



Apalachee Wildlife Management Area (Jackson County)

Photo by Amy Jenkins

Upland Mixed Woodland

Description: Upland mixed woodland has an open to partially closed canopy of southern red oak (*Quercus falcata*), mockernut hickory (*Carya alba*), post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), and black oak (*Quercus velutina*), and shortleaf and/or longleaf pines (*Pinus echinata*, *P. palustris*). Pignut hickory (*Carya glabra*) and white oak (*Quercus alba*) may also be present. The subcanopy includes widely spaced flowering dogwood (*Cornus florida*), sparkleberry (*Vaccinium arboreum*), rusty blackhaw (*Viburnum rufidulum*), sassafras (*Sassafras albidum*), and hawthorns (*Crataegus michauxii*, *C. pulcherrima*). There is a dense ground layer of many species of grasses, forbs, and coppicing hardwoods. Typical ground layer species include New Jersey tea (*Ceanothus americanus*), eastern poison ivy (*Toxicodendron radicans*), eastern poison oak (*Toxicodendron pubescens*), little bluestem (*Schizachyrium scoparium*), slender bluestem (*Schizachyrium tenerum*), yellow indiagrass (*Sorghastrum nutans*), silver plumegrass (*Saccharum alopecuroides*), variable witchgrass (*Dichantherium commutatum*), dogtongue wild buckwheat (*Eriogonum tomentosum*), and oblongleaf twinflower (*Dyschoriste oblongifolia*), as well as many legumes (*Lespedeza* spp., *Desmodium* spp., *Tephrosia virginiana*) and composites (*Ageratina jucunda*, *Liatris graminifolia*, *Solidago* spp.).

Upland mixed woodland occurs on loamy soils on drier sites than upland hardwood forest and is often found in the ecotone between upland hardwood forest and frequently burned

sandhill or upland pine where fires burn into the hardwood forest edge. Its dominant hardwood species are more resistant to fire than are those in the upland hardwood forest and less resistant than those of the sandhills (Harper 1914).

Characteristic Set of Species: southern red oak, mockernut hickory, post oak, shortleaf pine, longleaf pine, flowering dogwood

Rare Species: Rare plants in upland mixed woodland include Flyr's brickell-bush (*Brickellia cordifolia*), Florida spiny-pod (*Matelea floridana*), gentian pinkroot (*Spigelia gentianoides*), and Bluffs blazing star (*Liatris gholsonii*). Rare animal species found in this community include Sherman's fox squirrel (*Sciurus niger shermani*) and two invertebrates, a beetle, *Mycotrupes cartwrighti*, currently known only from the Tallahassee Red Hills area, and a rare butterfly, the golden-banded skipper (*Autochthon cellus*) whose food plant, American hogpeanut (*Amphicarpaea bracteata*), is found in this community.

Range: Upland mixed woodland is found in only a limited area in northern Florida from Jackson to Marion counties (Harper 1914; Harper 1915) and extends a short way into southeastern Georgia (Wharton 1978). Its range largely follows the extent of older uplands in Florida where Plio-Pleistocene sediments near the surface give rise to richer soils, containing more clay, than the usual sandy soils found in most of the state. Much of the former area in upland mixed woodland has long been in cultivation, with only fragments remaining today, and its range has had to be reconstructed from historical accounts (Clewell 1980; Clewell 1986). Harper (1914) lists the dominant species of this community in five of the regions he maps for northern Florida which extend in a northward-curving arc from Jackson County through Liberty, Leon, Jefferson, Madison, Hamilton, Columbia, and Alachua counties, to the vicinity of Ocala in Marion County. Except possibly in the Tallahassee Red Hills area of Leon County, where it may have been the predominant cover over large areas (Kurz 1944; Clewell 1980; Burks 1992; Schwartz 1994), upland mixed woodland occurs primarily in ecotones between sandhill or upland pine and upland hardwood forest (Harper 1915; Harper 1921; Hubbell et al. 1956; Dunn 1982; Knight 1986; FNAI and Chicardi 1993; Herring and Judd 1995; Tan and Judd 1995).

Outside Florida, similar pine-oak-hickory communities have been described in Texas (Schafale and Harcombe 1983; Harcombe et al. 1993), Louisiana (Delcourt 1976), western Arkansas (Sparks et al. 1998), and the southern Piedmont (Ware et al. 1993; Skeen et al. 1993). These communities differ somewhat from those in Florida in containing more mesic (white oak, sweetgum [*Liquidambar styraciflua*]) or northern (northern red oak [*Quercus rubra*]) species, but tend to occur in similar situations between drier pine-dominated forests and more mesic hardwood forests. Several lines of evidence, including witness trees noted in General Land Office surveys, reconstruction of stand history from age structure all trees in a stand, and old forest maps, suggest these communities were present in presettlement times and are not the result of logging disturbance (Delcourt 1976; Schafale and Harcombe 1983; Harcombe et al. 1993).

