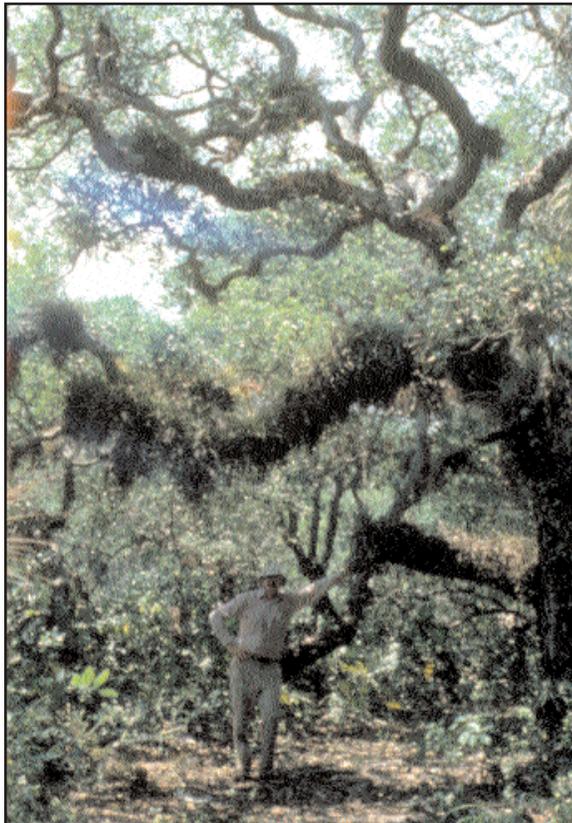

Mesic Temperate Hammock

FNAI Global Rank:	Undetermined
FNAI State Rank:	S3/S4
Federally Listed Species in S. FL:	8
State Listed Species in S. FL:	22

Mesic temperate hammock. *Original photograph by Ann Johnson.*



Mesic temperate hammock is a closed canopy forest, dominated by temperate evergreen tree species, primarily live oak and cabbage palm, that is naturally protected from fire by its position on the landscape. Tropical species are common in the shrub layer and become increasingly important in the canopy at the southern end of its range. Soils in mesic temperate hammock are moist due to a dense litter layer and the humid conditions that prevail under the closed canopy, but are rarely inundated. Mesic temperate hammocks are important habitat for wildlife and provide secondary habitat for a number of rare, threatened, and endangered plant and animal species. This community has been heavily impacted by human activity, primarily clearing for agriculture and urbanization. Soils and understory vegetation in mesic hammocks, often the only shaded habitat in a landscape of prairie, pasture, pineland, or marsh, are trampled and compacted by cattle. Mesic temperate hammocks have also been adversely affected by exotic plant and animal species, especially feral hogs, and by fire suppression and hydrological alterations in adjacent and surrounding communities. Protection measures for mesic temperate hammocks include conservation land acquisition; ecosystem management practices, particularly restoration of natural fire and hydrological regimes; control and eradication of exotics; and limits on grazing, development, and recreational uses.

Synonymy

The following terms have been applied in whole or in part to the plant communities of South Florida that are included within this description of mesic temperate hammock: upland hardwood forest, upland mixed forest, prairie hammock, xeric hammock, hydric hammock (FNAI and Florida Department of Natural Resources (FDNR) 1990); I.A.4N.a.050-*Quercus virginiana-Sabal palmetto* forest alliance (Weakley *et al.* 1998); oak hammock, cabbage

palm hammock, upland hardwood hammock (SWCS 1989); 422-other hardwood forest (DOA 1976); hardwood hammock, live oak-cabbage palm hammock, mesic hammock (Ward 1979); temperate broad-leaved evergreen forest (Greller 1980, Platt and Schwartz 1990); I.A.7a-temperate evergreen seasonal broad-leaved forest (UNESCO 1973); 1.evergreen, b. non-hydric, (2) eastern (b) palmetto-evergreen hardwoods, high hammock (Penfound 1967); upland mixed forest (Duever *et al.* 1979); type 15 (Davis 1967); oak hammock, oak and cabbage palm hammock, cabbage palm hammock (Davis 1943); sandy hammock, calcareous hammock (Harper 1921); low hammock, live-oak hammock, live oak-palmetto hammock (Harshberger 1914); upland hammock (Austin 1998), low hammock (Austin 1998, Richardson 1977, Harper 1927); low temperate hammock (Austin *et al.* 1977, Cox 1988), and high hammock (Alexander 1958). Nomenclature in this report follows Kartesz (1994). The FLUCCS codes for mesic temperate hammock include: 422 (Brazilian pepper), and 414 (pine/mesic oak).

Distribution

Mesic temperate hammock occurs in a broad zone of peninsular Florida, where it is transitional between the southern mixed hardwood forest of north peninsular and panhandle Florida and the tropical forest of southern Florida (Greller 1980) (Figure 1). The southern mixed hardwood forest of north Florida comprises a diverse mix of deciduous hardwoods, such as beech (*Fagus grandifolia*), hickory (*Carya* spp.) and oaks (*Quercus falcata*, *Q. alba*, etc.); broad-leaved evergreens, such as southern magnolia (*Magnolia grandiflora*) and live oak (*Quercus virginiana*); and needle-leaved evergreens, such as spruce pine (*Pinus glabra*) and loblolly pine (*P. taeda*). This north Florida community is typical of the southern mixed hardwood forest found throughout the southeastern coastal plain, and is considered the most species-rich community in North America by some researchers (Platt and Schwartz 1990, Wolfe 1990). North Florida hammocks are classified as upland hardwood or mixed forest by FNAI (FNAI and FDNR 1990) and have been researched and described by a number of authors (Monk 1960, 1965, 1967; Genelle and Fleming 1978, Mohlenbrock 1976, HDR 1987, Wolfe 1990, Daubenmire 1990, Platt and Schwartz 1990).

Tropical forests, or hammocks, of South Florida are also highly diverse, containing a high percentage of species whose centers of distribution lie in tropical latitudes. These forests contain tropical tree species such as tamarind (*Lysiloma latisiliquum*), lancewood (*Ocotea coriacea*), gumbo-limbo (*Bursera simaruba*), poisonwood (*Metopium toxiferum*), wild lime (*Zanthoxylum fagara*), mahogany (*Swietenia mahogoni*), and black ironwood (*Krugiodendron ferreum*). They also have a high component of tropical shrubs, such as wild coffee (*Psychotria nervosa*), marlberry (*Ardisia escallonioides*), myrsine (*Myrsine floridana*), and stoppers (*Eugenia* spp.). Temperate canopy species such as live oak, hackberry (*Celtis laevigata*), and cabbage palm (*Sabal palmetto*) also occur in tropical hardwood hammocks.

