Appendix A
Society of American Foresters
Cover Type Descriptions

The cover type descriptions listed in this manual for bottomland hardwoods are from Society of American Foresters (SAF) publication, "Forest Cover Types of the United States and Canada," reprinted verbatim with permission from Eyre, 1980. Numbers listed below the cover types refer to the classification system used by the SAF. For a more complete list of forest cover types or for scientific names of the common names used in the cover type descriptions, please see Eyre, 1980.

River Birch–Sycamore
61

Definition and composition. River birch and sycamore, commonly found along rivers and streams in eastern North America, may be recognized as a type when occurring together as dominants in floodplain or bottomland forests. River birch usually has the greater density of stems, but sycamore may be more conspicuous because of its generally greater size and many stem sprouts (Fowells 1965). The type is of minor importance in its contribution to forest cover except in relatively narrow bands of about 30 m (100 ft.) on frequently flooded, moist alluvial soils.

Associated tree species may include black willow at the edge of the river, and farther back, other flood-tolerant species such as sweetgum, cottonwood, red maple, silver maple, boxelder, hackberry, American elm, slippery elm, walnut, and butternut. Mesophytic species such as sugar maple, yellow-poplar, white oak, overcup oak, loblolly pine, and Virginia pine from adjacent terraces and uplands may appear in the community.

Geographic distribution. The type occurs sporadically where the ranges of the two species overlap. Generally, this is a region that extends from northeastern Florida west to eastern Texas, north to southern Illinois, east through southern Ohio, and then northeast into parts of southern New England (Little 1971). In combination with other bottomland types river birch-sycamore occurs primarily along rivers and streams and occasionally on wet lake margins. The type has been reported at an elevation of 457 m (1,500 ft.) in the southern Appalachian Mountains (Allen R. Bateson 1978, personal communication) and may occur as high as 762 m (2,500 ft.).

Ecological relationships. The position of the type adjacent to rivers and streams suggests that it appears early in the establishment of floodplain vegetation and follows pioneer species such as black willow. However, either or both species may occur in the absence of a willow border (Wistendahl 1958). Seedling establishment and survival are more closely associated with flooding patterns and with the absence of competition for light from other bottomland and floodplain species than with a rigid successional sequence. Although tolerant of periods of soil saturation, both species grow best in the generally moist but periodically drained sandy alluvium of natural levees, where litter accumulation is sparse and there is direct light.

River birch may form almost pure stands along streams flooded by acidic water where a consequential increase in dissolved aluminum is toxic to associated species but not to river birch (Cribben and Ungar 1974).

The occurrence of river birch and sycamore together in numbers sufficient to be recognized as a type is probably fortuitous and dependent on seed dispersal at a time when bare soil (deposited by floods or exposed by erosion) is available for seedling establishment. Flooding kills many seedlings. River birch seed germinate in large numbers soon after dispersal in late spring or early summer, whereas sycamore seed are dispersed in the fall but germinate the following spring (Forest Service, USDA, 1948). Flooding subsequent to these times reduces seedling density of one or the other or both species.

Variants and associated vegetation. The relative proportion of each species in a given stand varies greatly. In areas affected by acid mine water drainage, the type may be composed of but six or fewer species of trees, with river birch comprising 90 percent or more of the stem density. Elsewhere, a greater mix of species (12 or more) may be found, with river birch having approximately half of the total stem density. In such stands the density of sycamore stems is generally less than 10 percent (Cribben and Ungar 1974).

Locally within any stand river-bank grape or winter grape may be abundant. Poison-ivy occurs on disturbed, open sites. Few shrubs are present, but small trees such as common (hazel) alder, American bladdernut,

and American hornbeam may form a dense understory. Herbaceous plants are highly diverse and are abundant seasonally, especially spotted touch-me-not and wood-nettle.

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Silver Maple–American Elm
62

Definition and composition. Silver maple and American elm are the majority species in this type, although the proportion of either depends on the history of the stand. Major associates may include sweetgum, pin oak, swamp white oak, eastern cottonwood, sycamore, green ash, and other moist-site hardwoods, according to the region.

Geographic distribution. The type is common throughout the central forest region of the United States and in the deciduous southern portion of the Great Lakes-St. Lawrence forest region of Canada. It occurs primarily on well-drained moist sites along river bottoms and floodplains and beside lakes and larger streams. This type is only sparingly represented along the East Coast and is absent at the high elevations in the Appalachians. It is most common in the Ohio, Wabash, upper Mississippi, and Missouri river valleys of the United States and in the floodplains of southern Ontario.

Ecological relationships. Silver maple–American elm is generally regarded as a subclimax type in the portion of its range in the United States, following cottonwood and willow, and as a climax type in the portion of its range in southern Ontario, where it regenerates in willow and red-osier dogwood thickets. Small pockets may sometimes develop as pioneer succession on abandoned agricultural lands on floodplains. The type is more common on organic soils than on medium- to fine-textured mineral soils; rarely does it occur on clays and gravels.

Variants and associated vegetation. A variant, silver maple–American elm–pin oak–sweet gum, is found in sloughs and well-drained benches along major streams in southern Illinois and southern Indiana (Telford 1926). In southern Ontario the type generally consists of a mixture of silver maple, American elm, green ash, and eastern cottonwood in varying proportions. However, in the washboard swamps where high and low ground is intermingled the type often includes such species as red maple, basswood, black walnut, black cherry, black gum, hackberry, and boxelder. The understory may include willow, redberry elder, red-osier dogwood and greenbriar. The ground cover mainly consists of wood-nettle, jewelweed, poison-ivy, ferns, sedges, cardinal-flower, Joe-pye-weed, swamp milkweed, and boneset.

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Cottonwood
63

Definition and composition. Cottonwood is pure or comprises a majority of the stocking, but it is associated with other bottomland hardwoods. Eastern, plains, and swamp cottonwood are included under the type name. The chief associates in the younger stages are black and sandbar willow. Sweetgum is rare. White or green ash, silver maple, and American elm may occur in the northern extremities of the type and pecan, sycamore, and sugarberry in the southern.

Geographic distribution. The type is characteristic of the fronts or banks of all major streams in the central and southern forests. It is found along major streams of the Great Plains, but particularly within the Mississippi, Ohio, and Missouri river systems. Along the East Coast, cottonwood as a type occurs only in small groups along river and stream bottoms.

Ecological relationships. Cottonwood is a temporary, pioneer type capable of phenomenal growth. Along with the willows, it establishes itself wherever moist, bare soil is available: on newly made sandbars, front land ridges, and well-drained flats, and occasionally on abandoned fields on well drained ridges in the first bottoms. Where cottonwood and willow occur together, cottonwood outgrows willow and eventually becomes dominant unless frequent and extended flooding during the growing season covers the trees and only willow survives. Sites commonly silt in during the life of the stand, with possible elevation changes as great as 6 m (20 ft.), though the increment from any one flood may range from only 2.5 cm (1 in.) to .9 to 1.5 m (3 to 5 ft.). Cottonwoods and willow are relatively short lived and cannot regenerate under shade. Invaders in the next successional stage are sycamore, pecan, sugarberry, hackberry, river birch, green ash, American elm, silver maple, red maple, and boxelder. As soils build up and willows and cottonwoods drop out, succession in the central forest usually passes to the silver maple–American elm type or to boxelder, and in the southern forest to sycamore–sweetgum–American elm, sugarberry–American elm–green ash, or boxelder. The cottonwood type merges with the cottonwood–willow type in the Great Plains area.

