



Blue Creek Ravine, with seepage stream (Alachua County)

Photo by Katy NeSmith

### **Upland Hardwood Forest**

**Description:** Upland hardwood forest is a well-developed, closed-canopy forest dominated by deciduous hardwood trees on mesic soils in areas sheltered from fire. It typically has a diverse assemblage of deciduous and evergreen tree species in the canopy and midstory, shade-tolerant shrubs, and a sparse groundcover. Characteristic canopy trees include southern magnolia (*Magnolia grandiflora*), pignut hickory (*Carya glabra*), sweetgum (*Liquidambar styraciflua*), Florida maple (*Acer saccharum* ssp. *floridanum*), live oak (*Quercus virginiana*), laurel oak (*Q. hemisphaerica*), swamp chestnut oak (*Q. michauxii*), southern hackberry (*Celtis occidentalis*), white ash (*Fraxinus americana*), and loblolly pine (*Pinus taeda*). Species commonly found in Florida Panhandle and northern peninsula but not farther south include American beech (*Fagus grandifolia*), white oak (*Q. alba*), and spruce pine (*Pinus glabra*). The midstory layer is composed of younger canopy species as well as small trees, and tall shrubs, such as American holly (*Ilex opaca*), red bay (*Persea borbonia*), American hornbeam (*Carpinus caroliniana*), gum bully (*Sideroxylon lanuginosum*), devil's walkingstick (*Aralia spinosa*), eastern hophornbeam (*Ostrya virginiana*), flowering dogwood (*Cornus florida*), eastern redbud (*Cercis canadensis*), horse sugar (*Symplocos tinctoria*), American strawberrybush (*Euonymus americanus*), silverbells (*Halesia* spp.), winged elm (*Ulmus alata*), black cherry (*Prunus serotina*), basswood (*Tilia americana*). The groundcover is composed of shade-tolerant herbs, graminoids, and vines, such as partridgeberry (*Mitchella repens*), Virginia creeper (*Parthenocissus quinquefolia*), violets (*Viola* spp.), sedges (*Carex* spp.), sarsaparilla vine (*Smilax pumila*), ebony spleenwort (*Asplenium platyneuron*), woodsgrass (*Oplismenus hirtellus*), and longleaf woodoats (*Chasmanthium laxum* var.

*sessiliflorum*). Trilliums (*Trillium* spp.) can be found in the groundcover in the Panhandle and northern peninsula.

Upland hardwood forest occurs on rolling mesic hills, slopes above river floodplains, in smaller areas on the sides of sinkholes, and occasionally on rises within floodplains. Limestone or phosphatic rock may be near the surface. Soils are generally sandy clays or clayey sands with substantial organic and sometimes calcareous components. These soils have higher nutrient levels than the sandy soils prevalent in most of Florida. The moisture retention properties of clays and layers of leaf mulch conserve soil moisture and create decidedly mesic conditions. The dense canopy and multiple layers of midstory vegetation restrict air movement and light penetration, which maintains high relative humidity within the community.

**Characteristic Set of Species:** flowering dogwood, American beech, southern magnolia, white oak, horse sugar

**Rare Species:** Over fifty species of rare plants occur in upland hardwood forest throughout its range. These include heartleaf (*Hexastylis arifolia*), pygmy-pipes (*Monotropis reynoldsiae*), sweet-shrub (*Calycanthus floridus*), trout lily (*Erythronium umbilicatum*), several species of spiny-pods (*Matelea floridana*, *M. alabamensis*, *M. flavidula*), trailing arbutus (*Epigaea repens*), and the endemic Marianna columbine (*Aquilegia canadensis* var. *australis*). Several animal species reach their southern limit within upland hardwood forest in northern Florida: four-toed salamander (*Hemidactylum scutatum*), copperhead (*Agkistrodon contortrix*), Louisiana waterthrush (*Seiurus motacilla*), American redstart (*Setophaga ruticilla*), worm-eating warbler (*Helmitheros vermivorum*), and eastern chipmunk (*Tamias striatus*).

**Range:** Upland hardwood forest occurs throughout the southeastern coastal plain from the Carolinas to east Texas (Platt and Schwartz 1990). Upland hardwood forest occurs in the Florida Panhandle south to the central peninsula (Schwartz 1988; USFWS 1999). Upland hardwood forest most commonly occurs within the inland portions of the state.

**Natural Processes:** Light gap succession is the driving force behind tree recruitment in upland hardwood forest and can happen at many different scales from single tree sized gaps to larger canopy openings (Clewell 1986; Platt and Schwartz 1990). Localized damage from low intensity, naturally occurring fires that creep into the forest edges from surrounding pyrogenic upland communities (e.g., upland pine, sandhill) appears to be a natural part of the forest dynamics of upland hardwood forest; however, fires rarely burn completely through the understory, and even less frequently lead to crown or devastating fires (Batista and Platt 1997). Hurricanes are another irregular natural process by which the canopy opens and the forest canopy regenerates (Batista and Platt 1997).

