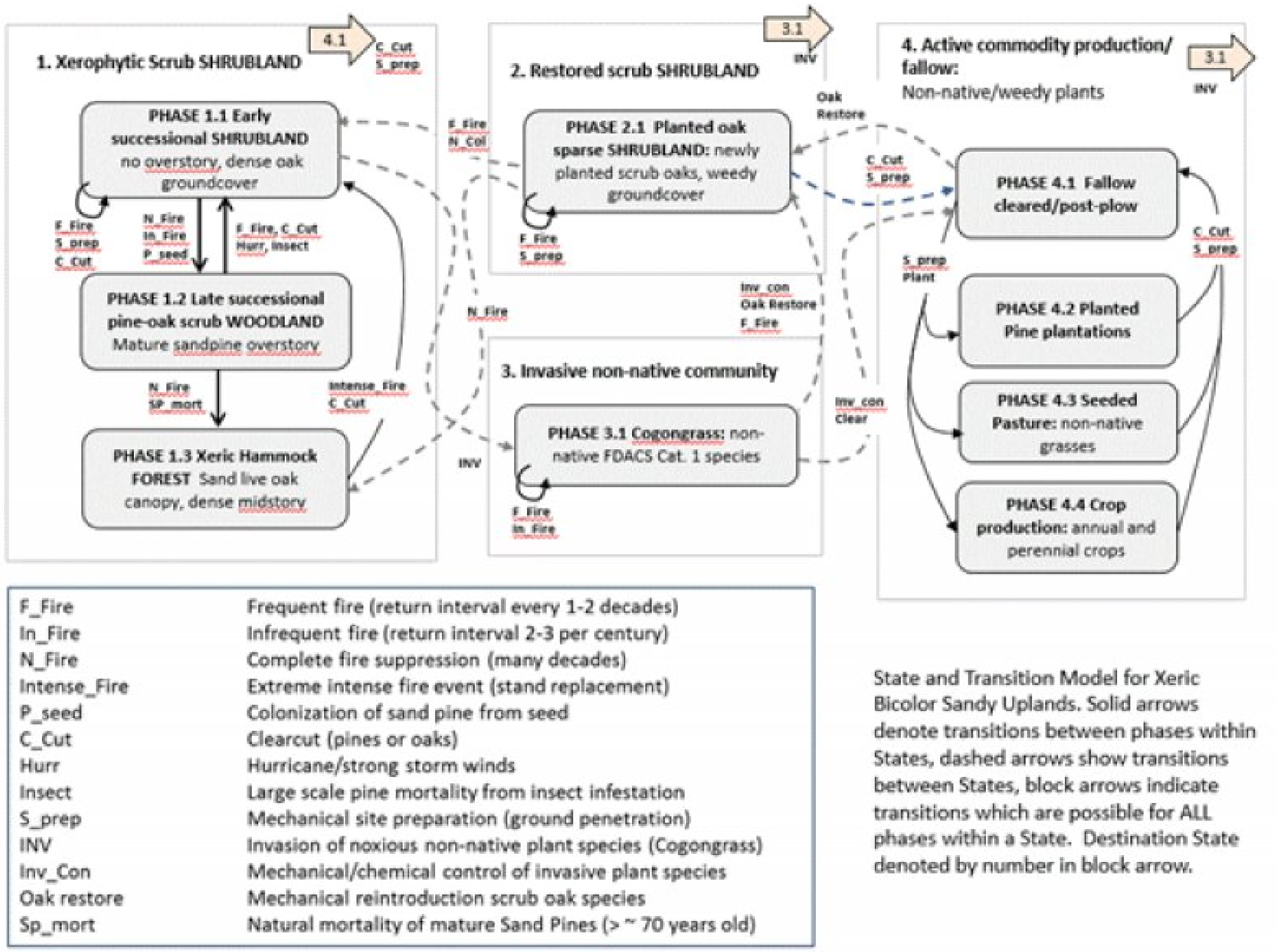


Figure 9. State and Transition Model: Xeric Bicolor Sandy Uplands

Description of Transitions and Drivers in State and Transition Model

In the State and Transition model above, "transitions" describe successional changes between States, or between Phases within States. "Drivers" are the management actions or natural phenomena which trigger transitions. Transitions are indicated by arrows, and drivers are labels for each arrow (Figure 5).

F_Fire = *"Frequent", intense fire, return interval of 5-10 per century*
This regime mimics natural fire patterns of early successional Central Florida scrub vegetation: hot fires which infrequently ignite in periods of extreme weather conditions (i.e. drought, high winds). Here, it is labeled "frequent" to distinguish from fire regimes of longer return interval, although this fire regime is infrequent compared to that of most Central Florida pineland communities. This driver includes prescribed fire as well as wildfire, in as much as prescribed fire mimics high intensity wildfires.

In_Fire = *"Infrequent", intense fire: return interval 1-5 per century*
This describes "natural" fire regimes of longer return interval than that above. These fires are more intense due to denser scrub vegetation (and more fuels). However, these fire regimes affect similar succession patterns.

N_Fire = *No Fire/Fire suppression*
This includes fire regimes with fire return intervals of >> 100 years.