Variants and associated vegetation. Common understory tree species are boxelder, sugarberry, red maple, silver maple, American elm, red mulberry, roughleaf

dogwood, and swamp-privet. Undergrowth may consist of stinging nettle, pokeweed, poison-ivy, greenbrier, trumpet creeper, peppervine, dewberry, and grape. Herbs may or may not be present, depending on how dense the overstory is and how long flood waters cover the ground during the growing season.

Levee systems and stream channelization have restricted the area available for formation of the cottonwood type.

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Pin Oak–Sweetgum
65

Definition and composition. Pin oak and sweetgum form the majority of trees in the overstory, although the proportion of each varies according to geographic location and edaphic factors. Associates may include red maple, American elm, blackgum, swamp white oak, willow oak, overcup oak, bur oak, green ash, Nuttall oak, swamp chestnut oak, white oak, and shellbark and shagbark hickories.

Geographic distribution. This forest cover type occurs in the Ohio River Valley and tributaries from West Virginia through southwestern Ohio, southern Indiana, southern Illinois, Kentucky (except the eastern mountains), and in the western two-thirds of Tennessee. It extends southward in the central Mississippi River Valley from southeastern Missouri to central Arkansas and western Tennessee and through central Arkansas in the Arkansas River Valley (Telford 1926, Chapman 1942).

Ecological relationships. In broader stream valleys the type occurs on clay flats and in depressions where shallow water accumulates during the winter, and on clay ridges of first bottoms (Putnam and Bull 1932; Braun 1936,1950; Kilkus 1977). The type is rare, however, on the most poorly drained sites and does not occur where inundation is permanent. It also occurs in old fields on poorly drained, impervious wet uplands of the Illinoian till plain, but pure pin oak stands much more commonly occupy these sites, which comprise the "pin oak flats."

The pin oak–sweetgum type is an early successional stage in the regrowth of bottomland forests, although it was common in the original forests and may persist for prolonged periods on poorly drained sites (Braun 1936). Where drainage is better sweetgum will remain as a component of later successional phases whereas pin oak is the first to disappear with further successional development. In southwestern Ohio where sweetgum and red maple are abundant in the initial regrowth phase, beech follows in the intermediate phase; where pin oak is more abundant in the initial phase, white oak follows (Braun 1936). Similar patterns probably do not develop in the western and southern portions of the range of this type.

Variants and associated vegetation. The proportion of sweetgum to pin oak increases from north to south and from wetter sites to drier, and nearly pure stands of each species may occur accordingly. In central Arkansas this type may grade into sweetgum–willow oak as the southern range limit of pin oak is reached. In the north, variants include white oak–pin oak–sweetgum (an intermediate successional stage), pin oak–American elm, pin oak–red maple, red maple–American elm–sweetgum, and pure pin oak. In the lower Ohio and central Mississippi valleys, pure pin oak stands are more abundant than mixed pin oaks and sweetgum (L.S. Minckler 1978, personal communication). Shrubs and small trees, if present, may include blue beech (American hornbeam), deciduous holly (possumhaw), poison-ivy, and trumpet creeper. The herbaceous stratum is well developed only in more open stands and includes numerous sedges and grasses (Braun 1936, Voigt and Mohlenbrock 1964).

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Willow Oak–Water Oak–Diamondleaf (Laurel) Oak
88

Definition and composition. The three species together comprise a majority of the stocking, but the proportion of each may vary widely depending on site and location. The associated tree species may include Nuttall oak, red maple, green ash, sweetgum, swamp hickory, honeylocust, and, on the wetter sites, water hickory, waterlocust, and overcup oak. On better-drained areas, spruce pine loblolly pine, swamp chestnut oak, and cherrybark oak may be found in the association.

In his checklist, Little (1979) does not recognize a difference between diamondleaf oak and laurel oak, but in the past diamondleaf has been given the status of both a variety and a separate species (*Q. obtusata* Ashe.) (Sargent 1965). Those who favor separate species status point out that there are not only recognizable anatomical differences but also vast differences in site preference. Specimens first recognized as *Q. laurifolia* occur on deep, well drained soils such as the sandy banks of streams, whereas diamondleaf oak occurs on poorly drained flat sites.

Geographic distribution. The type is found in the Coastal Plain from southeastern Virginia to western Florida and through the Gulf States into the pine region of eastern Texas. It also extends into southeastern Oklahoma and southern Arkansas. The type is most abundant in Louisiana, southern Mississippi, and south central Alabama.

Ecological relationships. The type is most common on alluvial floodplains. It occupies relatively poorly drained, flat sites. Where drainage is unusually poor, diamondleaf oak makes up most of the stand, sometimes forming almost pure stands. As elevation increases and drainage improves, the willow and water oak component increases. Of the two, water oak usually occupies the somewhat better drained areas. Topographically, the type is usually located between the swamp chestnut oak–cherrybark oak type on the better-drained sites and the overcup oak–water hickory type on the poorer-drained sites. The type may also occur on terrace flats and poorly drained flatwoods sites and is often referred to as "oak glades" or "pin oak flats." It probably represents a topographic/edaphic climax, but when it is heavily cut, species such as sugarberry, green ash, American elm, and red maple may capture the site, at least temporarily.

Variants and associated vegetation. In the Mississippi River drainage, especially north of Vicksburg, the type is replaced by sweetgum–Nuttall oak–willow oak, which occupies sites similar to those of Type 88 in other drainages. In areas elsewhere than the Delta of the Mississippi, diamondleaf may gradually be replaced by Nuttall oak as the northern range of the type is approached. Some common understory components are poison-ivy, grape, Alabama supplejack (rattan), and greenbriers.

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Live Oak
89

Definition and composition. Live oak typically comprises a majority of the stocking and on coastal ridges it may be pure. Common associates are water oak and southern magnolia. On sites less well drained, sugarberry, American elm, and green ash accompany live oak.

Geographic distribution. The live oak type occurs in southern Louisiana and southwestern Mississippi on natural levees or "frontlands" and on islands within marshes and swamps.

Ecological relationships. Elevation of the frontlands where live oak is present has been determined by the flood height of the river that deposited the silt. Width of a live oak forest belt varies; at a minimum it may be only 100 m (a few hundred feet) wide or even less, and at a maximum usually under 1.6 km (less than a mile). In many places the belt becomes narrower with time as the land subsides and man-made levees prevent further flooding and silting.

The silt soils that support live oak forests represent some of the best agricultural land in the region, and much has been cleared for that purpose. Nonetheless, there are abandoned fields in the New Orleans area that have regrown to forests now about 73 years old (Bonck and Penfound 1945, Penfound and Howard 1940). The sequence is as follows: annual and perennial weeds occupy the fields for about five years, after which shrubs, especially southern bayberry (waxmyrtle) and roughleaf dogwood, begin to take over. By 25 years the shrub community approximates a young forest, but live oak seedlings begin to appear and seem destined to grow into a typical live oak forest in another 50 years.