Mesic temperate hammock in the South Florida Ecosystem occupies something of a “tension zone” (Schwartz 1988) between these two distinctive

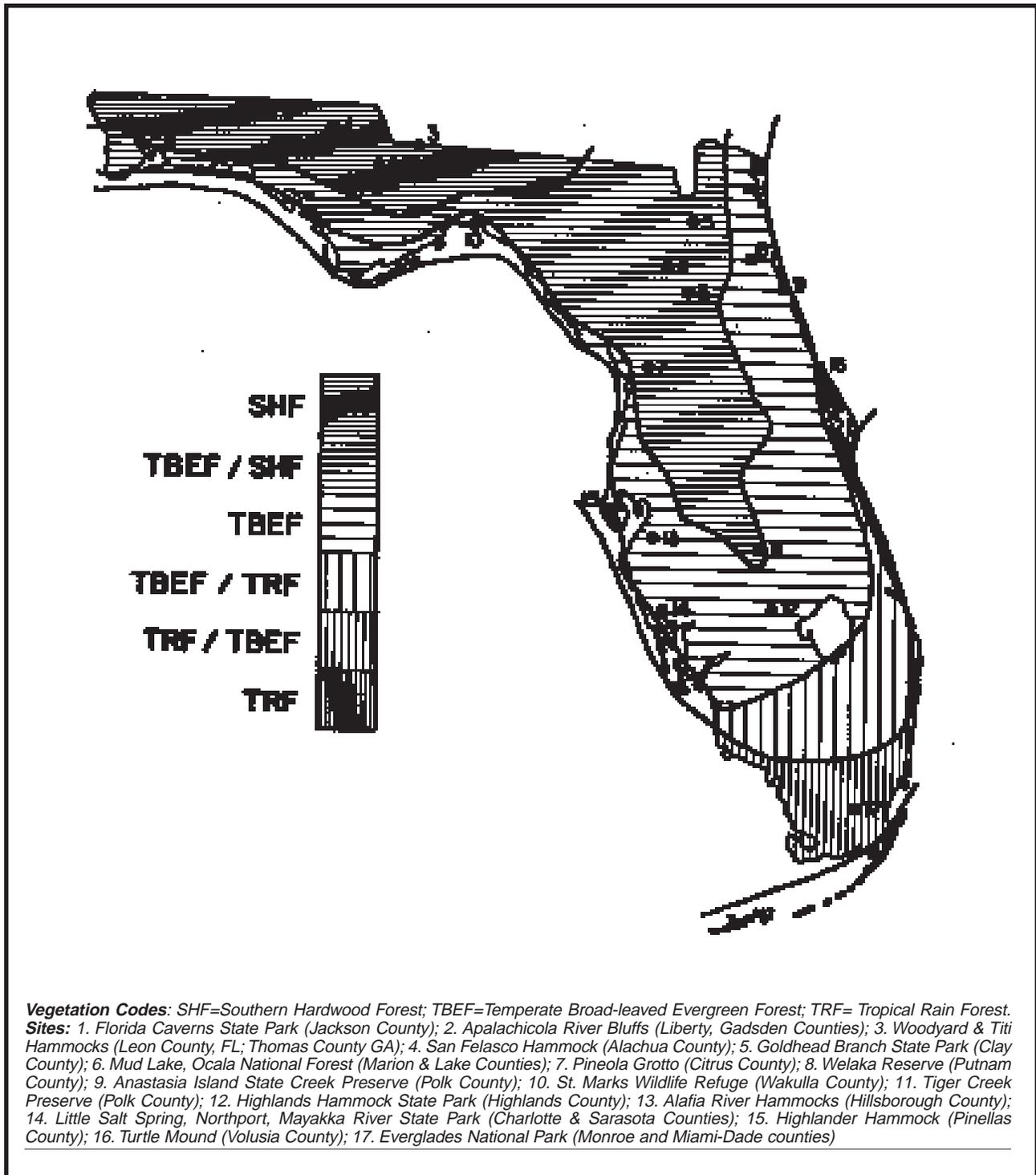


Figure 1. Hammock vegetation zones of Florida. Modified after Greller (1980) and cited in Myers and Ewel (1990).

forest types. In this “tension zone,” lying roughly south of Orlando to just south of Lake Okeechobee, species diversity is significantly lower than in either northern or tropical forests (Schwartz 1988). Although mesic temperate hammocks in the South Florida Ecosystem frequently contain species found in both northern and tropical forests, they are generally less species rich than either of these forests. Species diversity is higher at the northern boundary of the South Florida Ecosystem, where more northern species are present (Bridges and Reese 1996), and at the temperate-tropical boundary, where as much as 70 percent of the species are of tropical affinity (Cox 1988).

Mesic temperate hammock has been distinguished from tropical forests or hammocks on the basis of an overall percentage of tropical species, with tropical forests having more than 70 to 80 percent tropical species (Cox 1988, Austin *et al.* 1977), or on the basis of percent canopy dominants (G. Gann, Institute for Regional conservation, personal communication 1998). Greller (1980) maps the temperate-tropical transition as occurring across a zone south of Lake Okeechobee and extending narrowly up the Atlantic coast to just north of Cape Canaveral; tropical forest predominates from Miami-Dade County south. Mesic temperate hammock is found in every county within the South Florida Ecosystem except perhaps for Monroe (G. Gann, Institute for Regional Conservation, personal communication 1998). Mesic temperate hammocks have been described as far south as Big Cypress National Preserve in Collier County (Duever *et al.* 1979) and as far north in the South Florida Ecosystem as Upper Lakes Basin Watershed in Osceola and Polk counties (Bridges and Reese 1996). Mesic temperate hammocks that occur north of the South Florida Ecosystem are not discussed in this review.

Description

Mesic temperate hammocks are closed canopy forests, dominated by evergreen tree species of temperate affinities, primarily live oak and cabbage palms, that are naturally protected from fire because of their position in the landscape. Soils in mesic temperate hammocks remain moist due to shading and dense leaf litter, but they are rarely inundated. Mesic temperate hammocks are found primarily in four topographic positions in the South Florida Ecosystem: (1) as “islands” in a pine-cypress-or graminoid-dominated community, also known as prairie hammock (FNAI and FDNR 1990); (2) as “islands” on elevated areas within floodplain wetlands, (3) on levees of rivers, and (4) midslope or ecotonal between xeric communities and low-lying wetland communities.

Mesic temperate hammock occurs as prairie hammock “islands” on slight elevations within the relatively flat terrain of central and South Florida (FNAI and FDNR 1990). In Okeechobee and Glades counties, they occur as “islands” in dry prairies composed of saw palmetto and graminoid species (FNAI 1995, Hilsenbeck and Hedges 1994). In Big Cypress National Preserve, at the southern extent of this community in Florida, hammocks develop on limestone outcroppings within graminoid marsh or open cypress forest (Snyder *et al.* 1990, Duever *et al.* 1979). Mesic temperate hammock “islands” also develop on elevated areas within hydric hammocks, as in the Upper Lakes Basin Watershed in Polk and Osceola counties (Bridges and Reese 1996). Mesic

temperate hammock occurs in extensive bands along historical floodplain boundaries in the Kissimmee River Valley and also on elevated ridges and knolls within the floodplain (Milleson *et al.* 1980). It also exists as an ecotonal community, transitional between xeric uplands, such as scrub and high pine, and wetland communities such as hydric hammock, wet flatwoods, floodplain forest, or baygall. Examples of this hammock type occur at Highlands Hammock SP (P. Anderson, DEP, personal communication 1998) and Avon Park AFR (Orzell 1997). In each of these landscape positions, mesic temperate hammock occupies somewhat better drained soils than surrounding or adjacent wetland communities, although dense litter accumulation and a closed canopy maintain relatively high soil moisture conditions at most times.