Intense_Fire = Extreme intense fire event (stand replacement fire)
An exceptionally intense fire following an extended period of fire suppression, which affects a transition from a closed canopy forest (i.e. xeric hammock) to an early successional scrub shrubland.

P_seed = Availability sand pine seed for colonization
Sand pine can colonize post-fire or fire suppressed conditions if seed source if available. In the absence of seed source, there is no sand pine regeneration.

C_Cut = *Clearcut Logging of Sand Pine (or oaks)*
This includes clearcut logging natural or planted of pine stands (and in some cases, oaks). In MLRA 154, clearcut logging generally involves mechanical means of cutting, stacking, and hauling logs. Heavy equipment such as feller-bunchers and skidders can affect soil conditions via compaction and ground disturbance. Clear-cutting directly affects plant community composition and function through soil disturbance, alteration of canopy conditions and available resources, such as light and available moisture.

Hurr = Hurricane, Strong storm wind damage
Strong winds are often associated with hurricanes, and occasionally affect large scale landscape disturbances in Central Florida. Storm winds of this magnitude occur on the order of several times a century. Sandpine (*P. clausa*) is particularly susceptible to wind generated damage and mortality. Storm related sand pine mortality can convert late successional sand pine scrub or xeric hammock to early successional oak scrub.

Insect = Pine mortality caused by insect or other pathogens
Large scale pine mortality is caused by periodic epidemics of insect infestation. The southern pine beetle is the most common insect responsible for large scale mortality of southern pine species, including sand pine.

S_Prep = *Site preparation*
This refers to a number of land use practices, usually applied when preparing land for commodity plantation or crop management. Specific treatments may involve ground penetration and soil disturbance, such as disking, roller chopping, shearing, raking, etc. Also included in this category are chemical treatments for reduction of hardwoods or herbaceous vegetation. Site prep treatments may precede planting for natural community restoration, and wildlife management.

INV=Colonization of Invasive Noxious Plant Species.
Invasive plant species will colonize natural scrub communities as well as successional and cultural plant communities (abandoned crop and grove lands, clearings and old fields). In particular, there are four species common to xeric sands of Central Florida which are recognized by the Florida Exotic Pest Plant Council as "Category 1" species: lantana (*Lantana camara*), natal-grass (*Melinis repens*), ceasar's weed (*Urena lobata*) and cogongrass (*Imperata cylindrica*). These invasive species displace native populations and change plant community dynamics and ecological functions. Cogongrass is a highly clonal species which forms dense naturalized populations that extirpate local native plant populations.

Inv_Con = *Mechanical/Chemical Control of invasive plant populations.*
This includes all treatments which target invasive plant populations for the purpose of eradication or control. Invasive plant control is often a part of natural area restoration, but can also be applied to improve wildlife habitat, rangeland, forestry and croplands. Mechanical treatments such as hand clearing, disking, and raking are generally applied to smaller infestations (< 0.25 acre). Chemical treatments include direct and indirect herbicide applications on small and larger areas. Fire may also control spread of invasive plant populations, but is not included in this category.

Oak restore = Restoration of scrub oak species
Reintroduction of scrub oak populations typical of Central Florida scrubs for the purpose of scrub restoration. Scrub oaks include myrtle oak (*Quercus myrtifolia*), sand live oak (*Q. geminata*), and Chapman's oak (*Q. chapmanii*).

Sp_mort = *Natural mortality of mature Sand Pines (P. clausa)*
This includes the death of mature sand pines due to natural processes. Sand pines typically occur in even aged populations and are short lived (about 70 years). Sand pines weakened by age, insects, and pathogens typically fall over and release seed from heat sensitive cones. This provides a seed source for sand pine germination under conditions conducive for regeneration.

Figure 10. Description of Transition Drivers listed in STM legend

State 1
Xerophytic Scrub SHRUBLAND

State 1 vegetation is scrub or xeric hammock. These natural communities are comprised of dense growths of scrub oaks (myrtle, Chapman's and sand live oaks) and palmetto (saw and scrub palmetto). Phases within this State vary in their community structure and periodicity of fire (or other natural or anthropogenic disturbances).