Live oak grows on uplands but not as a majority species. Several salt domes that rise 30 to 180 m (100 to 600 ft.) above marshes in southwestern Louisiana have good soil and a climate comparable to that where live oak forests grow. However, the domes support a mixed angiosperm forest, with live oak in mixture with southern magnolia, white basswood, and American beech. Live oak here is in the majority only where planted.

Variants and associated vegetation. Variation in tree composition is due to differences in drainage that result from an elevation change of only about 1 m (a very few feet). Shrubs in the live oak forest usually include dwarf palmetto, yaupon, American elder; vines are Alabama supplejack, grape, poison-ivy, and Virginia creeper; and herbs are oak forest grass and *Tradescantia* (spiderwort).

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Swamp Chestnut Oak–Cherrybark Oak
91

Definition and composition. Swamp chestnut oak and cherrybark oak together usually constitute a majority of the stocking, but when many species are in mixture, they may comprise only a plurality. Prominent hardwood associates are the ashes (green and white) and the hickories (shagbark, shellbark, mockernut, and bitternut), as well as white oak, Delta post oak, Shumard oak, and blackgum. Sweetgum may occasionally be of high importance on first bottom ridges. Minor associates include willow oak, water oak, southern red oak, post oak, American elm, winged elm, water hickory, southern magnolia, yellow-poplar, beech, and occasionally loblolly and spruce pines.

Geographic Distribution. Small areas of the type are scattered over a large part of the South within the floodplains of the major rivers, except that of the Mississippi, where the type is rare.

Ecological relationships. The type occurs on the highest first-bottom ridges in the terraces on the best,

most mature, fine sandy loam soils, and also on first-bottom ridges on a few well drained soils other than sandy loam. The site is seldom covered with standing water and rarely, if ever, overflows, though it may be hummocky and wet between hummocks. Swamp chestnut oak–cherrybark oak succeeds sycamore–sweetgum–American elm on the ridges in the terraces. Typically it is climax on older alluvium (Putnam et al. 1960). Site indexes at 50 years range from 80 to 100 for swamp chestnut oak and from 95 to 115 for cherrybark oak (Broadfoot 1976).

Variants and associated vegetation. The type most commonly occurs adjacent to the sycamore–sweetgum–American elm type and to beech–southern magnolia stands (formerly recognized as type No. 90). Among the subordinate tees and undergrowth are painted buckeye, pawpaw, American hornbeam, flowering dogwood, dwarf palmetto, Coastal Plain willow, American snowbell, southern arrowwood, possumhaw, devils walking-stick, eastern redbud, and American holly.

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Sweetgum–Willow Oak
92

Definition and composition. Sweetgum and willow oak comprise a plurality of the stocking, with sweetgum essentially the key species. Willow oak may be superseded by water oak in the southernmost range of the type. Sugarberry, green ash, American elm, and Nuttall oak are major associates, especially on slightly lower elevations. Minor associates are overcup oak, water hickory, cedar elm, eastern cottonwood, laurel oak, red maple, honeylocust, persimmon and, rarely, baldcypress. The type was formerly named sweetgum–Nuttall oak–willow oak (SAF 1954).

Geographic distribution. The type is widespread in the alluvial floodplains of major rivers in Arkansas, Louisiana, Mississippi, Alabama, eastern Missouri, and eastern Texas. Most extensive stands are in the Mississippi River delta.

Ecological relationships. The type perpetuates itself on first-bottom ridges and terrace flats, except in deep sloughs, swamps, and the lowest flats. Usually it is interspersed with the sugarberry–American elm–green ash type and the overcup oak–water hickory type. Elsewhere, heavy cutting usually increases the sweetgum component because of that species' sprouting characteristics. The sprouts grow rapidly early and continue growing well on sites where this type occurs. On transitional sites, the sweetgum–willow oak type is usually superseded by the sugarberry–American elm–green ash type. Major reasons are the oak's insufficient acorn crops, poor seedling establishment, and very slow early growth.

Variants and associated vegetation. The type becomes predominantly sweetgum on well-drained first-bottom ridges and pervious silty clays on terrace flats. It is predominantly willow oak combined with water oak on clay soils on first-bottom ridges and better drained flats and on poorly drained terrace flats. Nuttall oak dominates on well-drained, first-bottom flats. Willow oak prevails on first bottom ridges and poorly drained terrace flats. Near the Gulf Coast, laurel oak dominates. A cedar elm–water oak–willow oak variant occurs on poorly drained impervious soils on low, indistinct or flattened first-bottom ridges; this variant is also of minor importance on certain impervious terrace sites, amounting to high, shallow flats.

Understory species are sugarberry, green ash, oaks, red maple, and red mulberry. Undergrowth includes greenbrier, dwarf palmetto, and several vines—redvine, peppervine, trumpet-creeper, and poison-ivy.

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Sugarberry–American Elm–Green Ash
93

Definition and composition. The type species sugarberry, American elm, and green ash together constitute a plurality of the stocking. Hackberry replaces sugarberry in the northern part of the range. Major associates include water hickory; Nuttall, willow, water, and overcup oaks; sweetgum; and boxelder. Other associated species are cedar and winged elm, blackgum, persimmon, honeylocust, waterlocust, red and silver maple, American sycamore, and eastern cottonwood.

Geographic distribution. The type is found throughout the southern forests from east Texas to the Atlantic, from the Gulf Coast to southern Illinois. It is found within the floodplains of the major rivers.

Ecological relationships. The type is usually located in transitional areas between the sweetgum–willow oak type, which occupies higher elevations, and the overcup oak–water hickory type, which occurs at the lower elevations. lt occupies low ridges, flat, and sloughs in first bottoms; terrace flats and sloughs; and occasionally new lands or fronts. Rarely does it occur on maltreated terrace ridges. It may be found on clay or silt loam soils, and it tends to be long term in the successional scale. The type species are all shade tolerant when small and reproduce readily. All three, but especially green ash, sprout prolifically.

Variants and associated vegetation. Occasional small stands of pure green ash may occur almost anywhere within the type, but most notably on moist flats or in shallow sloughs. Stands composed predominantly of sugarberry occur on new land or front sites.

The understory commonly includes sugarberry, ash, elm, water hickory, Nuttall oak, overcup oak, red maple, roughleaf dogwood, hawthorn possumhaw, and red mulberry. Undergrowth includes several vines—trumpet-creeper, peppervine, redvine, rattan (Alabama supplejack), Carolina moonseed, Virginia creeper, grape, and poison-ivy. Herbaceous plants include bedstraw, violet, wild carrot, wild lettuce, amsonia, mint, legumes, sedge, smartweed, and false indigo. When openings are created in the stands, a heavy growth of annual grasses and cocklebur may occur.

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Sycamore–Sweetgum–American Elm
94

Definition and composition. American sycamore, sweetgum, and American elm together comprise a plurality of the stocking, but composition varies widely from mixed stands to nearly pure stands of one of the type species. The type includes the river front species-site type described by Putnam et al. (1960), which occurs on the banks or front land of major rivers in the southern forest. The most common associated species are green ash, sugarberry (and hackberry in the northern Mississippi River Valley), boxelder, silver maple, cottonwood, black willow, water oak, and pecan. This type was formerly designated sycamore–pecan–American elm (SAF 1954).