Vegetative Structure and Composition

Mesic temperate hammock is characterized in South Florida by a closed canopy of hardwood species, primarily live oak and cabbage palm, and by a fairly open shrub layer and a sparse, species-poor herb layer. Herb diversity is frequently higher among epiphytes than among ground layer species. Table 1 contains lists of dominant and characteristic species found in mesic temperate hammocks at 15 sites in the South Florida Ecosystem.

Canopy tree dominants are relatively constant in mesic temperate hammocks throughout the South Florida Ecosystem. Live oak and cabbage palm are consistently present, and are joined by water oak (*Quercus nigra*), laurel oak (*Q. laurifolia*), hackberry (*Celtis laevigata*), red maple (*Acer rubrum*), and other temperate hardwoods at many sites. Hammocks at the northern boundary of the South Florida Ecosystem are more diverse and may contain species such as pignut hickory (*Carya glabra*), sweet gum (*Liquidambar styraciflua*), and southern magnolia (*Magnolia grandiflora*) that do not occur further south (Bridges and Reese 1996). Hammocks at the border of the tropical zone often contain tropical species such as strangler fig (*Ficus aurea*) and trema (*Trema micrantha*) (Austin *et al.* 1977, Cox 1988).

Although canopy composition is relatively constant in mesic temperate hammock throughout its range in Florida, shrub species composition is variable across the range of this community within South Florida. A unifying factor is the presence of at least some shrub species considered tropical in even the most northern locations within the South Florida Ecosystem (Bridges and Reese 1996). Tropical shrub species found in hammocks throughout South Florida include wild coffee (*Psychotria nervosa* and *P. sulzneri*), marlberry (*Ardisia escallonioides*), and myrsine (*Myrsine floridana*). The dense, closed canopy of the hammock protects such tropical species from freezing temperatures. Observers of mesic temperate hammocks in South Florida have commented on the low species diversity of the herb layer, while simultaneously noting the abundance of epiphytes (Harshberger 1914, Harper 1927). Epiphytes include orchids (*Encyclia tampensis*, *Epidendrum conopseum*, *E. anceps*, *Harrisella filiformis*), ferns (*Vittaria lineata*, *Polypodium polypodioides*, *Phlebodium aureum*, *Cheiroglossa palmata*), and bromeliads (*Tillandsia setacea*, *T. utriculata*, *T. usneoides*, *T. fasciculata*, and *T. flexuosa*.)

Table 1. Vegetative Composition of Selected Mesic Temperate Hammocks in South Florida .

Location	Position	Canopy/Subcanopy	Shrubs and Vines	Herbs and Epiphytes
Tiger Creek Preserve, Polk County (FNAI 1982)	floodplain ecotone	<i>Quercus virginiana</i> , <i>Sabal palmetto</i> , <i>Liquidambar styraciflua</i> , <i>Q. nigra</i> , <i>Q. laurifolia</i> , <i>Morus rubra</i> , <i>Persea</i> sp.	<i>Rhododendron viscosum</i> , <i>Callicarpa americana</i> , <i>Asimina parviflora</i> , <i>Psychotria nervosa</i>	<i>Cyperus tetragonus</i> , <i>Panicum jooi</i> , <i>Thelypteris</i> sp., <i>Habeneria odontopetala</i> , <i>Scleria triglomerata</i> , <i>Mitchella repens</i>
Upper Lakes Basin Watershed, Polk and Osceola counties (Bridges and Reese 1996)	wetlands ecotone and "islands" in hydric hammocks	<i>Quercus virginiana</i> , <i>Q. nigra</i> , <i>Q. laurifolia</i> , <i>Sabal palmetto</i> , <i>Pinus elliotii</i> , <i>Acer rubrum</i> , <i>Carya glabra</i> , <i>Liquidambar styraciflua</i> , <i>Magnolia grandiflora</i> , <i>Celtis laevigata</i> , <i>Persea palustris</i> , <i>Zanthoxylum clava-herculis</i>	<i>Serenoa repens</i> , <i>Illicium parviflorum</i> , <i>Vitis rotundifolia</i> , <i>Rhododendron viscosum</i> , <i>Vaccinium corymbosum</i> , <i>Lyonia ferruginea</i> , <i>Decumaria barbara</i> , <i>Ilex cassine</i> , <i>Magnolia virginiana</i> , <i>Ardisia escallonioides</i> , <i>Myrica cerifera</i> , <i>Myrsine floridana</i> , <i>Rhapidophyllum hystrix</i> , <i>Callicarpa americana</i> , <i>Citrus aurantium</i> , <i>Toxicodendron radicans</i> , <i>Chiococca alba</i> , <i>Hamelia patens</i> , <i>Rhamnus caroliniana</i>	<i>Solidago leavenworthii</i> , <i>Osmunda cinnamomea</i> , <i>Dichanthelium</i> spp., <i>Diodia virginianum</i> , <i>Epidendrum conopseum</i> , <i>Mitchella repens</i> , <i>Polypodium polypodioides</i> , <i>Tillandsia</i> spp., <i>Woodwardia virginica</i> , <i>Bidens bipinnata</i> , <i>Callisia repens</i> , <i>Iresine diffusa</i> , <i>Pharus lappulaceus</i>
Avon Park Air Force Range, Polk and Highlands counties (Orzell 1997)	transitional to floodplain	<i>Quercus virginiana</i> , <i>Quercus laurifolia</i> , <i>Sabal palmetto</i> , <i>Acer rubrum</i>	<i>Ardisia escallonioides</i> , <i>Psychotria sulzneri</i> , <i>Serenoa repens</i> , <i>Sida acuta</i> , <i>Hypericum hyperico ides</i> , <i>Cornus foemina</i> , <i>Myrsine floridana</i> , <i>Gelsemium sempervirens</i> , <i>Parthenocissus quinquefolia</i> , <i>Smilax bona-nox</i> , <i>Ampelopsis arborea</i> , <i>Mikania cordifolia</i> , <i>Toxicodendron radicans</i>	<i>Dichanthelium</i> spp., <i>Oplismenus setarius</i> , <i>Carex longii</i> , <i>Rhynchospora caduca</i> , <i>Scleria triglomerata</i> , <i>Mitchella repens</i> , <i>Centella erecta</i>
Highlands Hammock State Park, Highlands County (Stalter <i>et al.</i> 1981)	transitional to floodplain	<i>Quercus virginiana</i> , <i>Quercus laurifolia</i> , <i>Sabal palmetto</i> , <i>Acer rubrum</i> , <i>Carya glabra</i> , <i>Morus rubra</i> , <i>Celtis laevigata</i> , <i>Liquidambar styraciflua</i> , <i>Persea borbonia</i>		
Kissimmee Prairie Preserve, Okeechobee County (FNAI 1995 <i>op.cit.</i> , Hilsenbeck and Hedges 1994)	"islands" in dry prairie and levee of Kissimmee River	<i>Quercus virginiana</i> , <i>Sabal palmetto</i> , <i>Persea</i> sp., <i>Pinus elliotii</i>		<i>Epidendrum conopseum</i> , <i>Encyclia tampensis</i> , <i>Phlebodium aureum</i> , <i>Polypodium polypodioides</i> , <i>Tillandsia usneoides</i>
Kissimmee River Valley, Polk, Osceola, Highlands, Okeechobee counties (Milleson <i>et al.</i> 1980)	levees, floodplain ridges	<i>Quercus nigra</i> , <i>Q. virginiana</i> , <i>Sabal palmetto</i>	<i>Serenoa repens</i> , <i>Rubus cuneifolia</i> , <i>Smilax</i> sp., <i>Vitis rotundifolia</i>	<i>Blechnum serrulatum</i> , grasses, <i>Phlebodium aureum</i>
Three Lakes WMA, Osceola County (FDNR 1979)	edge of floodplain, "islands" in prairies	<i>Quercus virginiana</i> , <i>Q. hemisphaerica</i> , <i>Sabal palmetto</i> , <i>Celtis laevigata</i> , <i>Ulmus americana</i>	<i>Serenoa repens</i>	

Table 1. Vegetative Composition of Selected Mesic Temperate Hammocks in South Florida .