Community 1.1
Early successional SHRUBLAND

Figure 11. Phase 1.1 scrub vegetation

Phase 1.1 vegetation is predominantly dense growths of scrub oaks (myrtle, Chapman's and sand live oaks) and palmetto (saw and scrub palmetto). Canopy is absent in this early successional phase, either because sand pine seed source is unavailable or has not yet colonized the stand following disturbance. The dense establishment of clonal oaks discourages colonization of other pine species (longleaf and slash pines), as these species require abundant light and bare ground for germination. Phase 1.1 scrub oaks reach heights of 3 to 5 feet (0.9 to 1.5 m). Herbaceous ground cover of Phase 1.1 is very sparse or completely absent. Where it occurs, ground cover vegetation is patchily distributed. Because of the dominance of a few clonal oaks and paucity of herbaceous species, small scale diversity of Phase 1.1 is very low (average 19 species / 400 m2, NRCS inventory data 2014). The diversity and density of herbaceous plants are highest in the years immediately following fire, gradually decreasing as oak growth dominates (Menges and Hawkes 1998). The pre-settlement composition and structure of Phase 1.1 scrub was maintained by fire. Although estimates vary in the literature, pre-settlement fire regimes of Central Florida scrubs had infrequent return intervals of once every one to several decades (Myers 1985). Scrub vegetation of the bicolor soils may have burned with greater frequency compared to shrubs on white sand Entisols, due to relatively higher vegetation productivity. Scrub fires ignite in drought conditions, and are typically are very hot and intense. Clonal scrub oaks and palmettos vigorously re-sprout, rapidly re-colonizing the post-fire environment (Abrahamson 1984; Freeman and Kobziar 2011). Recovery of pre-fire plant composition and cover typically occurs within 1 to 5 years following fire, although oak height growth continues for longer periods (Abrahamson 1984; Schmalzer 2003). Non-clonal plants, including herbaceous plants, are typically killed in hot fires. Some species which are prolific seeders (such as Florida rosemary), will recolonize post-fire (Johnson 1982). Maintenance of Phase 1.1: Early successional scrub is maintained by occasional large scale disturbances. Fires, with return intervals of once every 5 to 20 years are frequent enough to preclude development of sand pine or oak dominated canopies. Other natural disturbances affecting scrub succession are strong winds associated with storms and hurricanes (Myers 1985). Mechanical treatments may maintain the low stature of scrub oaks; these include chopping and chain dragging and other forms of disturbance to the soil surface (but not soil penetration; Greenberg 2003).

Forest overstory. Pinus clausa (Sand pine)

Midstory:

Pinus clausa
Quercus geminata
Quercus laevis
Quercus chapmanii
Quercus myrtifolia
Vaccinium arboreum
Carya floridana
Lyonia ferruginea

Forest understory. Balduiana angustifolia
Carphephorus paniculatus
Centrosema sp.
Chapmannia floridana
Cnidoscolus stimulosus
Commelina erecta
Eupatorium compositifolium
Galactia elliottii
Galactia regularis
Gaylussacia dumosa
Gaylussacia nana
Gelsemium sempervirens
Helianthemum nashii
Monotropa uniflora
Opuntia humifusa
Palafoxia feayi*
Parthenocissus quinquefolia
Pityopsis graminifolia
Smilax auriculata
Smilax glauca
Smilax pumila
Solidago odora var. chapmanii
Tephrosia mysteriosa
Tillandsia sp.
Tragia urens
Vitis rotundifolia
Andropogon floridanus
Andropogon virginicus
Dichanthelium dichotomum
Dichanthelium sabulorum var. thinium
Sorghastum secundum
Cladonia spp.
Usnea spp.
Selaginella arenicola
Asimina obovata
Callicarpa americana
Ceratiola ericoides
Garberia heterophylla
Licania michauxii
Rhus coppalina
Sabal etonia
Serenoa repens
Sideroxylon tenax
Vaccinium myrsinites
Vaccinium stamineum var. ceasium
Carya floridana 1
Ilex opaca var. arenicola
Persea borbonia var. humilis

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-25%	20-80%	0-5%	0-2%
>0.15 <= 0.3	0-25%	50-90%	0%	0-1%
>0.3 <= 0.6	0-25%	50-90%	0%	0%
>0.6 <= 1.4	0-5%	0-25%	0%	0%
>1.4 <= 4	0%	0%	0%	0%
>4 <= 12	0%	0%	0%	0%
>12 <= 24	0%	0%	0%	0%
>24 <= 37	0%	0%	0%	0%
>37	0%	0%	0%	0%

Community 1.2
Late successional pine-oak scrub WOODLAND

Figure 12. Late successional pine-oak scrub woodland

Phase 1.2 is dominated by dense growths of scrub oaks (Q. myrtifolia, Q. chapmannii, Q. geminata) mixed with palmetto (saw and scrub palmetto), and a few other xeriophytic hardwood species. Species composition of Phase 1.2 is very similar to that of Phase 1.1; the main difference between these Phases is structural. Shrub growth is very dense and can reach >10 feet (3 m) in height, although midstory is generally lower in stature under dense pine canopy. Where present, sand pine canopies are typically even-aged, an artifact of seedling colonization following intense fire or logging (Laessle 1958). Sand pine canopies only form where seed source is available. Herbaceous ground cover of Phase 1.2 is very sparse or absent. With prolonged fire exclusion, patches of open ground occur following death of individual oak clones. These patches often support abundant growth of fire intolerant fruticose lichens (members of the genus Cladonia). Dense accumulations of pine needles and hardwood leaves are also typical in the prolonged absence of fire. Phase 1.2 describes the late successional conditions of scrub communities which are adapted to infrequent and intense fires, on the order of two to three fires per century (FNAI 2010; Myers 1985). Coarse, woody fuels of Phase 1.2 only carry fire in extreme weather and drought conditions. If fire return interval is less than the typical lifespan of sand pine (60 to 70 years), fires will trigger regeneration of sand pine from serotinous cones. Sand pine can rapidly reseed post-fire conditions.