Geographic distribution. Sycamore–sweetgum–American elm occurs as scattered stands throughout the southern forest region (exclusive of Florida). This area includes the southeastern Coastal Plain (Delaware to Georgia), the Gulf Coastal Plain (Alabama to Texas and north to southern Arkansas and southeastern Oklahoma), and the Mississippi River floodplain (Louisiana to southern Missouri). The type is also present in the lower Ohio River Valley and its lower tributaries, and in the Piedmont and Cumberland plateaus, and adjacent areas.

Ecological relationships. The type occupies river fronts in the first bottoms of major rivers, the banks of smaller rivers and large creeks that flood, and occasionally branch heads and coves of small creeks. Slightly elevated sites with somewhat poorly drained to well-drained silty soils of alluvial origin characterize the river fronts (Broadfoot 1976). In small creek bottoms the type occurs on nonalluvial soils that are usually coarser textured. The soils of both kinds of sites typically are rich, with moderately good drainage, and have adequate moisture throughout the growing season. Site indexes at 50 years range from 100 to 130 for sycamore and 90 to 120 for sweetgum (Broadfoot 1976).

The type succeeds the cottonwood type on river front sites, but may pioneer on heavily cut over sites or old fields in either river bottoms or small creek bottoms. Where repeated disturbances such as floods occur, the type may represent a persistent subclimax, but the climax on these sites will be swamp chestnut oak–cherrybark oak or sweetgum–willow oak.

Variants and associated vegetation. Sycamore–pecan–American elm variant is found on river fronts in the Mississippi River Valley. On wetter sites with heavier soils in alluvial bottoms of rivers, the type becomes transitional with sweetgum–willow oak. On branch heads and coves of small creeks in the uplands the type intergrades with sweetgum–yellow-poplar. The companion types in the central forest region are river birch–sycamore and silver maple–American elm.

Some common understory components of the type include pawpaw, giant cane, and pokeweed (McKnight 1968). Vines often present are poison-ivy, grape, Alabama supplejack (rattan), greenbriers, and Japanese honeysuckle. Wood-nettle is sometimes present in moist coves and bottoms.

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Black Willow
95

Definition and composition. Black willow and other species of *Salix* together comprise a majority of the stocking. Cottonwood is the chief associate, particularly in the early stages, but green ash, sycamore, pecan, persimmon, waterlocust, American elm, baldcypress, red maple, sugarberry, boxelder, and in some areas, silver maple are invaders preceding the next successional stage.

Geographic distribution. The type is characteristic of the fronts and banks of most major streams through the central and southern forests but extends also into the northern forest. Along the East Coast, the black willow type has only minor distribution and then generally in swamps rather than in river bottoms.

Ecological relationships. Black willow is a temporary, pioneer type of very rapid growth. Along with cottonwood, it is the first to appear on newly formed sandbars and river margins, almost to the exclusion of other species. It is also frequently found in front land, sloughs, and low flats and occasionally in shallow swamps and deep sloughs throughout the first bottom. Where willow and cottonwood occur together, cottonwood outgrows willow and becomes dominant except

where frequent and extended growing-season flooding covers the trees and kills the cottonwood. Sites may silt in 6 m (20 ft.) during the life of the stand, and any one flood may increase the elevation from 2.5 cm (1 in.) to 1.5 m (5 ft.).

Black willow is relatively short lived and cannot regenerate under shade. As the soils build up and the willow and cottonwoods drop out, the type is usually replaced in the central forest by the silver maple–American elm type and by boxelder; and in the southern forest by the sycamore–sweetgum–American elm type and by boxelder and, on the lower sites, by swamp-privet. The type merges with the cottonwood–willow type in the prairie-plains area.

Variants and associated vegetation. Common understory tree species are boxelder, red maple, red mulberry, swamp-privet, and planer tree (waterelm). Undergrowth may consist of buttonbush, possumhaw, poison-ivy, trumpet-creeper, redvine, and peppervine. Herbs may or may not be present, depending on length of growing season overflow and density of overstory.

Levee systems and stream channelizations have restricted the area available for formation of this type.

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Overcup Oak–Water Hickory
96

Definition and composition. Overcup oak and water hickory together make up a majority of the stocking. Major associates are green ash, sugarberry, American elm, waterlocust, red maple, and Nuttall oak. Willow oak, persimmon, and cedar elm are minor associates.

Geographic distribution. The type occurs in the floodplain forests of the Gulf and south Atlantic states and also in Tennessee and southern Illinois. The most extensive areas occupied are backwater basins of the principal rivers.

Ecological relationships. The type usually occurs in areas where water stands into the growing season–low-lying, poorly drained flats with clay or silty clay soils. It also occurs in sloughs in the lowest backwater basins and on low ridges with clay soils that are subject to late spring inundation. Site quality is usually quite poor and most species cannot survive where this type exists. Where drainage is improved, the type may revert to sugarberry–American elm–green ash. Overcup oak reproduces more consistently than other oaks; its good seed crops are frequent and its acorns, which seem to be less desirable to wildlife than most, receive some protection from the water. Water hickory is a prolific sprouter and reproduces in this fashion when the stand is cut. Both overcup oak and water hickory are among the last tree species to leaf out in the growing season and thus are less subject to the mortality that occurs when seedlings or sprouts in leaf are covered by standing water.

Variants and associated vegetation. Nearly pure water hickory stands or pure overcup oak stands can be found representing the type. Sometimes there is clear demarcation between the overcup oak–water hickory and the sugarberry–American elm–green ash type, but usually the two types mix in a transitional zone.

Understory includes the water hickory, overcup oak, and occasionally Nuttall oak, green ash, sugarberry, roughleaf dogwood, swamp-privet, and planertree (water-elm). Undergrowth includes buttonbush and numerous vines—redvine, peppervine, trumpet creeper, and poison-ivy. Because of the depth and duration of standing water in this type, associated herbaceous plants are few. Following cutting or partial opening of the stands, heavy growth of annual grasses and cocklebur may occur.

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Baldcypress
101

Definition and composition. Baldcypress is pure or comprises a majority of the stocking. Its main associates are water tupelo in the alluvial floodplains or swamp tupelo in the swamps and estuaries of the Coastal Plain. Other associates are pondcypress, black willow and, occasionally, swamp cottonwood, red maple, Atlantic white-cedar, American elm, green ash, pumpkin ash, Carolina ash, waterlocust, redbay, common persimmon, overcup oak, and water hickory.

Geographic distribution. The type occurs intermittently through the Coastal Plain from southern Delaware to south Florida, and west to southeastern Texas almost to the Mexican border. Inland, it occurs along the many streams of the coastal plains and northward through the Mississippi Valley to southeastern Oklahoma, southeastern Missouri, southern Illinois, and southwestern Indiana (Fowells 1965).

Ecological relationships. The baldcypress species is unusual in form, shape, and habitat requirements. Sites are usually characterized by frequent prolonged flooding. Floodwaters may be 3 m (10 ft.) deep or more and may be stagnant or may flow at rates up to 7 km (4 mi.) per hour. Cypress knees are common on trees on most sites, but are usually absent where the floodwater remains at a constant level or where there is no flooding. It is not clear what role cypress knees play in aeration of

the root system, but it is known that they exchange oxygen and carbon dioxide with their surroundings under normal atmospheric conditions. Thus it appears that they may be beneficial as an aeration organ but not critical to tree survival.

