Babcock Ranch (Charlotte County) Photo by Cathleen NeSmith

Mesic Flatwoods

Description: Mesic flatwoods is characterized by an open canopy of tall pines and a dense, low ground layer of low shrubs, grasses, and forbs. Longleaf pine (*Pinus palustris*) is the principal canopy tree in northern and Central Florida, and South Florida slash pine (*P. elliottii* var. *densa*) forms the canopy south of Lake Okeechobee. Although slash pine (*Pinus elliottii*) is currently more common than longleaf pine in mesic flatwoods in northern Florida, this a result of invasion by, or planting of, slash pine after logging of longleaf pine followed by a long period of fire exclusion in the early part of the twentieth century (Garren 1943). Early accounts mention slash pine only in wet flatwoods sites (Clewell 1986). Characteristic shrubs include saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), coastalplain staggerbush (*Lyonia fruticosa*), and fetterbush (*Lyonia lucida*). Rhizomatous dwarf shrubs, usually less than two feet tall, are common and include dwarf live oak (*Quercus minima*), runner oak (*Q. elliottii*), shiny blueberry (*Vaccinium myrsinites*), Darrow's blueberry (*V. darrowii*), and dwarf huckleberry (*Gaylussacia dumosa*). The herbaceous layer is predominantly grasses, including wiregrass (*Aristida stricta* var. *beyrichiana*), dropseeds (*Sporobolus curtissii, S.*

floridanus), panicgrasses (*Dichanthelium* spp.), and broomsedges (*Andropogon* spp.), plus a large number of showy forbs.

Mesic flatwoods is the most widespread natural community in Florida, covering the flat sandy terraces left behind by former high stands of sea level during the Plio-Pleistocene. Soils are acidic, nutrient-poor fine sands with upper layers darkened by organic matter. Leon, Vero, and Smyrna fine sands are common examples (Gilbert et al. 1995). Drainage in this flat terrain can be impeded by a loosely cemented organic layer (spodic horizon) formed within several feet of the soil surface. The soils are alternately droughty during dry periods and saturated, or even inundated, after heavy rains

Characteristic Set of Species: longleaf pine or south Florida slash pine, saw palmetto, gallberry, dwarf live oak, wiregrass.

Rare Species: Many rare plants endemic to Florida are found in mesic flatwoods. In the Panhandle these include pine-woods aster (*Aster spinulosus*), scare-weed (*Baptisia simplicifolia*)**,** telephus spurge (*Euphorbia telephioides*), mock pennyroyal (*Hedeoma graveolens*), white birds-in-a-nest (*Macbridea alba*), and narrow-leaved phoebanthus (*Phoebanthus tenuifolius*). Peninsular mesic flatwoods harbor Canby's wild indigo (*Baptisia calycosa* var. *calycosa*), beautiful pawpaw (*Deeringothamnus pulchellus*), Rugel's pawpaw (*Deeringothamnus rugelii*), and variable-leaf crownbeard (*Verbesina heterophylla*). Found throughout Florida are pine-woods bluestem (*Andropogon arctatus*), many-flowered grass-pink (*Calopogon multiflorus*), and Florida beargrass (*Nolina atopocarpa*).

Rare animals in mesic flatwoods include the frosted flatwoods salamander (*Ambystoma cingulatum*), reticulated flatwoods salamander (*A. bishopi*), eastern diamondback rattlesnake (*Crotalus adamanteus*), timber rattlesnake (*Crotalus horridus*), Bachman's sparrow (*Aimophila aestivalis*), red-cockaded woodpecker (*Picoides borealis*), Sherman's fox squirrel (*Sciurus niger shermani*), Big Cypress fox squirrel (*Sciurus niger avicennia*), and Florida black bear (*Ursus americanus floridanus*). Among rare invertebrates, three rare butterflies are found in mesic flatwoods, the Arogos skipper **(***Atrytone arogos arogos*), the Loammi skipper (*Atrytonopsis loammi*), and the dusky roadside skipper (*Amblyscirtes alternata*). A long-horned beetle, the yellow-banded typocerus (*Typocerus flavocinctus*) is found in mesic flatwoods only in the central peninsular Florida, where it has been noted on flowers of gallberry and saw palmetto.

Range: Mesic flatwoods occur throughout Florida, except for Monroe County and portions of the Big Cypress and Everglades areas. In the Panhandle north of the Cody Scarp, mesic flatwoods occupy relatively small, low-lying areas. Outside Florida, mesic flatwoods with saw palmetto and slash or longleaf pine are found on the lower coastal plain from South Carolina to Mississippi (NatureServe 2008).