Table 8. Ground cover

Tree foliar cover	10-75%
Shrub/vine/liana foliar cover	0-1%
Grass/grasslike foliar cover	0-2%
Forb foliar cover	0-1%

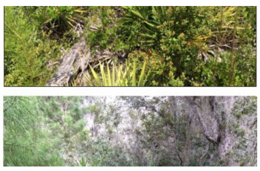
Non-vascular plants	5-75%
Biological crusts	0%
Litter	10-80%
Surface fragments >0.25" and <=3"	0-2%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-50%

Community 1.3
Xeric Hammock FOREST

Figure 13. Xeric hammock Forest

Phase 1.3 describes late successional vegetation resulting from long term fire suppression (> 100 years) of former scrub (FNAI 2010). This phase represents Xeric Hammock, a natural community type recognized by the Florida Natural Areas Inventory (FNAI 2010). Compositionally, Phase 1.3 resembles Phases 1.1 and 1.2, in that the same clonal oak species are dominant (Q. myrtifolia, Q. chapmannii, Q. geminata). However, this phase is a forest with a closed canopy of sand live oak (Q. geminata), overtopping lower growths of clonal scrub oaks and hardwood seedlings. Sand pine is either absent, having failed to regenerate under densely forested conditions, or is present as a few old emergent trees. The mid- and under-story strata are overwhelmingly dominated by scrub oaks and palmetto. Other shrubs are sometimes irregularly distributed, including rusty staggerbush (*Lyonia ferruginea*), sparkleberry (*Vaccinium arboreum*), deerberry (*V. stamineum*), garberia (*Garberia heterophylla*), and Florida rosemary (*Ceratiola ericoides*). Herbaceous ground cover in Phase 1.3 is very sparse or absent. The forest floor is covered with oak leaf litter which holds considerable moisture, creating mesic conditions at ground level and further depressing native herbaceous growth as well as pine germination (FNAI 2010). The Xeric Hammock community itself is fire resistant. Fine fuels are absent, and hardwood litter retains ample moisture which deters fire spread. Extreme drought conditions are necessary for fire ignition. Unlike surface fires, these intense fires consume most standing biomass. In xeric hammocks, clonal oaks quickly re-sprout from extensive rhizome systems, impeding colonization of pines and herbaceous species.

Pathway 1.1A
Community 1.1 to 1.2



Early successional SHRUBLAND

Late successional pine-oak scrub WOODLAND

Fire suppression or very infrequent fire (on the order of once every 50+ years) allows the establishment of sand pine overstory and dense oak midstory, which are typical of late successional pine-oak Scrub (Phase 1.2). Colonization of sand pines will occur in the presence of seed sources. In the absence of sand pine, sand live oaks will eventually form a dense midstory and overstory.

Pathway 1.2A
Community 1.2 to 1.1

Late successional pine-oak scrub WOODLAND

Early successional SHRUBLAND

Phase 1.2 describes changes from reference site condition via natural succession and/or alteration of historical fire regime. Plant species typical of Phase 1.1 scrubs are still present in Phase 1.2, although shifts in relative abundances and structure have occurred. Transition from Phase 1.2 to Phase 1.1 occurs following a hot fire (that consumes most above ground biomass). Additionally, mechanical methods affect reduction of shrub biomass, such as clearcutting and site preparation. Shifts to Phase 1.1 early successional scrub occurs following one or more of these events.

Conservation practices

Brush Management
Prescribed Burning
Land Clearing
Tree/Shrub Site Preparation
Native Plant Community Restoration and Management

Pathway 1.2B
Community 1.2 to 1.3

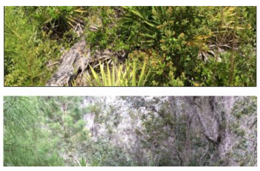
Late successional pine-oak scrub WOODLAND

Xeric Hammock FOREST

In the continued absence of fire (> 100 years) Phase 1.2 scrub will succeed to Phase 1.3 (Xeric Hammock). This occurs when the larger statured sand live oaks overtop the other scrub oaks creating a closed canopy, coupled with the eventual mortality of canopy sand pines and lack of sand pine regeneration.

Pathway 1.3A
Community 1.3 to 1.1

Xeric Hammock FOREST



Early successional SHRUBLAND

A single catastrophic fire or a series of hot intense fires could possibly convert Phase 1.3 to early successional Scrub (Phase 1.1) if the fire is hot enough to kill the oak overstory. Similarly, other natural disturbances which remove the sand live oak canopy will affect transition to Phase 1.1, including strong winds associated with hurricanes and storms. Mechanical treatments can affect transition of Xeric Hammock to early successional scrub (Phase 1.1). These include clear cutting of oak overstory, and mechanical chopping to reduce oak cover.

Conservation practices

Brush Management
Prescribed Burning
Land Clearing
Tree/Shrub Site Preparation

State 2
Restored Scrub SHRUBLAND

Planted oak shrubland for the purpose of scrub restoration. This state describes scrubs with restored community structure and function, and restored ecological processes. Compositionally, restored scrubs are similar to the reference site condition, but lack the full compliment of native scrub plant species.