Baldcypress shows adaptations to flooding similar to those of water and swamp tupelos, the main associates in the type. Under prolonged flooding newly adapted roots develop near the base of the tree. The new roots are more succulent, larger in diameter, and less branched than roots of cypress grown in moist well-aerated soils. Newly adapted roots of tupelos have been observed to oxidize their rhizosphere in floodwaters (Hook et al. 1971). Cypress roots also show evidence of oxidation at depths up to 1.2 m (4 ft.), thus providing oxygen to active root tips and facilitating nutrient uptake from otherwise highly reduced soil environment. Baldcypress grows along the estuaries near the coast, but apparently cannot tolerate salinities above 0.89 percent salt (Montz and Cherubini 1973).

Cypress, highly prized for its lumber, was so heavily exploited during the first half of the 20th century that there was much concern for its future. All recent evidence, however, suggests a general replacement by second growth (Sternitzke 1972).

Variants and associated vegetation. The type has one major variant, baldcypress–pondcypress (Langdon 1958). Where the two species occur together it is difficult and sometimes impossible to tell them apart. These two intermingle in varying proportions in the lower coastal plains from southeastern Virginia to eastern Louisiana. The baldcypress type has only a few shrub associates and these vary widely. The most prominent in south Florida are common buttonbush, swamp (stiff-cornel) dogwood, and Walter viburnum. In contrast, the most common associates in North Carolina are the coast leucothoe, Carolina rose, poison-sumac, swamp dogwood, and possumhaw viburnum. In addition, ferns, vines, epiphytes, alligator-weed, and duckweeds are present.

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Clemson University

Baldcypress–Tupelo
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Definition and composition. Baldcypress together with water tupelo or swamp tupelo comprises the majority of the stocking. On deep alluvial swamps, the common associates are red maple, black willow, Carolina ash, pumpkin ash, swamp cottonwood, planertree (water-elm), and waterlocust. In the shallower margins, overcup oak, water hickory, American elm, green ash, Nuttall oak, laurel oak, sweetgum, persimmon, and sweetbay are also present. ln Coastal Plain swamps, red maple, black willow, redbay, sweetbay, pondcypress, slash pine, and loblolly pine are found. Ogeechee tupelo is an associate in southwestern Georgia and northern Florida. Atlantic white-cedar and pond pine are also present in some acid, peaty swamps of the Atlantic Coastal Plain.

Geographic distribution. The type occurs in the southern Coastal Plain, particularly on the seaward margins, from southeastern Texas to Maryland, excluding the lower third of the Florida peninsula. It is also present in the Mississippi River bottom and along the lower reaches of its tributaries north to southern Illinois.

Ecological relationships. The type is always found on very wet sites where, in years of normal rainfall, surface water stands well into or throughout the growing season. These include swamps, deep sloughs, very low, poorly drained flats of the major river floodplains, swamps of tidal estuaries, margins of coastal marshes and the deeper, more extensive landlocked depressions of the Coastal Plain (Penfound 1952).

Soils of the alluvial bottoms are mineral soils and usually range in texture from silt loam to almost pure clay; surface soil pH varies from moderately acid to slightly alkaline. Coastal swamps and depressions of the Coastal Plain usually have a surface of muck or shallow peat. The mineral fraction of the soil may range from fine sand to clay, and soil pH ranges from moderately to strongly acid.

Stand makeup is strongly influenced by site as well as by cutting. Water tupelo cannot survive where soil acidity is high or surface water brackish. Consequently, it is almost completely restricted to alluvial floodplains and is replaced by swamp tupelo on colluvial soils of the Coastal Plain and in coastal swamps. Swamp tupelo also occurs in mixture with baldcypress and water tupelo around the edges of alluvial swamps where maximum water depth is less than 0.6 m (about 2 ft.). Baldcypress and water tupelo are most tolerant of complete inundation and advance into the deepest sites when water depth is reduced during periodic droughts, particularly around quiet ponds and lakes. In shallow swamps, water and swamp tupelo regenerate more successfully than baldcypress because of greater seed production and somewhat faster early growth. Here, following heavy cutting, the type usually reverts to water or swamp tupelo (Putnam et al. 1960). Regeneration of swamp tupelo and water tupelo by stump sprouts is also of major importance in cut over stands; sprouting of baldcypress is minor.

No clear succession has been observed in this type and, barring aggradation, it is considered permanent and is held in this stage by prolonged periods of deep flooding (Wells 1928). The relative shade tolerance of baldcypress and water tupelo has not been clearly

established; both are rated intolerant and both endure heavy stocking in even-aged stands. When in association with baldcypress, water tupelo is usually the younger component, suggesting the greater tolerance of the latter and a possible trend towards pure stands of that species without periodic disturbance.

Variants and associated vegetation. Small, pure stands of baldcypress are scattered throughout the type. Regeneration of baldcypress is very uncertain, however, and stands usually revert to tupelo following heavy cutting.

In the deep swamps and under dense stands, undergrowth, sparse because of low light intensity and long hydroperiods, is limited to a few shrubs and some aquatic herbs. Mosses and lichens are common on the lower exposed portions of the tree trunks. Spanish moss often drapes the crowns. ln shallow swamps and along the fringes of the deep swamps, a wide variety of wet-site shrubs may commonly occur: buttonbush, swamp-privet, Virginia sweetspire (Virginia-willow), swamp cyrilla, buckwheat-tree, stiffcornel (swamp) dogwood, fetterbush lyonia, leucothoe, dahoon, yaupon, southern bayberry, possumhaw, swamp rose, and poison-sumac. Woody vines that may be common include greenbriers, Alabama supplejack, southeast decumaria, crossvine, peppervine, and poison-ivy.

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Water Tupelo–Swamp Tupelo 103

Definition and composition. Where the type is most extensive, water tupelo is pure or provides a majority of the basal area stocking. On certain more limited sites, however, swamp tupelo tends to take the place of water tupelo. On some sites the two type species mix. Common associates of water tupelo where flooding is deep are baldcypress, red maple, black willow, Carolina ash, pumpkin ash, swamp cottonwood, planer tree (water-elm), and waterlocust. ln shallow water, swamp tupelo, overcup oak, water hickory, American elm, green ash, Nuttall oak, laurel oak, sweetgum, persimmon, and sweetbay are also present. Common associates of swamp tupelo in addition may include pondcypress, redbay, sweetbay, slash pine, and loblolly pine. Ogeechee tupelo is an associate in southeastern Georgia and northern Florida. Atlantic white-cedar and pond pine are also associates in some acid, peaty swamps of the Atlantic Coastal Plain. The type formerly was named water tupelo.

Geographic distribution. The type occurs in the southern Coastal Plain from southeastern Texas to southern Florida and northward to southeastern Virginia. lt also occurs in the Mississippi River bottom and the lower reaches of its tributaries and in bottomlands of the Tennessee River in Alabama. The water tupelo component is nearly absent from most of the Florida peninsula and the southeastern corner of Georgia.