Natural Processes: Unlike those of sandhill or scrub, plants of mesic flatwoods must be able to withstand the stress of soil saturation or inundation during the wet part of the year, as well as dry conditions at other times**.**

Mesic flatwoods require frequent fire; all of its constituent plant species recover rapidly from fire and several species require fire to reproduce. South Florida **s**lash and longleaf

pines have thick bark to protect them from fire and their seeds need the mineral soil and open sunlight that fire provides to germinate; both form a grass stage for several years after germination that is resistant to fire. Wiregrass requires fire to flower, along with a number of other characteristic herbs, including, but not limited to, whitetop aster (*Oclemena reticulata*), many-flowered grass-pink, crowpoison (*Stenanthium densum*), and grassleaf goldenaster (*Pityopsis oligantha*). Red-cockaded woodpeckers, which nest in cavities in mature living pines, will abandon a nesting site if the midstory becomes too tall and dense, i.e. if fire is excluded for too long (Conner and Rudolph 1989). The flatwoods salamander prefers a grassy border around its breeding ponds which is maintained against encroaching shrubs by frequent fire (Drewa et al. 2002).

Direct evidence for the natural fire return interval and season in mesic flatwoods comes from a study of fire scars on cross sections of old longleaf pine stumps in mesic flatwoods near the Gulf coast west of Apalachicola (Huffman 2006). Scars from 61 fires were recorded over a 189 year period (1679 to 1868). The average fire return interval was 3.2 years, and most fires occurred at two year intervals (42%) with three year intervals having the next highest number (22%). Seventy-two percent of all fires occurred within one to three year intervals and 23% occurred within four to six year intervals. The maximum interval recorded was ten years. Over 95% of all fires Huffman recorded before European settlement in the area (1830) occurred in the growing season.

Community Variations: The major variation in mesic flatwoods is the shift in the dominant canopy species from longleaf pines in North and Central Florida to South Florida slash pine at the latitude of Lake Okeechobee. The dominant species in shrub and herbaceous layers of mesic flatwoods are generally found throughout Florida. Some less abundant species, however, differ with region (Carr 2007). The following species are common in mesic flatwoods in northern Florida and absent from South Florida: slimleaf pawpaw (*Asimina angustifolia*), vanillaleaf (*Carphephorus odoratissimus*), Florida pineland spurge (*Euphorbia inundata*), thistleleaf aster (*Eurybia eryngiifolia*) woolly huckleberry (*Gaylussacia mosieri*), hairy wicky (*Kalmia hirsuta*), grassleaf gayfeather (*Liatris elegantula*), savannah meadowbeauty (*Rhexia alifanus*), and Florida dropseed (*Sporobolus floridanus*). Species found only in peninsular mesic flatwoods include netted pawpaw (*Asimina reticulata*), bigflower pawpaw (*A. obovata*), tarflower (*Bejaria racemosa*), false vanillaleaf (*Carphephorus odoratissimus* var. *subtropicanus*), Garber's gayfeather (*Liatris garberi*), and yellow milkwort (*Polygala rugelii*).

A minor variation is flatwoods on younger barrier islands which tend not to have wiregrass in ground layer, possibly due to lack of development of a spodic layer in the soils. One of the few places where wiregrass is found on a barrier island is the most landward portion of St. Vincent Island (Franklin County) which is geologically the oldest portion of the island (Donoghue and Tanner 1992). The understory of flatwoods on more recent portions of barrier islands is usually dominated by shrubs, particularly yaupon (*Ilex vomitoria*), saw palmetto, and gallberry.

Associated Communities: The understory layers of mesic flatwoods are very similar to dry prairie from which it differs primarily in having a pine canopy consisting of more than just a few widely scattered pines. Flatwoods landscapes also tend to be more dissected than that of dry prairie with more forested wetlands that would inhibit the

spread of fires (Orzell and Bridges 2006). Mesic flatwoods is distinguished from shrub bog and wet flatwoods by the absence of wetland shrubs and trees such as sweetbay (*Magnolia virginiana*), large gallberry (*Ilex coriacea*), and titi or black titi (*Cyrilla racemiflora* or *Cliftonia monophylla*). Shrub bog and some wet flatwoods also have a muck or peat layer at the soil surface, not found in mesic flatwoods. Mesic flatwoods differs from scrub and scrubby flatwoods in that it lacks scrub oaks, i.e., sand live oak (*Quercus geminata*), scrub oak (*Q. inopina*), myrtle oak (*Q. myrtifolia*), and Chapman's oak (*Q. chapmanii*). Sandhill and upland pine differ from mesic flatwoods in the presence of deciduous oaks, such as turkey oak (*Quercus laevis*), bluejack oak (*Q. incana*), and southern red oak (*Q. falcata*), and the absence, or sparse cover of, saw palmetto.

Management Considerations: The need for frequent fire (2- to 4-year intervals) to control hardwood and off-site pine invasion of longleaf pine communities has been known for many years (Heyward 1939; Garren 1943), when it was realized that fire exclusion policies of the 1920s and 1930s had resulted in canopy destroying wildfires and lack of pine reproduction on some sites, in contrast to sites that had been regularly winter-burned for grazing. That fire stimulates flowering in many flatwoods herbs and that frequent fire (1-3 years) increases species richness and abundance of herbs were also noted from an early date (Lemon 1949). Controlled burns in this matrix community will indirectly determine fire frequency and season for all the included communities, such as wet prairie, depression marsh, shrub bog, scrub, etc (Breininger et al. 2002).