Community 2.1
Planted oak sparse SHRUBLAND

Phase 2.1 describes a restored shrubland with similar structure and ecological function to that of native scrub (Phases 1.1 and 1.2). Notably, this Phase describes conditions where native propagules have been extirpated following long term fire suppression and/or extensive soil disturbance associated with commodity land uses, followed by artificial establishment of native clonal oaks and other scrub shrub species. Many native species are absent, and weedy or residual non-native species may persist in this restored scrub community. Herbaceous species are absent, weedy or non-native, depending on pre-restoration conditions and geography. Restoration of native oaks in Phase 2.1 provides fuels for infrequent fires necessary for ecological functioning and dynamics. Once established, clonal oaks may provide habitat suitable for establishment of other native plant populations, either from artificial seeding or natural recruitment. Phase 2.1 scrub may provide suitable habitat for nesting birds, amphibians and reptiles (such as the gopher tortoise and indigo snake). The full complement of scrub species composition remains incomplete in Phase 2.1. Perennial grasses and forbs with seed dispersal mechanisms not conducive to colonization of distant and disturbed sites are notably absent (i.e. big seeded species which rely on animal and gravity dispersal, and long lived clonal species). However, over time, native scrub plants may recolonize the Site, particularly wind-dispersed native herbaceous species.

State 3
Invasive non-native community

This state describes vegetation dominated by non-native and noxious plant species. Noxious plant dominance changes not only the composition of scrub communities, but structure and ecological dynamics as well.

Community 3.1
Cogongrass

Figure 14. Cogongrass grassland

Phase 3.1 describes a condition where one or more noxious non-native plant species has invaded and dominated the site. By far the most common noxious invasive plant species of this site is cogongrass (*Imperata cylindrica*; (MacDonald 2004)). This highly clonal grass spreads rapidly by underground rhizomes and windblown seeds, forming dense circular patches which can become very large (on the order of 100's of acres). Cogongrass grows vigorously in full sunlight and thrives on acidic, nutrient-poor soils and droughty conditions such as those of this Site (MacDonald 2004). Furthermore, cogongrass is a prolific seed producer, and readily invades following soil disturbances. (Yager et al. 2010). Once clones are established, rapid cogongrass growth will extirpate native ground cover plant populations. In addition, cogongrass may be allelopathic in some situations (Bryson and Carter 1993). Cogongrass invasion of the infertile Entisols of this site may occur with less frequency than on more fertile soils. In general, cogongrass may colonize the phases of this site that have plenty of sun exposure and open ground. Soil disturbance is conducive to cogongrass colonization. A Phase 3.1 community may have oaks in the midstory or canopy, overtop a solid sward of pure cogongrass. Similarly, cogongrass can occur as pure grasslands with no trees or shrubs. Cogongrass infestations of commodity lands can damage crops directly by yield reduction and suppressed growth from competition for nutrients and moisture. Furthermore, cogongrass is very poor forage and infestation lowers the forage quality of pasture lands (Coile and Shilling 1993).

State 4
Active commodity production / fallow

All phases of state 4 (except Phase 4.1) describe commodity land uses of Xeric Bicolor Sandy Uplands. Common crops of Central Florida xeric sands include annual and perennial crops, the most notable of which is citrus (although this is limited LRU 154.2 for the most part). Other crops include horticultural ornamentals, vineyards, and some row crops. Pine plantations managed for community pulpwood production are included in State 4. Additionally, improved pastures of bahiagrass (or other sod forming grass species) are included in this state. All Phases describe conditions following ground penetrating soil disturbance, and the absence of native plant communities. This includes the extirpation of native populations, including seed banks and dormant propagules, although native weedy species may persist. Depending on the severity and frequency of ground disturbance, soil profile characteristics in the upper part of the soil may be altered.

Community 4.1
Fallow: cleared/plowed


Figure 15. Fallow fields, native community removed.

Phase 4.1 describes a non-production condition of “cleared or fallow fields”, generally either preceding land conversion, or following crop abandonment. Plant species of Phase 4.1 includes weedy native and non-native plants. If soils were recently tilled, most plants will be annual, predominantly wind dispersed weeds. If the previous land use was improved pasture or plantation with sod grass, bahia or centipede grass may predominate.

Community 4.2
Planted pine plantations

Figure 16. Planted pine plantations, non-native or weedy grou

Phase 4.2 describes commercial pine plantations. Tree species grown for commodity production on this Site include sand, longleaf and slash pines. Pine plantations are usually very densely planted and even aged stands. Ground cover and midstory vegetation of pine plantations is usually sparse or absent, depending largely on the age of the plantation. The ground is typically covered with needle fall following canopy closure.

Community 4.3
Seeded Pasture: non-native grasses

Figure 17. Seeded Pasture: non-native grasses

Phase 4.3 describes pastures with established non-native turf grasses, which support livestock production or horse farms. Sod grasses almost completely replace native plant species. Some hardwood species may persist depending on the degree of land clearing.

Community 4.4
Crop production: annual and perennial crops

Figure 18. Crop production: annual and perennial crops

Phase 4.4 describes croplands. Included in this category are annual and perennial croplands (i.e. fruit and ornamental orchards, sod farms, etc).