Ecological relationships. The type is always found on very wet sites where, in years of normal rainfall, surface water stands well into or throughout the growing season. Stands of water tupelo are restricted to deep swamps, sloughs, and low flats of the alluvial floodplains, whereas those of swamp tupelo occur in upland swamps and ponds of the Coastal Plain and in slightly brackish swamps of coastal estuaries and marsh borders (Penfound and Hathaway 1938). Mixtures occur along the shallow borders of alluvial swamps and flats and where such sites grade into upland swamps. Water tupelo sites are characterized by deeper and longer periods of flooding than swamp tupelo sites, and by higher pH and silt-plus-clay content but lower organic matter content of the surface soil (Klawitter 1962).

The type is permanent on most sites because of annual flooding. Relatively rapid soil aggradation over limited areas in alluvial bottoms undoubtedly does occur. The resulting improvement in soil aeration should favor changes in composition following the sequence observed in southern bottoms on sites with increasing drainage (Putnam et al. 1960).

Variants and associated vegetation. There are no common variations of this type. Uncut stands of water or swamp tupelo are typically very densely stocked. In water tupelo stands with normally deep flooding, undergrowth is often limited to scattered shrubs with some aquatic herbs. Epiphytic mosses and lichens are common on the exposed tree trunks, particularly the lower and north-facing portions, and the crowns may be draped with Spanish moss. Wet-site shrubs become more abundant along shallow margins of the swamps or in stand openings; species occurring widely and frequently include buttonbush, swamp-privet, Virginia sweetspire (Virginia-willow), swamp dogwood, swamp cyrilla, leucothoe, possumhaw, swamp rose, and poison-sumac. Woody vines frequently occurring along the shallow swamp margins are greenbriers, Alabama supplejack, southeast decumaria, crossvine, peppervine, and poison-ivy.

In the usually shallower upland swamps where swamp tupelo is dominant there are additional woody plants not common to the alluvial swamps. These include such species as buckwheat-tree, dahoon, yaupon, southern bayberry, fetterbush lyonia, summersweet clethra (sweet pepperbush), and several hawthorns.

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Sweetbay–Swamp Tupelo–Redbay 104

Definition and composition. Combinations of sweetbay with swamp tupelo, redbay, or both provide a majority of the stocking, and locally any one of the three may possess a plurality. A great many species that grow on moist to wet sites may be associated with this type, depending upon geographic location, site and stand history. Common hardwoods include red maple, black tupelo, loblolly-bay, sweetgum, water oak, laurel oak, yellow-poplar, American holly, Carolina ash, southern magnolia, and flowering dogwood. Associated conifers include baldcypress, pondcypress, slash pine, longleaf pine, loblolly pine, pond pine, and Atlantic white-cedar.

Geographic distribution. The type is found throughout the southern Coastal Plain from Maryland and southeastern Virginia to southeastern Texas. It is most extensive in the lower Coastal Plain. Individual stands of this type are commonly limited in area, although locally they may predominate.

Ecological relationships. The type occurs on sites where the soil is normally saturated, or at least moist, throughout the growing season. Surface flooding also occurs on some sites, but it does not persist through the growing season. Sites include branch heads; the narrow bottoms of small perennial or intermittent streams or branches; pocosins; and poorly drained upland depressions in the Coastal Plain such as small ponds, peat bogs, and the borders of swamps.

Soils are sandy in texture and predominantly colluvial in origin, although narrow alluvial floodplains occur in stream bottoms. The wetter sites are consistently very acid, pH 4.0-4.5, and relatively sterile, whereas sites with better drainage are frequently very productive. Stands on more acid, sterile sites generally contain a high proportion of hardwood evergreens, such as redbay, sweetbay, and loblolly-bay, as well as the conifers pond pine and Atlantic white-cedar (Monk 1966).

Deep flooding in ponds and around swamp borders favors swamp tupelo, pondcypress, baldcypress, and red maple. Improved drainage increases representation of such species as black tupelo, yellow-poplar, sweetgum, American holly, and southern magnolia. Changes in soil drainage and related properties are often abrupt, and over short distances stands may contain species representative of both the more deeply flooded swamps and the surrounding uplands. The type is permanent because of persistent soil saturation.

Despite the usual wetness of the sites, fires frequently spread into stands from the surrounding uplands. Fire during drought can be very destructive because of the flammable nature of the peat accumulations and the evergreen foliage of many species. In peaty bogs and shallow swamps, Atlantic white-cedar may dominate if the peat is too wet to burn. Shallow burns favor pond pine, but stands may revert to pondcypress–swamp tupelo after deep burns (Wells 1942). Fires on better-drained sites with mineral soils increase the representation of shade-intolerant species such as slash and longleaf pine, yellow-poplar, and sweetgum, but selective cutting of these species has kept their numbers low (Gemborys and Hodgkins 1971). Recurrent fires on any site tend to develop evergreen shrub or grass-sedge-rush communities.

Variants and associated vegetation. The type itself exhibits such wide variation that there is no single common variant. Undergrowth is both abundant and diverse. Evergreen shrubs and small trees are prevalent, particularly on the poorly drained acid sites. Common species include buckwheat tree, swamp cyrilla, southern bayberry, odorless bayberry, dahoon, yaupon, large gallberry, inkberry, coast leucothoe, fetterbush and staggerbush lyonia, summersweet clethra (sweet pepperbush), and switchcane. Common deciduous shrubs are Virginia sweetspire (Virginia-willow), hazel alder, swamp dogwood, red chokeberry, poison-sumac, American snowbell, possumhaw viburnum, and numerous ericaceous species.

Greenbriers, muscadine grape, poison-ivy, Japanese honeysuckle, Virginia creeper, southeast decumaria and climbing hempweed are common perennial vines. Herbaceous species occurring within this type are incompletely catalogued and are too numerous and variable to list. Some relatively common and characteristic representatives, however, are ferns, mosses, pitcher plants, pipeworts, yellow-eyed grasses, and sedges.

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Appendix B
Common and Scientific Names of Plant and Tree Species

Common name	Scientific name
Plants	
America pokeweed (see pokeberry)	*Phytolacca americana*
American wormseed (see Mexican tea)	*Chenopodium ambrosioides*
Annual ragweed (see ragweed)	*Ambrosia artemisifolia*
Aquatic milkweed (see milkweed)	*Asclepias perennis*
Autumn olive	*Elaeagnus umbellata*
Bahia grass	*Paspalum notatum*
Beakrush (see millet beakrush)	*Rhynchospora miliacea*
Beggartick (see small-fruit beggartick)	*Bidens mitis*
Bermuda grass	*Cynodon dactylon*
Blackberry	*Rubus argutus*
Boneset	*Eupatorium perfoliatum*
Brazilian pepper tree	*Schinus terebinthifolius*
Broomsedge	*Andropogon virginicus*
Bugleweed	*Lycopus* spp.
Burnweed	*Erechtites hieracifolia*
Bur-reed (burreed)	*Sparganium* spp.
Bushy beardgrass (bushy bluestem)	*Andropogon glomeratus*
Cane	*Arundinaria gigantea*
Cattail	*Typha latifolia*
Chain-fern	*Woodwardia* spp.
Chinese bushclover	*Lespedeza cuneata*
Chinese tallow	*Triadica sebiferum*
Cocklebur	*Xanthium* spp.
Coffeeweed	*Sesbania macrocarpa*
Cogongrass	*Imperata cylindrica*
Common carpetgrass (see Southern carpetgrass)	*Axonopus fissifolius*
Coral honeysuckle	*Lonicera sempervirens*
Crabgrass	*Digitaria* spp.
Dewberry	*Rubus hispidus*
Dog fennel (see small dogfennel)	*Eupatorium capillifolium*
Falsenettle (see small-spike falsenettle)	*Boehmeria cylindrica*
Fern, various species	*Osmunda* spp., *Thelypteris* spp.
Fescue	*Festuca* spp.
Florida pokeweed	*Phytolacca americana* var. *rigida*
Geranium (see purple crane's-bill geranium)	*Geranium carolinianum*
Golden club	*Orontium aquaticum*
Goldenrod	*Solidago* spp.
Goldenweed (see groundsel)	*Packera aureus*
Groundsel (see goldenweed)	*Packera aureus*
Hairlike mock bishop-weed (see mock bishop-weed, herbwilliam)	*Ptilimnium capillacium*
Herbwilliam (see hairlike mock bishop-weed, mock bishop-weed)	*Ptilimnium capillacium*
Honeysuckle, (Japanese)	*Lonicera japonica*
Horseweed	*Conzya canadensis*
Japanese climbing fern	*Lygodium japonicum*
Japanese privet	*Ligustrum japonicum*
Johnson grass	*Sorghum halepense*