Location	Position	Canopy/Subcanopy	Shrubs and Vines	Herbs and Epiphytes
Cypress Creek CARL proposal, St. Lucie County (FNAI 1996a)	elevated areas within hydric hammock	<i>Sabal palmetto</i> , <i>Quercus laurifolia</i> , <i>Q.</i> <i>virginiana</i> , <i>Morus</i> <i>rubra</i>	<i>Serenoa repens</i> , <i>Psychotria</i> <i>nervosa</i> , <i>P. sulzneri</i> , <i>Eugenia</i> <i>axillaris</i> , <i>Ardisia</i> <i>escallonioides</i> , <i>Myrcianthes</i> <i>fragrans</i> , <i>Myrsine floridana</i>	<i>Campyloneurum phyllitides</i>
Myakka River State Park, Sarasota and Manatee counties (Huffman and Judd 1998)	Elevated areas within floodplain, “islands” in flat woods and dry prairies	<i>Quercus virginiana</i> , <i>Q.</i> <i>laurifolia</i> , <i>Sabal</i> <i>palmetto</i> , <i>Prunus</i> <i>caroliniana</i> , <i>Morus</i> <i>rubra</i> , <i>Carya glabra</i>	<i>Callicarpa americana</i> , <i>Myrsine floridana</i> , <i>Ardisia</i> <i>escallonioides</i> , <i>Campsis</i> <i>radicans</i> , <i>Toxicodendron</i> <i>radicans</i> , <i>Parthenocissus</i> <i>quinquefolia</i> , <i>Cornus</i> <i>foemina</i> , <i>Vitis rotundifolia</i> , <i>Vaccinium arboreum</i> , <i>V.</i> <i>elliottii</i> , <i>Viburnum nudum</i> , <i>Sabal minor</i>	<i>Ruellia caroliniensis</i> , <i>Arisaema</i> <i>triphylllum</i> , <i>Carex stipata</i> , <i>Apios</i> <i>americana</i> , <i>Tillandsia setacea</i> , <i>T. usneoides</i> , <i>T. fasciculata</i> , <i>T.</i> <i>recurvata</i> , <i>T. utriculata</i>
Babcock-Webb WMA/Hall Ranch, Charlotte County (GFC 1997a <i>op.cit.</i> , FNAI 1996b)	“islands” in wet flatwoods, edge of stream	<i>Sabal palmetto</i> , <i>Pinus</i> <i>elliottii</i> , <i>Ulmus</i> <i>floridana</i> , <i>Acer rubrum</i> , <i>Quercus virginiana</i> , <i>Q.</i> <i>nigra</i>	<i>Serenoa repens</i> , <i>Callicarpa</i> <i>americana</i> , <i>Psychotria</i> <i>sulzneri</i> , <i>P. nervosa</i> , <i>Sideroxylon sp.</i> , <i>Toxicodendron radicans</i> , <i>Smilax sp.</i>	<i>Axonopus sp.</i> , <i>Vittaria lineata</i> , <i>Phlebodium aureum</i>
Barley Barber Indian Mound, Martin County (Cox 1988)	Indian mound	<i>Diospyros virginiana</i> , <i>Ficus aurea</i> , <i>Morus</i> <i>rubra</i> , <i>Persea sp.</i> , <i>Quercus virginiana</i> , <i>Q.</i> <i>laurifolia</i> , <i>Sabal</i> <i>palmetto</i>	<i>Baccharis sp.</i> , <i>Myrsine</i> <i>floridana</i> , <i>Psychotria</i> <i>sulzneri</i> , <i>Erythrina herbacea</i> , <i>Ilex cassine</i> , <i>Schinus</i> <i>terebinthifolius</i> , <i>Serenoa</i> <i>repens</i>	<i>Rivina humilis</i>
J.W. Corbett WMA, Palm Beach County (GFC 1997b, Cox 1988)	knolls within hydric hammock	<i>Sabal palmetto</i> , <i>Acer</i> <i>rubrum</i> , <i>Quercus</i> <i>laurifolia</i> , <i>Persea sp.</i>	<i>Lyonia fruticosa</i> , <i>L. lucida</i> , <i>Baccharis sp.</i> , <i>Myrica</i> <i>cerifera</i> , <i>Myrsine floridana</i> , <i>Eugenia spp.</i> , <i>Serenoa</i> <i>repens</i> , <i>Zanthoxylum fagara</i> , <i>Psychotria nervosa</i>	
Hickory Forge-Clavel Ranch, DeSoto County (Peter NeSmith, Water & Air, personal communication 1998)	lee sides of depression marshes	<i>Quercus virginiana</i> , <i>Sabal palmetto</i> , <i>Pinus</i> <i>elliottii</i> , <i>Celtis laevigata</i>	<i>Psychotria nervosa</i> , <i>Rivina</i> <i>humilis</i> , <i>Citrus spp.</i>	<i>Vittaria lineata</i> , <i>Phlebodium</i> <i>aureum</i> , <i>Epidendrum</i> <i>conopseum</i> , <i>Encyclia tampensis</i>
Butts Hammock (low hammock portion), Palm Beach County (Austin <i>et al.</i> 1977)	limestone ridge in wetlands	<i>Chrysophyllum</i> <i>oliviforme</i> , <i>Diospyros</i> <i>virginiana</i> , <i>Ficus aurea</i> , <i>Morus rubra</i> , <i>Pinus</i> <i>elliottii</i> , <i>Quercus</i> <i>virginiana</i> , <i>Sabal</i> <i>palmetto</i> , <i>Trema</i> <i>micrantha</i>	<i>Baccharis halimifolia</i> , <i>Lyonia fruticosa</i> , <i>Rhus</i> <i>copallina</i> , <i>Serenoa repens</i> , <i>Ampelopsis arborea</i> , <i>Ipomoea alba</i> , <i>Melothria</i> <i>pendula</i> , <i>Mikania scandens</i> , <i>Parthenocissus quinquefolia</i> , <i>Sarcostemma clausa</i> , <i>Smilax</i> <i>bona-nox</i> , <i>Toxicodendron</i> <i>radicans</i> , <i>Vitis rotundifolia</i> , <i>V. shuttleworthii</i>	<i>Phyla nodiflora</i> , <i>Trichostema</i> <i>suffrutescens</i> , <i>Verbesina</i> <i>virginica</i> , <i>Phlebodium aureum</i> , <i>Psilotum nudum</i> , <i>Pteridium</i> <i>aquilinum</i> , <i>Thelypteris kunthii</i> , <i>Tillandsia balbisiana</i> , <i>T.</i> <i>fasciculata</i> , <i>T. recurvata</i> , <i>T.</i> <i>utriculata</i>

Table 1. Vegetative Composition of Selected Mesic Temperate Hammocks in South Florida .