Pathway 4.1A
Community 4.1 to 4.2

Fallow: cleared/plowed

Planted pine plantations

Transitions among the Phases of State 4 are affected by land use and land conversion practices. Transition from cleared/fallow fields to timber plantations involve site prep and tree planting. Maintenance of pine plantations may involve thinning and ongoing hardwood control.

Pathway 4.1B
Community 4.1 to 4.3

Fallow: cleared/plowed

Seeded Pasture: non-native grasses

Transitions among the Phases of State 4 are affected by land use and land conversion practices (i.e. land clearing, raking, disking, planting, chemical treatments). Transition from cleared/fallow fields to improved pasture involves site prep (mechanical and/or chemical) and seeding with Bahia or other pasture grasses.

Pathway 4.1C
Community 4.1 to 4.4

Fallow: cleared/plowed

Crop production: annual and perennial crops

Transitions among the Phases of State 4 are affected by land use and land conversion practices. Transition from cleared/fallow fields to annual or perennial crop production depends on the specific land conversion needs for the crop.

Pathway 4.2A
Community 4.2 to 4.1

Planted pine plantations

Fallow: cleared/plowed

Transition to all other States and Phases involves conversion of pine plantation to Phase 4.1 (cleared land). This includes clear cutting and/or site prep.

Pathway 4.3A
Community 4.3 to 4.1

Seeded Pasture: non-native grasses

Fallow: cleared/plowed

Transition to all other States and Phases involves conversion of pine plantation to Phase 4.1 (cleared land). For this Phase, this may only involve field abandonment.

Pathway 4.4A
Community 4.4 to 4.1

Crop production: annual and perennial crops

Fallow: cleared/plowed

Transition to all other States and Phases involves conversion of pine plantation to Phase 4.1 (cleared land). This involves clearing and site prep.

Transition T1A
State 1 to 3

State 1 can transition to State 3 if colonized by highly invasive non-native plant species, particularly cogongrass (*Imperata cylindrica*). Late successional scrub is much less susceptible to invasion due to diminished availability of light and space. However, cogongrass may colonize open spaces or scrub edges.

Transition T1B
State 1 to 4

State 1 can be converted to commodity land uses (State 4) via clear-cutting followed by land conversion, such as bulldozing, disking, stump removal, chemical application, and planting of commodity crops. Phase 4.1 represents the cleared and initial land conversion condition. From Phase 4.1, many commodity land uses are installed.

Restoration pathway R2A
State 2 to 1

In the long term absence of fire, Phase 2.1 can transition to Xeric Hammock, as Sand Live Oak (Q. geminata) overtops other scrub vegetation and forms a closed canopy. The understory and midstory of this restored community may be depauperate of the full suite of native scrub species, depending on natural and artificial colonization prior to succession to xeric hammock.

Conservation practices

Native Plant Community Restoration and Management

Transition T2A
State 2 to 3

The colonization and aggressive spread of invasive non-native plants can affect the transition to Phase 3.1. Cogongrass is the most aggressive and wide-spread invasive plant species of this Site. Early restoration conditions may be particularly susceptible, given the likelihood of ground disturbance, propagule proximity, and open conditions conducive to cogongrass colonization.

Transition T2B
State 2 to 4

The transition from Phase 2.1 to Phase 4.1 requires clearing of vegetation and site preparation. Specific clearing and site preparation may involve mechanical and chemical applications. Cultivation practices depend on the community goals for the land conversion.

Restoration pathway R3A
State 3 to 2

Transition to State 2.1 first requires control and reduction of cogongrass. Fire will not control spread of cogongrass. Repeated tillage throughout a growing season may be sufficient to contain cogongrass spread if the infestation is small (i.e. under 0.25 acres). However, this treatment is insufficient and cost ineffective for larger well-established infestations. In these situations, a combination of burning followed by repeated chemical applications has been found effective. Two active herbicide ingredients found to affect cogongrass growth are glyphosate and imazapyr. Following cogongrass eradication, site preparation, re-establishment of native oaks, and re-introduction of native fire regimes may affect transition to Phase 2.1.

Conservation practices

Tree/Shrub Establishment
Invasive Plant Species Control
Herbaceous Weed Control

Transition T3A
State 3 to 4

Phase 3.1 can be converted to commodity land uses (State 4) with cogongrass eradication followed by land conversion, such as bulldozing, disking, stump removal, chemical application, and planting of commodity crops.

Restoration pathway R4A
State 4 to 2

Depending on the severity of site and soil disturbances, State 4 phases may be restored to natural or semi-natural conditions, including the “restored structure and function” scrub (Phase 2.1). This transition may involve clearing, site preparation, and chemical control of undesirable non-native vegetation. Of key importance is the establishment of scrub oaks and palmetto, the dominant scrub plant species.

Conservation practices

Prescribed Burning
Native Plant Community Restoration and Management

Transition T4A
State 4 to 3

Phase 4.1 (cleared/fallow field) may transition to State 3 if noxious non-native plants (i.e. cogongrass) colonize and dominate the site. Cleared fields with soil disturbance are particularly susceptible to cogongrass invasion, if there are nearby propagule sources.