Common name	Scientific name
Kudzu	*Pueraria lobata*
Licorice Weed	*Scoparia dulcis*
Lizard's tail	*Saururus cernuus*
Melaleuca	*Melaleuca leucadendron*
Mexican tea (see American wormseed)	*Chenopodium ambrosioides*
Mexican water-hemlock (see water-hemlock)	*Cicuta maculata*
Milkweed (see aquatic milkweed)	*Asclepias perennis*
Millet beakrush (see beakrush)	*Rhynchospora miliacea*
Mock bishop-weed (see hairlike mock bishop-weed, herbwilliam)	*Ptilimnium capillacium*
Morning glory	*Ipomoea* spp.
Multiflora rose	*Rosa multiflora*
Nutsedge	*Cyperus* spp.
Panic grass	*Panicum* spp.
Peruvian seedbox (see primrose willow)	*Ludwigia peruviana*
Pickerel weed (see pickerelweed)	*Pontederia cordata*
Pickerelweed (see pickerel weed)	*Pontederia cordata*
Pineland pimpernel (see water pimpernil)	*Samolus valerandi* var. *parviflorus*
Pokeberry (see American pokeweed)	*Phytolacca americana*
Poorjoe	*Diodia teres*
Primrose willow (see Peruvian seedbox)	*Ludwigia peruviana*
Purple crane's-bill geranium (see geranium)	*Geranium carolinianium*
Ragweed	*Ambrosia* spp.
Rough button-weed	*Diodia radula*
Sericea lespedeza	*Lespedeza cuneata*
Sheathed flatsedge	*Cyperus haspan*
Shiny spikegrass (see spikegrass, shiny wood-oats)	*Chasmanthium nitidum*
Shiny wood-oats (see shiny spikegrass, spikegrass)	*Chasmanthium nitidum*
Sicklepod	*Cassia obtusifolia*
Small dogfennel (see dog fennel)	*Eupatorium capillifolium*
Small-fruit beggartick (see beggartick)	*Bidens mitis*
Small-spike falsenettle (see falsenettle)	*Boehmeria cylindrica*
Smartweed	*Polygonum* spp.
Southern carpetgrass (see common carpetgrass)	*Axonopus affinis*
Southern crabgrass	*Digitaria ciliaris*
Spikegrass (see shiny spikegrass, shiny wood-oats)	*Chasmanthium nitidum*
Sumac, poison	*Toxicodendron vernix*
Sumac, smooth	*Rhus glabra*
Sumac, winged	*Rhus copallina*
Sunflower	*Helianthus* spp.
Swamplily	*Crinium americanum*
Sweet broom	*Scoparia dulcis*
Sweet clover	*Melilotus* spp.
Trumpet creeper	*Campsis radicans*
Vasey grass	*Paspalum urvillei*
Vetch	*Vicia* spp.
Water-hemlock (see Mexican water-hemlock)	*Cicuta maculata*
Water pimpernil (see pineland pimpernel)	*Samolus valerandi* var. *parviflorus*
Wild grape	*Vitis* spp.
Wild onion	*Allium* spp.
Winter vetch	*Vicia villosa*
Wooly croton	*Croton capitatus*

Common name	Scientific name
Trees	
American beech	*Fagus grandifolia*
American elm	*Ulmus americana*
American holly	*Ilex opaca*
American hornbeam	*Carpinus caroliniana*
Baldcypress	*Taxodium distichum*
Bitter pecan (see water hickory)	*Carya aquatica*
Black cherry	*Prunus serotina*
Blackgum	*Nyssa sylvatica*
Black walnut	*Juglans nigra*
Black willow	*Salix nigra*
Boxelder	*Acer negundo*
Buckthorn bumelia (buckthorn bully)	*Sideroxylon lycioides*
Bur oak	*Quercus macrocarpa*
Buttonbush	*Cephalanthus occidentalis*
Carolina ash	*Fraxinus caroliniana*
Cedar elm	*Ulmus crassifolia*
Cherrybark oak	*Quercus pagoda*
Common persimmon	*Diospyros virginiana*
Dahoon	*Ilex cassine*
Deciduous holly	*Ilex decidua*
Delta post oak	*Quercus stellata* var. *mississippiensis*
Eastern cottonwood	*Populus deltoides*
Eastern hophornbeam	*Ostrya virginiana*
Fir	*Abies* sp.
Florida maple	*Acer barbatum*
Flowering dogwood	*Cornus florida*
Green ash	*Fraxinus pennsylvanica*
Hackberry	*Celtis occidentalis*
Hawthorn	*Crataegus* spp.
Honeylocust	*Gleditsia triacanthos*
Laurel (diamondleaf) oak	*Quercus laurifolia*
Live oak	*Quercus virginiana*
Loblolly bay	*Gordonia lasianthus*
Nuttall oak	*Quercus nuttallii* (current accepted nomenclature is *Q. texana*)
Ogeechee tupelo	*Nyssa ogeche*
Overcup oak	*Quercus lyrata*
Pawpaw	*Asimina triloba*
Pin oak	*Quercus palustris*
Pondcypress	*Taxodium distichum* var. *nutans*
Possumhaw	*Ilex decidua*
Pumpkin ash	*Fraxinus profunda*
Red bay	*Persea borbonia*
Red mulberry	*Morus rubra*
River birch	*Betula nigra*
Rough-leafed dogwood	*Cornus drummondii*
Sandbar willow	*Salix exigua*
Sassafras	*Sassafras albidum*
Shagbark hickory	*Carya ovata*
Shellbark hickory	*Carya laciniosa*
Shumard oak	*Quercus shumardii*
Silver maple	*Acer saccharinum*