Location	Position	Canopy/Subcanopy	Shrubs and Vines	Herbs and Epiphytes
Del Ray Oaks, Palm Beach County (Steve Farnsworth, Palm Beach County, Department of Environmental Resources Management; Iverson and Austin 1988)	"island" in wet prairie	<i>Quercus virginiana</i> , <i>Morus rubra</i> , <i>Celtis laevigata</i> , <i>Ficus aurea</i> , <i>Ocotea coriacea</i> , <i>Sabal palmetto</i> , <i>Persea sp.</i>	<i>Psychotria nervosa</i> , <i>Ardisia escallonioides</i> , <i>Ilex cassine</i> , <i>Chiococca alba</i> , <i>Myrica cerifera</i> , <i>Chrysobalanus icaco</i> , <i>Myrsine floridana</i> , <i>Serenoa repens</i> , <i>Vitis rotundifolia</i> , <i>Toxicodendron radicans</i> , <i>Passiflora suberosa</i> , <i>Parthenocissus quinquefolia</i>	<i>Blechnum serrulatum</i> , <i>Nephrolepis cordifolia</i> , <i>Psilotum nudum</i> , <i>Euthamia tenuifolius</i> , <i>Oplismenus hirtellus</i> , <i>Vittaria lineata</i> , <i>Polypodium polypodioides</i> , <i>Tillandsia spp.</i> , <i>Phlebodium aureum</i> , <i>Habenaria odontopetala</i> , <i>Galactia elliotii</i> , <i>Campyloneurum phyllitides</i>
Kendall Indian Hammock, Dade County (G. Gann, Institute for Regional Conservation, personal communication 1998)	Indian mound (sand)	<i>Quercus virginiana</i> , <i>Q. laurifolia</i> , <i>Ficus aurea</i> , <i>Sabal palmetto</i> , <i>Coccoloba diversifolia</i> , <i>Morus rubra</i> , <i>Diospyros virginiana</i> , <i>Persea palustris</i> , <i>Zanthoxylum fagara</i>	<i>Myrsine floridana</i> , <i>Psychotria sulzneri</i> , <i>P. nervosa</i> , <i>Trema micrantha</i> , <i>Vitis rotundifolia</i>	<i>Dichanthelium commutatum</i> , <i>Oplismenus hirtellus</i> , <i>Rivina humilis</i> , <i>Phlebodium aureum</i> , <i>Polypodium polypodioides</i> , <i>Tillandsia fasciculata</i> , <i>T. utriculata</i>

Because mesic temperate hammocks develop naturally in the absence of fire, they share some species with oak hammocks that are the result of anthropogenic fire suppression. Oak hammocks may develop at old home or camp sites that were protected from fire; more frequently, hammocks invade pyric communities such as pine flatwoods or dry prairie that have been fire-suppressed for long periods, eventually fire-proofing the area. Such anthropogenic oak hammocks generally have a depauperate shrub layer or may have a dense, nearly monospecific understory of saw palmetto (*Serenoa repens*).

Wildlife Diversity

Mesic temperate hammocks provide food, cover, roosting, and nesting sites to a wide variety of wildlife species. An abundance of hardwood mast makes mesic hammocks attractive to many birds and mammals. Mature trees and snags provide good roosting and nesting sites. Mesic hammocks that occur as “islands” in wetland communities provide refuge for wildlife during wet conditions. Mesic hammocks provide resting cover and foraging habitat for a large number of passerines during migration. Animal species typically found in mesic temperate hammocks are listed below.

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

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

Reptiles that inhabit mesic temperate hammock include: Florida box turtle (*Terrapene carolina bauri*), southeastern five-lined skink (*Eumeces inexpectatus*), eastern glass lizard (*Ophisaurus ventralis*), fence lizard (*Sceloporus undulatus undulatus*), green anole (*Anolis carolinensis*), ground skink (*Seincella lateralis*), mole skink (*Eumeces egregius onocrepis*), Florida worm lizard (*Rhineura floridana*), barking treefrog (*Hyla gratiosa*), eastern spadefoot toad (*Scelophus holbrooki holbrooki*), southern toad (*Bufo terrestris*), squirrel treefrog (*Hyla squirrelia*), green treefrog (*Hyla cinerea*),

Florida kingsnake (*Lampropeltis getulus floridana*), eastern hognose snake (*Heterodon platyrhinos*), ringneck snake (*Diadophis punctatus punctatus*), corn snake (*Elaphe guttata guttata*), Florida red-bellied snake (*Storeria occipitomaculata*), southern black racer (*Coluber constrictor priapus*), yellow rat snake (*Elaphe obsoleta quadrivittata*), rough green snake (*Opheodrys aestivus*), eastern coral snake (*Micrurus fulvius fulvius*), and pygmy rattlesnake (*Sistrurus miliarius barbouri*).

Wildlife Species of Concern

Federally listed species that depend upon or utilize the mesic temperate hammock in South Florida include: Florida panther (*Puma* (= *Felis*) *concolor coryi*), Key deer (*Odocoileus virginianus clavium*), eastern indigo snake (*Drymarchon corais couperi*), Kirtland's warbler (*Dendroica kirtlandii*), bald eagle (*Haliaeetus leucocephalus*), Bachman's warbler (*Vermivora bachmanii*), and Audubon's crested caracara (*Polyborus plancus audubonii*). The ivory-billed woodpecker (*Campephilus principalis*) is identified in literature as having occurred in the Highlands Hammock State Park (Robertson and Wolfenden 1992). Biological accounts and recovery tasks for these species are included in "The Species" section of this recovery plan. Mesic temperate hammock is also important for State listed species, and other species of concern that require a diversity of forested habitats for cover, food, roosting, or nesting (Appendix C).

Florida panthers have been found in almost all South Florida communities, including mesic temperate hammocks (Humphrey 1992). Primary prey for Florida panther, white-tailed deer and feral pigs, are abundant in mesic hammocks. Panther habitat has been severely decreased by increased urbanization and agricultural expansion into its habitats; however, panthers may persist where forested areas, such as mesic hammocks, exist in a mosaic of agricultural lands. A mix of forested and cleared lands seems to benefit white-tailed deer and feral hogs, the main components of Florida panther diet. The Florida panther is classified as endangered by FCREPA, GFC, and FWS. It is ranked as G5T1 (globally imperiled) by FNAI (1997b).