Additional community tables

Table 9. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
sandyfield beaksedge	RHME	*Rhynchospora megalocarpa*	Native		0–5

sandyfield beaksedge	RHME	*Rhynchospora megalocarpa*	Native	–	0–5
broomsedge bluestem	ANVI2	*Andropogon virginicus*	Native	–	0–1
cypress panicgrass	DIDI6	*Dichanthelium dichotomum*	Native	–	0–1
hemlock rosette grass	DISAT	*Dichanthelium sabulorum var. thinium*	Native	–	0–1
capillary hairsedge	BUCI	*Bulbostylis ciliatifolia*	Native	–	0–1
flatsedge	CYPER	*Cyperus*	Native	–	0–1
Florida bluestem	ANFL	*Andropogon floridanus*	Native	–	0–1
Forb/Herb					
eastern milkpea	GARE2	*Galactia regularis*	Native	–	0–2
Elliott's milkpea	GAEL2	*Galactia elliottii*	Native	–	0–2
yankeeweed	EUCO7	*Eupatorium compositifolium*	Native	–	0–1
whitemouth dayflower	COER	*Commelina erecta*	Native	–	0–1
finger rot	CNURS	*Cnidoscolus urens var. stimulosus*	Native	–	0–1
Florida alicia	CHFL2	*Chapmannia floridana*	Native	–	0–1
pineland butterfly pea	CEAR5	*Centrosema arenicola*	Native	–	0–1
Chapman's goldenrod	SOODC	*Solidago odora var. chapmanii*	Native	–	0–1
narrowleaf silkgrass	PIGR4	*Pityopsis graminifolia*	Native	–	0–1
Florida scrub frostweed	HENA2	*Helianthemum nashii*	Native	–	0–1
devil's-tongue	OPHU	*Opuntia humifusa*	Native	–	0–1
Feay's palafox	PAFE	*Palafoxia feayi*	Native	–	0–1
coastal plain honeycombhead	BAAN3	*Balduina angustifolia*	Native	–	0–1
hairy chaffhead	CAPA53	*Carphephorus paniculatus*	Native	–	0–1
Spanish moss	TIUS	*Tillandsia usneoides*	Native	–	0–1
wavyleaf noseburn	TRUR	*Tragia urens*	Native	–	0–1
small ballmoss	TIRE	*Tillandsia recurvata*	Native	–	0–1
Fern/fern ally					
sand spikemoss	SEAR	*Selaginella arenicola*	Native	–	0–1
Shrub/Subshrub					
myrtle oak	QUMY	*Quercus myrtifolia*	Native	0.2–1.8	10–95
scrub palmetto	SAET	*Sabal etonia*	Native	–	0–75
Chapman oak	QUCH	*Quercus chapmanii*	Native	0.2–1.8	5–75
silk bay	PEHU2	*Persea humilis*	Native	–	0–50
rusty staggerbush	LYFE	*Lyonia ferruginea*	Native	–	0–50
garberia	GAHE4	*Garberia heterophylla*	Native	–	0–15
saw palmetto	SERE2	*Serenoa repens*	Native	–	0–15
coastal plain staggerbush	LYFR3	*Lyonia fruticosa*	Native	–	0–10
American holly	ILOPA	*Ilex opaca var. arenicola*	Native	–	0–5
farkleberry	VAAR	*Vaccinium arboreum*	Native	–	0–5
devilwood	OSAM	*Osmanthus americanus*	Native	–	0–5
gopher apple	LIMI5	*Licania michauxii*	Native	–	0–3
bigflower pawpaw	ASOB6	*Asimina obovata*	Native	–	0–2
shiny blueberry	VAMY3	*Vaccinium myrsinites*	Native	–	0–2
American beautyberry	CAAM2	*Callicarpa americana*	Native	–	0–2
winged sumac	RHCO	*Rhus copallinum*	Native	–	0–2

Confederate huckleberry	GANA	*Gaylussacia nana*	Native	–	0–2
tough bully	SITE2	*Sideroxylon tenax*	Native	–	0–1
sand heath	CEER3	*Ceratiola ericoides*	Native	–	0–1
dwarf huckleberry	GADU	*Gaylussacia dumosa*	Native	–	0–1
Tree					
sand live oak	QUGE2	*Quercus geminata*	Native	0.2–3	1–75
scrub hickory	CAFL6	*Carya floridana*	Native	–	0–50
turkey oak	QULA2	*Quercus laevis*	Native	–	0–5
Vine/Liana					
sarsparilla vine	SMPU	*Smilax pumila*	Native	–	0–2
earleaf greenbrier	SMAU	*Smilax auriculata*	Native	–	0–2
cat greenbrier	SMGL	*Smilax glauca*	Native	–	0–1
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	–	0–1
evening trumpetflower	GESE	*Gelsemium sempervirens*	Native	–	0–1
muscadine	VIRO3	*Vitis rotundifolia*	Native	–	0–1
Nonvascular					
reindeer lichen	CLADI3	*Cladina*	Native	–	0–30
beard lichen	USNEA2	*Usnea*	Native	–	0–1

Recreational uses

Recreational uses of Xeric Bicolor Sandy Uplands vary depending on location. Typically, areas in close proximity to urbanized areas are playgrounds, picnic areas, or golf courses and are the primary recreational uses. In contrast, natural areas are typically used for hunting, bird watching, camping, paths and trails, and off-road vehicle trails.