**Community Variations:** Geographic differences in species composition can be noted through the range of this community. Upland hardwood forest of the Panhandle support several herbaceous species that are more common north of Florida, including woodland pinkroot (*Spigelia marilandica*), bloodroot (*Sanguinaria canadensis*), heartleaf (*Hexastylis arifolia*), May apple (*Podophyllum peltatum*), and several species of trilliums (*Trillium underwoodii*, *Trillium decipiens*). In the peninsula, the proportion of evergreens tends to increase and species richness in the canopy decreases as northern

deciduous species (e.g. American beech, white oak) reach their southern limits (Greller 1980; Platt and Schwartz 1990).

Upland hardwood forest is generally considered a mesic forest. However it may occur along a wide range of moisture conditions such as along upper slopes and ecotones along upland communities where it can be dominated by species tolerant of drier conditions (e.g., laurel oak, live oak). Upland hardwood forest occurring in the Mariana Lowlands (e.g., Florida Caverns State Park) is noted for its calcareous slopes and prominent limestone outcrops on rich clayey soils, and abundance of northern spring ephemeral species (Mitchell 1963; Platt and Schwartz 1990). Upland hardwood forest species can invade pyrogenic communities where fire is excluded; however the forests that develop in this manner have a mixed species composition representing both community types (Clewell 1986). Upland mixed woodland may develop in the ecotone of upland hardwood forest and adjacent sandhill or upland pine in the Panhandle and northern peninsula.

One common variant of upland hardwood forest occurs within Florida.

Variant: DRY UPLAND HARDWOOD FOREST – Occurring along upper slopes of upland hardwood or slope forest, on sandy ridges within more mesic upland hardwood forest, and mostly found in the northern peninsula where upland hardwood forests tend to be drier. This drier and more evergreen forest is dominated by laurel oak in the canopy and also includes live oak, pignut hickory (*Carya glabra*), southern magnolia, wild olive (*Osmanthus americanus*), Carolina laurelcherry (*Prunus caroliniana*), the rare Arkansas oak (*Quercus arkansana*), sparkleberry (*Vaccinium arboreum*), and horse sugar. This variant is distinguished from upland mixed woodland by its closed, evergreen canopy of laurel oak rather than an open mixed canopy of pines and deciduous species such as southern red oak (*Quercus falcata*) and sand post oak (*Quercus margaretta*). This variant may have a live oak component in the canopy but is not dominated by live oak; those forests dominated by live oak are usually better classified as mesic hammock.

**Associated Communities:** Upland hardwood forest often is associated with and grades into upland pine, slope forest, bottomland forest, or hydric hammock. Upland hardwood forest and slope forest are very similar community types which share characteristic species (e.g., American beech, southern magnolia, white oak) and forest structure. Upland hardwood forest differs from slope forest primarily by its lack of the abundance and high diversity of rare species characteristic of slope forest (e.g., Florida torreyia [*Torreya taxifolia*], fringed campion [*Silene polypetala*], Florida yew [*Taxus floridana*]; see slope forest). Upland hardwood forest differs from mesic hammock by the presence of northern deciduous species in the canopy and subcanopy (e.g. Florida maple, white oak, white ash, swamp chestnut oak), a lack of cabbage palm (*Sabal palmetto*) and saw palmetto (*Serenoa repens*), and a typically diverse canopy that is not dominated by live oak. Upland hardwood forest located in Central Florida, at the southern end of its range (particularly along the Brooksville Ridge), is often difficult to distinguish from mesic

hammock as there is a greater overlap of species in this geographic area. Upland hardwood forest differs from hydric hammocks in that the latter generally occupy lower, flat topography, are dominated by hydrophytic species, and lack American beech and white oak. Upland hardwood forests often contain limestone outcrops.

**Management Considerations:** Upland hardwood forest often occurs near streams, creeks, and rivers and can provide watershed protection (SCS 1989). Common disturbances include logging, development, foot or vehicular traffic, and feral hog rooting. Unsightly refuse dumps are frequently located in upland hardwood forests. This refuse can bury or damage vegetation and impact stream water quality.

Damage from invasive exotic plants and animals is a common problem in upland hardwood forest. Plant species that often invade these forests include coral ardisia (*Ardisia crenata*), Chinese privet (*Ligustrum sinense*), camphor tree (*Cinnamomum camphora*), Japanese climbing fern (*Lygodium japonicum*), and heavenly bamboo (*Nandina domestica*). Feral hog (*Sus scrofa*) foraging (rutting) damages soil and vegetation, may interfere with forest regeneration, and can lead to erosion problems, especially on slopes.

**Exemplary Sites:** Florida Caverns State Park (Jackson County), Wakulla Springs State Park (Wakulla County), Ichetucknee River State Park (Columbia County), Withlacoochee State Forest (Hernando County)

**Global and State Rank:** G5/S3

**Crosswalk and Synonyms:**

Kuchler	112/Southern Mixed Forest
Davis	4/Mixed Hardwoods and Pines 12/Hardwood Forests
SCS	11/Upland Hardwood Hammocks 15/Oak Hammocks
Myers and Ewel	Temperate hardwood forests
SAF	76/Shortleaf Pine - Oak
FLUCCS	431/Beech - Magnolia 434/Hardwood - Conifer Mixed 438/Mixed Hardwoods

Other synonyms: upland mixed forest in part (FNAI and FDNR 1990), southern mixed hardwood forest (Batista and Platt 1997), mesic hardwood forest (Mitchell 1963)

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