Florida black bear (*Ursus americanus floridanus*) use a wide variety of forested habitats, including cabbage palm hammocks and mixed hardwood forests, such as mesic temperate hammocks (Humphrey 1992). These habitats are especially important to black bear if contiguous with large tracts of forested wetlands. Forested communities provide cover, nesting habitat, and food. Primary constituents of the black bear diet include berries, hearts of saw palmetto and cabbage palm, and acorns, which are found in abundance in most mesic hammocks. Acorns, in particular, are critical to breeding success of black bear (Humphrey 1992). FNAI (1997b) lists Florida black bear as G5T2 and S2 (both state and globally imperiled). FCREPA and GFC list Florida black bear as threatened. Long-term conservation of this species depends on the preservation of large tracts of forest.

Big Cypress fox squirrel (*Sciurus niger avicennia*) is found south of the Caloosahatchee River and west of the Everglades, a distribution reflected in the recently adopted common name. It uses most forest types within its range, including oak hammocks (Humphrey 1992). Although slash pine and cypress cones are preferred food items, cabbage palm fruits, bromeliad buds, and acorns are included in its diet. This species builds its nests in the tops of cabbage palms and in large clumps of bromeliads, as well as in pines, hardwoods, and cypress. FNAI (1997b) lists Big Cypress fox squirrel as G5T2 and S2 (both state and globally imperiled). FCREPA and GFC list it as threatened. Long-term conservation of this species depends on the preservation of forests from development and clearing.

Florida weasel (*Mustela frenata peninsulae*) is endemic to central peninsular Florida, including areas north and west of Lake Okeechobee, and may be the state's rarest carnivore (Humphrey 1992). Weasels use a wide variety of habitats, including scrub, high pine, pond swamp, pine flatwood, tropical hardwood hammock. It is likely they are found in mesic temperate hammocks. FNAI (1997b) lists Florida weasel as G5T3 and S3? (both state and globally rare or vulnerable). FCREPA classifies Florida weasel as a species of special concern. Little is known about the habitat requirements of this rare species, but habitat loss and fragmentation are assumed to be detrimental (Humphrey 1992)

Sherman's short-tailed shrew (*Blarina carolinensis shermani*) has not been observed since 1955 (Humphrey 1992), but specimens have been taken from mesic hammock (K. NeSmith, FNAI, personal communication 1998). It has one of the most restricted ranges of any Florida mammal, and is considered very rare, possibly extirpated. FNAI (1997b) ranks Sherman's short-tailed shrew as G5T1 and S1 (imperiled globally and statewide). GFC lists it as a species of special concern. FCREPA states that its status is undetermined (Humphrey 1992).

Swallow-tailed kites (*Elanoides forficatus*) require a diverse mix of habitats for foraging including mesic hammocks. They usually nest and roost in tall pine or cypress trees in relatively open stands in a mosaic of woodland-prairie habitats. Habitat for swallow-tailed kite is rapidly disappearing (Rodgers *et al.* 1996). Swallow-tailed kite is not listed by State or Federal agencies, although FCREPA classifies this species as threatened. FNAI (1997) ranks it as G4 (globally secure) and S2/S3 (possibly imperiled or rare, restricted, or vulnerable to extinction in Florida).

Eastern indigo snake is found in a variety of habitats in South Florida ranging from mangrove swamps to xeric uplands, and including mesic temperate hammocks. The eastern indigo snake is listed as threatened by FWS and GFC and is ranked by FNAI as G4T3 and S3 (rare, local, or vulnerable to extinction globally and statewide). The eastern indigo snake requires large tracts of land for its survival and is threatened primarily by the fragmentation and loss of habitat (Moler 1992). It is also exploited for the pet trade.

Plant Species of Concern

Mesic temperate hammocks support relatively few species of rare, threatened, or endangered plants, compared to other South Florida communities.

***Tillandsia flexuosa* (twisted air plant).** Original photograph by E.D. Hardin.



Auricled spleenwort (*Asplenium auritum*) is an epiphytic fern, endemic to Florida, found on large trees in mesic hammocks in eight central and South Florida counties (FNAI 1997a, Coile 1998). It is one of the “resurrection ferns” that persist through drought with curled, desiccated leaves that green and expand on exposure to moisture. Auricled spleenwort is listed as endangered by Florida Department of Agriculture and Consumer Services (FDACS) (Coile 1998); it has no Federal status. FNAI (1997b) ranks this species as G5 (globally secure) and S2 (imperiled in Florida). Auricled spleenwort is endangered due to clearing of its habitat for agriculture and development.

Twisted air plant (*Tillandsia flexuosa*) is an epiphytic bromeliad that grows on trees in mesic and xeric hammocks, rockland hammocks, shell mounds, coastal berms, maritime hammock, mangroves, swamps, and scrub (FNAI 1997a, Coile 1998). Twisted air plant is not listed by the FWS, but is listed as endangered by FDACS (Coile 1998). FNAI (1997b) ranks twisted air plant as G4 (apparently globally secure) and S3 (rare, local, or vulnerable to extinction). It is found in 10 South Florida counties, and in the West Indies, Panama, and South America (Coile 1998). Twisted air plant forms a rosette of gray, white-banded, twisted leaves, supporting a twisted, zigzag flowering stem. Twisted air plant is threatened by clearing of its habitat for agriculture and residential development.

Florida Keys (=Green) ladies’ tresses (*Spiranthes polyantha*) is an inconspicuous, terrestrial orchid found in six widely scattered central and South Florida counties, where it occurs in mesic and xeric hardwood forests over limestone, and in Mexico and the Caribbean (Luer 1972, Coile 1998). Florida Keys ladies’ tresses is listed as endangered by FDACS, but currently has no Federal status. FNAI (1997b) ranked this species G3G5, indicating that there is insufficient data for assigning a definite global rank, and has assigned a State

rank of S1S2, indicating imperilment within the State. Green ladies' tresses is vulnerable to extirpation because of widespread clearing of forests for agriculture and urbanization.

Hand fern (*Cheiroglossa palmata*) is an evergreen, epiphytic fern that inhabits the leaf bases of cabbage palm in mesic, hydric, and maritime hammocks. The fern's rhizome is embedded in the detritus that collects within the persistent petiole bases. Hand fern has no Federal status, but is listed by FDACS as threatened (Coile 1998). The species is ranked by FNAI (1997b) as G5 (globally secure) and S2 (imperiled in Florida). It is known or reported from 18 counties in central and South Florida (FNAI 1997a, Wunderlin *et al.* 1996). Hand fern is threatened by overcollection by fern hobbyists and commercial wholesalers, and by clearing and development of its habitat. Fire is also detrimental to hand fern; although cabbage palm is fire adapted and rarely perishes in fire, the petiole bases can be burned away, destroying the substrate of this species.

Peperomia (*Peperomia humilis*) is a small succulent herb, terrestrial or epiphytic, found throughout central and South Florida and the West Indies (Coile 1998). It is listed as endangered by FDACS; it has no Federal status. FNAI ranks this species as G5 (globally secure) and S2 (imperiled in Florida). Peperomia is endangered due to clearing of its habitat for agriculture and development.

Tropical curly grass (*Schizaea germanii*) is a small terrestrial fern, growing in decaying litter or on stumps in mesic and other hammocks in three central and South Florida counties (including Loxahatchee NWR), the West Indies, and Central and South America (Coile 1998). Tropical curly grass is listed as endangered by FDACS (as *Schizaea germanii*); it has no Federal status. FNAI ranks this species as G4G5 (globally secure) and S1 (critically imperiled in Florida). Tropical curly grass is endangered due to clearing of its habitat for agriculture and development.