The xeric soils of this site have limitations for most recreational uses. Most limitations are due to internal soil factors such as sandy textures (too sandy) and droughty (low available water capacity). External soil factors, such as slope, are a restriction when the slope is > 8%.

These soils are fragile. Overuse will stress plants and contribute to a loss of ground cover and an increase in erosion, especially on more sloping portions of the site. Paths and trails should be designed to follow slope contours whenever possible.

Inventory data references

Ecological Classification and Inventory of Ocala National Forest, M.E. Collins and others. 1996. University of Florida Department of Soil Science.

NRCS field data collection, 2014. Nine vegetation samples.

References

. Fire Effects Information System. http://www.fs.fed.us/database/feis/.

. 2021 (Date accessed). USDA PLANTS Database. http://plants.usda.gov.

Other references

References
Abrahamson W.G. 1984. Species responses to fire on the Florida Lake Wales Ridge. American Journal of Botany

17(1):35-43.

Brooks, H.K. 1982. Guide to the Physiographic Divisions of Florida. Institute of Food and Agricultural Sciences, Florida Cooperative Extension Services. University of Florida, Gainesville, Florida.

Bryson, C.T., and Carter, R. 1993. Cogongrass, *Imperata cylindrica*, in the United States. Weed Technology, 1005-1009.

Coile, N. C., and D. G. Shilling. Cogongrass, *Imperata cylindrica* (L.) Beauv.: a good grass gone bad. Botany Circular 28 (1993): 1-3.

Florida Natural Areas Inventory. 2010. Guide to the natural communities of Florida. Florida Department of Natural Resources, Tallahassee, Florida.

Freeman, J.E. and L.N. Kobziar. 2011. Tracking postfire successional trajectories in a plant community Ecological Applications 21(1): 61–74

Givens, K.T., J.N. Layne, W.G. Abrahamson, and S.C. White-Schuler. 1984. Structural changes and successional relationships of five Florida Lake Wales Ridge plant communities. Bulletin of the Torrey Botanical Club 111:8-18.

Greenberg, C. H., D. G. Neary, L. D. Harris, and S. P. Linda. 1995. Vegetation recovery following high-intensity wildfire and silvicultural treatments in sand pine scrub. American Midland Naturalist 133:149-163.

Johnson, A.F. 1982. Some demographic characteristics of the Florida rosemary *Ceratiola ericoides* Michx. American Midland Naturalist, 170-174.

MacDonald, G. E. 2004. Cogongrass (*Imperata cylindrica*)—biology, ecology, and management. Critical Reviews in Plant Sciences 23(5): 367-380.

Menges, E.S. and C.V. Hawkes. 1998. Interactive effects of fire and microhabitat on plants of Florida scrub. Ecological Applications 8:935–946

Myers, R.L. 1985. Fire and the dynamic relationship between Florida sandhill and sand pine scrub vegetation. Bulletin of the Torrey Botanical Club 112 3:241-252.

Myers, R.L. 2000. Physical setting. p. 10–19. In: Wunderlin, R.P. and B.F. Hansen (eds.). Flora of Florida: pteridophytes and gymnosperms. The University Press of Florida, Gainesville, Florida.

Myers, R.L. and J.J. Ewel, (eds.). 1990. Ecosystems of Florida. University Press of Florida, Gainesville, Florida.

Myers, R.L. and D.L. White. 1987. Landscape history and changes in sandhill vegetation in north-central and south-central Florida. Bulletin of the Torrey Botanical Club 114(1):21-32.

Puri, H.S. and Vernon R.O. 1964. Summary of the geology of Florida. Florida Geological Survey Special Publication 5, 312 p.

Schmalzer, P.A. 2003. Growth and recovery of oak-saw palmetto scrub through ten years after fire. Natural Areas Journal, 23(1): 5-13.

Schowalter, T.D., Coulson, R.N., and Crossley, D.A. 1981. Role of southern pine beetle and fire in maintenance of structure and function of the southeastern coniferous forest. Environmental Entomology 10(6): 821-825.

USDA-ARS: USDA Plant Hardiness Zone Map, 2012. Agricultural Research Service, U.S. Department of Agriculture. Accessed from http://planthardiness.ars.usda.gov.

USDA-NRCS Agricultural Handbook 296. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. 682 pages.

Yager, L.Y., Miller, D.L., & Jones, J. 2010. Susceptibility of longleaf pine forest associations in south Mississippi to invasion by cogongrass [*Imperata cylindrica* (L.) Beauv.]. Natural Areas Journal 30(2): 226-232.

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Approval

Charles Stemmans, 2/21/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/20/2024
Approved by	Charles Stemmans
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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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):**

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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):**

---

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):**

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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):**

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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:**