Statistics from lightning-caused fires suggest that most areas in Florida would naturally have burned at the beginning of the lightning season (Robbins and Myers 1992). Growing season fires (April to mid-August) are known to be necessary for flowering and seed set in wiregrass (Myers 1990). Historically, prescribed burns in early summer were avoided because of higher pine mortality (Garren 1943), unpredictable winds that made it difficult to control the fire, and inferred adverse impacts on bird ground nesting. A more recent long-term study in frequently burned longleaf flatwoods in the Panhandle has shown that season of burn (as distinct from conditions on the day of burn) has no significant impact on longleaf pine growth or mortality (Streng et al. 1993; Glitzenstein et al. 1995). In frequently burned stands variability both in frequency and season of prescribed burning is desirable to allow pine reproduction and maintain herb diversity (Robbins and Myers 1992).

In contrast to frequently burned stands, long unburned pine stands have suffered high mortality of sapling and mature pine trees upon reintroduction of prescribed fire in some cases (Varner et al. 2005). Seventy-one percent of South Florida slash pines over 3 meters tall were killed in prescribed fires in stands that had not burned in the previous 25 years at Archbold Biological Station in south-central Florida, and mortality was not correlated with tree diameter (Menges and Deyrup 2001). A wildfire that burned a portion of an upland longleaf stand in Alabama that had been unburned for 45 years killed 91 percent of the longleaf pines over 35 centimeters dbh. In the latter case, pine death was not due to needle scorch but root death and damage to the stem cambial layers caused by fire smoldering for days in the duff at the base of large trees. In a subsequent prescribed fire in this stand, mature tree mortality was limited to 4 percent by cutting and removing understory hardwoods and extinguishing smoldering fires in tree duff for

several days post-fire (Varner et al. 2005). Thus, fuel and litter build-up are important considerations in reintroducing fire on long-unburned sites.

Long term experimental plots in mesic flatwoods burned in late winter at 1-, 2-, and 4-year intervals for 44 years at Osceola National Forest in northeast Florida have shown that annual burning increased herbaceous cover relative to shrub cover compared to plots winter burned at 2- or 4-year intervals and increased species richness at smaller scales ($\leq$ 100 m^2), but not at the largest scale (1000 m^2) measured (Glitzenstein et al. 2003). Saw palmetto cover decreased but wiregrass cover remained the same in annually burned plots. The authors concluded that long-term, high frequency winter burning can maintain high quality ground cover in mesic flatwoods but early summer burns (while maintaining a high frequency) may be necessary to increase cover of bunchgrasses. Early summer burns, as opposed to those in late winter, increased the dominance of fall-flowering forbs in a study at St. Marks National Wildlife Refuge in Wakulla County (Platt et al. 1988).

Wiregrass often does not withstand ground disturbance associated with planting pine plantations for commercial purposes. In some cases where the goal is to restore pine plantations to mesic flatwoods, there may not be enough wiregrass remaining to restore the herbaceous ground cover by frequent fire and natural seeding, especially since wiregrass is known to be a poor colonizer (Platt 1999; Kirkman et al. 2004). In such cases direct seeding may be required to restore the wiregrass ground layer. Care should be taken that the wiregrass and other seed used for restoration is not only from the same geographic area but also the same habitat type as the restoration site to maintain geographic genetic diversity (Walters et al. 1994) and to improve chances of survival (Kindell et al. 1996; Gordon and Rice 1998).

Invasive exotic plants that may cause problems in mesic flatwoods include the shrub, downy rose-myrtle (*Rhodomyrtus tomentosa*), a major problem in South Florida, cogon grass *(Imperata cylindrica*), old world climbing fern (*Lygodium microphyllum*), camphor tree (*Cinnamomum camphora*), and natal grass (*Melinis repens*), all listed as Category I exotics (capable of displacing native species) by the Florida Exotic Pest Plant Council.

Exemplary Sites: Apalachicola National Forest (Liberty and Wakulla counties), Jonathan Dickinson State Park (Martin County), Three Lakes Wildlife Management Area (Osceola and Polk counties), Triple N Ranch Wildlife Management Area (Osceola County), Fred C. Babcock-Cecil M. Webb Wildlife Management Area (Charlotte County), Jennings State Forest (Clay County), Myakka River State Park (Sarasota and Manatee counties), Starkey Wilderness Park (Pasco County)

Global and State Rank: G4/S4

Crosswalk and Synonyms:

Kuchler	112/Southern Mixed Forest
Davis	2/Pine Flatwoods
SCS	6/South Florida Flatwoods
	7/North Florida Flatwoods
	8/Cabbage Palm Flatwoods
Myers and Ewel	Flatwoods - mesic flatwoods
SAF	70/Longleaf Pine
	74/Cabbage Palmetto
	83/Longleaf Pine - Slash Pine
	84/Slash Pine
	111/South Florida Slash Pine
FLUCCS	411/Pine Flatwoods
	414/Pine - Mesic Oak
	428/Cabbage Palm

Other synonyms: pine barrens, pine flatwoods, longleaf pine savanna

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