Yellow star anise (*Illicium parviflorum*) is an evergreen shrub with small yellow flowers, aromatic leaves, and distinctive anise-like fruits. It is narrowly endemic to central Florida, where it occurs primarily in hammocks along spring-run streams. It also occurs in the two northernmost counties of the South Florida Ecosystem, where it is known from a few mesic hammocks (Bridges and Reese 1996). Yellow star anise currently has no Federal status, but is listed as endangered by FDACS (Coile 1998), and as globally and state-imperiled (G2) by FNAI (FNAI 1998). Yellow star anise is negatively impacted by changes in hydrology, removal of the overstory species through logging or other clearing, and is subject to collection as a landscape species. Yellow star anise is not adapted to frequent fire, but will re-sprout following low-intensity, surface fires. If fire is frequent or hot enough to burn into the top layers of duff, buds buried in the duff will be killed and the plants will not survive.

Yellow hibiscus (*Pavonia spinifex*) is a small, shrubby, summer- and fall-flowering perennial in the Malvaceae family found in seven central Florida counties. Only two occurrences, in Polk and Highlands counties, are documented in the South Florida area; both of these collections were made

prior to 1965. Yellow hibiscus is found in mesic, maritime, and hydric hammock, shell mounds, and in shaded disturbed areas along the coast. This species has neither Federal or State listing status; it is ranked by FNAI as G4G5 (globally secure) and S2S3 (imperiled or rare). Yellow hibiscus had a wide historical range but there are few recent collections. This species is also reported from Bermuda, the West Indies, and continental tropical America. Yellow hibiscus is vulnerable to extirpation by disturbance or competition from exotic species. It is not fire-adapted and is killed by fire.

Ecology

Succession

Although numerous studies have been conducted in the southeastern coastal plain in order to discern patterns of species replacement in mixed hardwood forests, there is considerable doubt regarding the role of succession in these communities. Studies suggest instead that a complex interplay of natural disturbances maintains hammocks in a state of nonequilibrium. The type of disturbance that is most prevalent—wind, fire, flooding—may determine the floristic composition of hardwood hammocks (Platt and Schwartz 1990). However, hammocks have been considered by many researchers to be the climax community of South Florida (Davis 1943, Craighead 1971, Alexander and Crook 1973, Ward 1979). The dominant tree species in mesic temperate hammock, live oak and cabbage palm, are considered to be the pioneer species, which, once established, provide conditions favorable to the establishment of other shade-tolerant mesic hammock species. Occasional hard frosts may topkill tropical species in hammocks, but most are capable of resprouting from root stock or upper limbs. Occasional low-intensity fire favors the perpetuation of live oak and cabbage palm, both relatively fire-resistant species. Catastrophic fire, particularly if it burns into the duff layer, may alter the species composition by killing roots and preventing resprouting. In this event, species dominance in a hammock will shift toward those species with readily available seed sources.

Fire

Mesic hammocks rarely burn although the dominant canopy species—live oak and cabbage palm—are fire-adapted species. Mesic hammocks are protected from fire in several ways. They frequently develop in landscape positions, such as around lakes and sinkholes and in river corridors, that are naturally protected from fire. They may develop on raised positions—limestone outcrops, Indian mounds—within frequently burned marshes and wet prairies where a lack of fuel and moist leaf litter deter fire. In the Big Cypress, mesic hammocks develop on limestone outcrops and are protected from fire by moat-like troughs that develop by solution of the underlying bedrock. They may also develop midslope where upland fires tend to extinguish naturally when they encounter the humid conditions within the hardwood forest. Conditions within the hammocks—dense leaf litter, high moisture levels in the litter layer, and higher

humidity—tend to make the community fire-resistant. Although similar in some respects to anthropogenic, fire-suppressed oak hammocks, mesic hammocks are recognizable on aerial photographs from the 1940s, before the era of extensive fire suppression, on the lee sides of depressional wetlands and along streams (Belinda Perry, DEP, Division of Recreation and Parks, personal communication 1998).

Mesic temperate hammocks burn infrequently as a result of fire entering from adjacent fire-maintained communities. Infrequent, low-intensity fire is not detrimental to mesic hammocks; however, catastrophic fires, burning through in times of drought, may completely destroy some hammocks, which may then be invaded by weedy and exotic species (Alexander and Crook 1973). In the Big Cypress, hammock vegetation may re-establish within 25 years following a catastrophic fire, although it is believed that the natural fire cycle within the Big Cypress hammocks exceeds 50 years (Duever *et al.* 1979).

Tree species composition within mesic hammocks is determined to some extent by the frequency and intensity of fire; more frequent and hotter fires will favor live oak and cabbage palm (Vince *et al.* 1989) over more fire-sensitive species such as hackberry (*Celtis laevigata*) and red maple (*Acer rubrum*). Spatial extent of mesic hammock is also affected by frequency and intensity of fires in surrounding and adjacent natural community types. Most mesic hammocks share at least one boundary with a fire-maintained community, such as marsh, pine flatwoods, or dry prairie. In the prolonged absence of fire in these communities, a species-depauperate version of mesic hammock will expand into the adjacent community, potentially rendering it impervious to fire. Mesic hammocks that develop as the result of fire suppression and invasion into pyric communities usually contain species associated with the invaded community, such as saw palmetto or slash pine (*Pinus elliotii*).

Soils

Soil plays at least as important a role as fire in determining the development of mesic hammocks in the central Florida hammock belt (Wolfe 1990, Harper 1921). Although data are lacking for the relationship between soil and fire in South Florida hammocks, it seems likely that the same interrelationship described by Wolfe (1990) for Gulf coast hammocks prevails in the formation of mesic temperate hammocks in the South Florida Ecosystem: where fire protection is complete, mesic hammock will develop regardless of soil type; where soils are fertile, mesic hammock will persist in the presence of fire. Hammocks have been observed to follow soil types rather than natural firebreaks (Harper 1921) and to show ample evidence of past fires (Vince *et al.* 1989). Mesic temperate hammocks in South Florida frequently develop on soils with limestone, marl, or other alkaline material near the surface or directly beneath the subsoil (Duever *et al.* 1979, Huffman and Judd 1998, SWCS 1989).

Hydrology

Mesic hammocks frequently occur on ridges or knolls in a wetland matrix or adjacent to floodplain wetlands. They are therefore vulnerable to alterations in the natural hydrologic regime of the surrounding or adjacent wetland.

Unnatural fluctuations in streamflow, artificially elevated high-water levels, and prolonged hydroperiods may weaken or kill some mesic hammock tree species as well as destroy adjacent wetland communities. An artificially lowered water table may lead to development of another community type or render a mesic hammock vulnerable to catastrophic fire.

Status and Trends

Mesic temperate hammocks, because they occur on well-drained sites, have long been considered ideal home and recreation sites. They have also been heavily logged. As a result, most of Florida's mesic hammocks have been destroyed or exist only as fragments (Austin *et al.* 1977, The Florida Conservation Foundation, Inc. 1989). Relatively intact hammocks remain in State and federally managed areas, but these are also subject to a number of destructive anthropogenic influences.