Upland mixed woodland occurs on loamy sands or fine sandy loams, e.g., Orangeburg, Lochloosa, and Kendrick soils (Clewell 1986; FNAI and Chicardi 1993). These soils are

richer in phosphorus, potassium, and calcium than most Florida soils and often contain phosphatic pebbles (Thomas et al. 1979).

Community Variations: The canopy dominants are found throughout the range of this community, with the exception of shortleaf pine which does not range southward to Alachua or Marion Counties where it is replaced by longleaf pine

Natural Processes: Since upland mixed woodland has not recently been recognized as a distinct community in Florida, little research has been done on the effects of fire in it (although fairly extensive research has been done outside Florida. There is evidence in Florida from charcoal accumulation that fires started in the drier and more flammable sandhill or upland pine community and burned into the upland mixed woodland before extinguishing in the moist litter of the more heavily shaded upland hardwood forest (Monk 1960). Harper (1943) surmised that upland mixed woodland naturally burned less frequently than the adjoining longleaf pine and wiregrass communities, perhaps every 10 years, and other authors have proposed fire intervals of one to two decades (Platt and Schwartz 1990). Recent research in other states suggests, however, that this is too long an interval. Ware et al. (1993) cite 5-10 years as an interval for mixed pine oak forest in the piedmont. In the Upper Coastal Plain of Arkansas a similar pine-oak-hickory woodland community is managed with 3 year fire intervals (Sparks et al. 1998). An upland mixed woodland at Tall Timbers Research Station in the Florida Panhandle is burned on a 2 year interval and supports a high diversity of native herbaceous plants, while maintaining the hardwood component (Robertson, pers. comm. 2007).

Associated Communities: Upland mixed woodland is distinguished from sandhill and upland pine by the absence, or low cover of, turkey oak (*Quercus laevis*) and wiregrass (*Aristida stricta* var. *beyrichiana*), and the co-dominance of mockernut hickory and southern red oak with pines. It can be distinguished from upland hardwood forest by the absence or near absence of such mesic hardwoods as American beech (*Fagus grandifolia*) and southern magnolia (*Magnolia grandiflora*) and the presence of longleaf and/or shortleaf pines, southern red oak, mockernut hickory, and a diverse ground layer dependent on relatively high light intensity.

Management Considerations: Upland mixed woodland probably burned at longer intervals than adjoining sandhill and upland pine, so prescribed fires in the latter to burn into these bordering areas and naturally extinguish would probably be sufficient to maintain them. Where fire-sensitive hardwoods, such as laurel oak (*Quercus hemisphaerica*), sweetgum, and water oak (*Quercus nigra*), have invaded upland mixed woodland in the absence of fire and grown to (fire-proof) tree size, mechanical removal of these invading species may be necessary to open up the canopy and allow light to reach the ground layer.

There is some question as to whether the occurrence of upland mixed woodland is determined by fire frequency alone or by some other factor in the physical environment. One recent study in the Tallahassee Red Hills area found that depth to the Bt soil horizon was smaller and mineral nutrients and pH higher in stands of upland mixed woodland than in stands dominated by longleaf pine and wiregrass (Tall Timbers Research Station 2007).

Reference Sites: Three Rivers State Park and Apalachee Wildlife Management Area (Jackson County), Elinor Klapp Phipps Park (Leon County), Tall Timbers Research Station (Leon County) Wakulla Springs State Park (Wakulla County), Ichetucknee Springs State Park (Suwannee/Columbia Counties), O’Leno State Park (Columbia County), San Felasco Hammock Preserve State Park (Alachua County)

Global and State Rank: G2/S2

Crosswalk and Synonyms:

Kuchler	112/southern mixed forest
Davis	4/forests of mixed hardwood and pine; 6/forests of longleaf pine and xerophytic oaks
SCS	5/mixed hardwood and pine
Myers and Ewel	temperate hardwoods – high hammock zone
SAF	76/shortleaf pine-oak; 82 loblolly pine-hardwood
FLUCCS	414/pine-mesic oak; 423/oak-pine-hickory
Whitney	Temperate hardwood hammock

Other synonyms: southern red oak forest (Dunn 1982), red oak woods (Harper 1915), hardwood-pine woodlands (Burks 1992), shortleaf pine-oak-hickory (Delcourt 1976), upland pine (in part; Florida Natural Areas Inventory and Chicardi 1993), 83-broadleaf deciduous-needleleaf evergreen upland forest (Wharton 1978)

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