Exotic Species

As with many of South Florida's natural communities, the natural species diversity and composition in mesic temperate hammocks is threatened by the encroachment of exotic plant species. Exotic species compete with native plant species, including rare and endangered species, for light and nutrients and may completely overwhelm and eliminate entire vegetative strata within a plant community. Florida's Exotic Pest Plant Council (EPPC 1997) has identified the most invasive plant species in Florida, many of which occur in mesic hammocks. Category I species, those that are currently invading native plant communities, that have been observed in mesic temperate hammocks include air potato (*Dioscorea bulbifera*), coral ardisia (*Ardisia crenata*), Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolius*), rosary pea (*Abrus precatorius*), guava (*Psidium guajava*), Japanese climbing fern (*Lygodium japonicum*), punk tree (*Melaleuca quinquenervia*), and tropical soda apple (*Solanum viarum*). Category II species, which have shown a potential to invade and disrupt native plant communities, have also been observed in mesic hammocks. These include caesar weed (*Urena lobata*), bowstring hemp (*Sansevieria hyacinthoides*), shrubby nightshade (*Solanum diphyllum*), tongue tree (*Albizzia lebbek*), and wedelia (*Wedelia trilobata*). A complete list of exotic plant species in this community is contained in Appendix E.

Feral hogs are common in mesic hammocks, where they feed on acorns in the fall and winter or on roots and seedlings in other seasons. Feral hogs pose a threat to native species such as turkey, white-tailed deer, and Florida black bear by intensely competing for mast, particularly during a year of mast failure. Their consumption of acorns, roots, and seedlings interferes with natural regeneration of trees and shrubs. Rooting by hogs severely disturbs soil structure and creates conditions that encourage exotic plant invasion.

Many mesic temperate hammocks on private lands and on public lands that are leased for cattle ranching are degraded by cattle grazing and trampling. As

increasing numbers of acres of native grassland and prairie are converted to pasture, patches of mesic hammock within these larger communities are subject to degradation by cows. Grazing and trampling destroys soil structure, promotes erosion, eliminates native shrub and herb species, girdles and kills saplings, and opens up the hammock to invasion by exotic plants. Cattle also compete with native browsers for food.

Loss of Ecological Connectedness to Adjacent and Surrounding Communities

Mesic temperate hammocks have frequently been isolated from the surrounding prairie, grassland, or marsh by the construction of roads or firebreaks in ecotones. Fire suppression in adjacent communities has led to the invasion of some mesic hammock tree species, usually live oak, into surrounding prairie or grassland, thus destroying the natural ecotone between the two communities. Disruption of natural hydrological regimes by draining or ditching or by excessive pumping of ground water has lowered the water table and shifted species composition in some hammocks toward xeric hammock composition. Dewatering of mesic hammocks has also led to destructive fires (Alexander and Crook 1973).

Excessive Recreational Uses

Mesic temperate hammocks have been favored by hunters, campers, and homesteaders for many years because of their cool, shady conditions. Large areas are cleared of understory vegetation to create hunt camps. Prolonged and frequent use of a hammock for a camp site has adverse effects on understory species and leads to the introduction of exotic species. Negative impacts to wildlife species viewed as pests, such as snakes, raccoons, and opossum, also occur (Duever *et al.* 1979). Mesic hammocks have also been degraded by off-road vehicle use which destroys vegetation and promotes rutting and soil displacement.

Management

Because of its transitional landscape position, generally small area, and low numbers of rare species, mesic temperate hammock has seldom been targeted for restoration. However, this community benefits from efforts to restore natural fire regimes in xeric uplands and hydrological regimes in river corridors and wetlands (refer to these specific community accounts, *i.e.*, scrub, high pine, and forested wetlands, for specific management recommendations). In addition, efforts to ameliorate the impacts of grazing on public lands and to eradicate exotic species have also benefitted mesic hammocks. Conservation land acquisition in Florida has focused on preserving ecosystems, such as Kissimmee Prairie or Big Cypress National Preserve, that often encompass mesic hammock as an ecotone or inclusion and has therefore succeeded in preserving some high-quality examples of mesic temperate hammock. Other protected and managed lands containing mesic temperate hammocks are given in Table 1. Because mesic hammock generally occurs in small, included patches or as ecotones, landscape-level approaches to conservation such as land acquisition, landowner agreements, and conservation easements are needed to preserve this community and its relationships with surrounding communities.

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Restoration of Mesic Temperate Hammock

Restoration Objective: Maintain the structure, function, and ecological processes of mesic temperate hammocks and prevent any further loss or degradation of this community in South Florida.

Restoration Criteria

Given that mesic temperate hammocks occur as ecotonal communities or as “islands” in a larger matrix of another natural community type, restoration of this community type implies protection and restoration of surrounding and adjacent communities.

Mesic temperate hammock may be considered restored when: (1) intact mesic temperate hammocks are protected from further degradation; (2) the effects of disturbance in degraded hammocks are reversed by active management; (3) ecological linkages to adjacent communities are restored and preserved; (4) management can insure the persistence in the wild of species that use mesic temperate hammocks as habitat; (5) invasive exotic species are reduced to non-threatening levels; and (6) landscape-level habitat diversity is restored.

Community-level Restoration Actions

1. **Protect intact mesic temperate hammocks from further degradation.** Recognizing that mesic temperate hammocks occur on the landscape either as included or ecotonal communities, it is critical to protect intact hammocks from both direct impacts and from indirect effects associated with degradation of the surrounding or adjacent communities. The primary tool for protecting mesic hammocks is therefore landscape-level approaches to conservation such as land acquisition, landowner agreements, and conservation easements. These activities will preserve the interrelationship of mesic hammocks with adjacent natural communities, as well as provide opportunities for better control of direct impacts, such as grazing, exotics invasion, vehicle use, and development. Enforcement of laws and regulations concerning trespassing, over-grazing, and wetlands conversion can also be used to protect mesic temperate hammocks on both public and private lands.
2. **Restore existing degraded mesic temperate hammocks by active management.**
 - 2.1. **Restore ecosystem function.**
 - 2.1.1. **Exclude livestock from mesic temperate hammocks.** Grazing and trampling by cattle destroy the herb and shrub layers in mesic hammocks and have long-term consequences for species composition of the canopy. Exclusion of cattle will allow a natural understory to develop.

- 3.2. **Monitor status of native plant and animal species for negative trends and potential extirpations.**
- 3.3. **Maintain natural fire regimes in surrounding and adjacent pyric natural communities.**
- 3.4. **Monitor hydrologic conditions in adjacent and surrounding communities and correct unnatural fluctuations in water levels and hydroperiods.**
- 3.5. **Maintain limits and controls on human use.**
- 3.6. **Monitor and correct for point source and non-point source pollution.**
4. **Research ecological role of mesic temperate hammock.** Mesic temperate hammocks have received very little attention from the scientific community. Their contribution to overall landscape diversity is poorly understood. The importance of this community for providing habitat for threatened and endangered species, particularly animals, has not been studied. These and other issues should be examined.
5. **Provide educational materials to public and private land managers on the ecological importance of mesic temperate hammocks and on management needs and issues.**