Common name	Scientific name
Slippery elm	*Ulmus rubra*
Southern magnolia	*Magnolia grandiflora*
Spruce	*Picea* sp.
Sugarberry	*Celtis laevigata*
Swamp bay	*Persea palustris*
Swamp black gum (see swamp tupelo)	*Nyssa sylvatica* var. *biflora*
Swamp chestnut oak	*Quercus michauxii*
Swamp cottonwood	*Populus heterophylla*
Swamp dogwood	*Cornus foemina*
Swampprivet	*Forestiera accuminata*
Swamp red maple	*Acer rubrum*
Swamp tupelo (see swamp black gum)	*Nyssa sylvatica* var. *biflora*
Swamp white oak	*Quercus bicolor*
Sweet bay	*Magnolia virginiana*
Sweetgum	*Liquidambar styraciflua*
Sweet pecan	*Carya illinoensis*
Sycamore	*Platanus occidentalis*
Water elm	*Planera aquatica*
Water hickory (see bitter pecan)	*Carya aquatica*
Waterlocust	*Gleditsia aquatica*
Water oak	*Quercus nigra*
Water tupelo	*Nyssa aquatica*
White ash	*Fraxinus americana*
White oak	*Quercus alba*
Willow oak	*Quercus phellos*
Winged elm	*Ulmus alata*
Yellow poplar	*Liriodendron tulipifera*

Appendix C
Partial List of Seed and Seedling Suppliers

SEED

Alabama

International Forest Seed Company
P.O. Box 490
Odenville, AL 35120
(800) 231-8079 in Alabama
(800) 633-4506 out of state
Fax: (205) 629-6671
Web page: http://issco.linnaeus.com

Arkansas

Barron's Inc.
1864 Ouachita 67
Camden, AR 71701

Florida

Matt Buchanan
Route 1, Box 52
Mayo, FL 32066

Georgia

C.P. Daniels, Inc.
P.O. Box 119
Waynesboro, GA 30830
(800) 822-5681
Fax: (706) 554-4424
Web page : www.burke.net/cpdaniel
E-mail: ctdan@burke.net

Southern Seed Company
P.O. Box 340
Baldwin, GA 30511
(706) 778-4542
Fax: (706) 776-2736

Kentucky

Lassiter Enterprises
496 Shady Lane
Midway, KY 40347-9740

Louisiana

Louisiana Forest Seed Company
303 Forestry Road
LeCompte, LA 71346
(318) 443-5026
Fax: (318) 487-0316
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William H. Brown, Jr.
Forestry Consultant
46 Whispering Pines Road
Natchez, MS 39120

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Elsberry, MO 63343
(573) 898-2103
Fax: (573) 898-2855
Web page: www.inweb.net/~lovelace
E-mail: lovelace@inweb.net

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Fairview, NC 28730
(828) 628-4709
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Orangeburg, SC 29116

Tennessee

Don Marcum
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Bells, TN 38006
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Fax: (334) 872-2358

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International Paper
Fred C. Gragg Supertree Nursery
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Bluff City, AR 71722
(800) 222-1270
Fax: (870) 685-2825

Weyerhauser
Magnolia Regeneration Center
2960 Columbia 11 East
Magnolia, AR 71753
(800) 736-9330 or (800) 221-5452
Fax: (870) 234-7918

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Apalachee Native Nursery
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Lloyd, FL 32344
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Fax: (850) 342-1216

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Scottsmoore, FL 32775
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Central Florida Lands and Timber
Nursery Division
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Mayo, FL 32066
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Fax: (904) 294-3416
E-mail: cflat@alltel.net

Central Florida Native Flora, Inc.
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San Antonio, FL 33576-1045
(904) 588-3687

Coastal Revegetation
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Delray Beach, FL 33483
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Creative Native
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(850) 584-3571

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Babson Park, FL 33827

Ecoshores, Inc.
3869 South Nova Road
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(904) 767-6232
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Florida Natives Nursery, Inc.
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Saint Cloud, FL 33770-1369
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Plants for Tomorrow
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Loxahatchee, FL 33470-9430

Salter Tree Farm
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Madison, FL 32340
(850) 973-6312

Save-on-Plants Liner Nursery, Inc.
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Arcadia, FL 33821

Superior Trees, Inc.
P.O. Box 9325
U.S. 90 East
Lee, FL 32059
(850) 971-5159
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2929 JB Carter Road
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The Palmetto Patch
1715 Pasco Road
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Urban Forestry Services
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Cascade Foresty Service
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Cascade, IA 52033
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Web page: www.cascadeforestry.com
E-mail: Cascade@netins.net

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Jonesboro, LA 71251
(318) 259-9484
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Cypress Creek Nursery
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Ruston, LA 71270

Natives Nursery
320 North Theard St.
Covington, LA 70433
(504) 892-5424
Fax: (504) 892-8698
E-mail: natives@wild.net

Northeast Delta RC&D
4274 Front Street
Winnsboro, LA 71295
(318) 435-7328
Fax: (318) 435-7436
E-mail: nedrcd@linknet.net

Richard's Nursery
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Web page:www.tecinfo.com/~hardwoods
E-mail: hardwoods@tecinfo.com

East of Eden Nursery
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Yazoo City, MS 39194
(601) 746-5577

Thomas Nursery
Route 2, Box 180A
Highway 11
Enterprise, MS 39330

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Philipp, MS 38950
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Fax: same as phone number
E-mail: yhnursery@microsped.com

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(931) 668-3041 in state or
(800) 426-0958
Fax: (931) 668-2223

Hillis Nursery
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Highway 56 S
McMinnville, TN 37110
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Fax: (931) 668-7432
Web page : www.hillisnursurer.com
E-mail: hillisnsy@blomand.net

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Trees by Touliatos
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Highway 71 S
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Virginia

Union Camp Nursery
18229 Eppes Drive
Capron, VA 23829-0129
(804) 658-4184

Additional Sources of Information

Association of Florida Native Nurseries, 1992, 1992-1993 Plant and Service Locator, P.O. Box 1045, San Antonio, FL 33576, (813) 978-8006.

Plant Industry Division, 1991, Certified Nurseries and Plant Collectors of North Carolina: Raleigh, N.C., North Carolina Department of Agriculture. [Note: Other states may have similar directories.]

Soil Conservation Service Staff, 1992, Directory of Wetland Plant Vendors, Wetlands Research Program Technical Report WRP-SM-1: Vicksburg, Miss., U.S. Army Corps of Engineers, Waterways Experiment Station.

Appendix D
Species-Site Relationships in the Midsouth

Walter Broadfoot (1964) identified a number of soil types in the midsouth that support good growth of bottomland hardwood species. These soil types are located in five soil areas: Mississippi River floodplain (commonly called the Delta), Loess, Coastal Plain, floodplains of the Red and Arkansas Rivers, and the Blackland areas (figs. D.1-D.5).

The following information and tables on soil types is taken almost verbatim from Broadfoot's publication, "Soil Suitability for Hardwoods in the Midsouth." According to Broadfoot, "Information was compiled from data and observation of natural stands and may not apply where physical, chemical, and morphological conditions of the soil have been worsened, or where there are unusual soil variations such as sand ridges and exceptionally dry phases. Species-site relationships in plantations may also differ from those indicated" (Broadfoot, 1964, p. 1-3).

The reader should keep in mind that the footnotes on each table refer to "weed species" and suggest which species to favor or not in management from a timber production point of view. If the forest to be restored will be used for purposes other than timber production, the table symbols and footnotes must be interpreted carefully. Many species that are considered "weeds" from a timber production perspective are often considered desirable for wildlife (see table 4.1).

Delta

The Delta area soils lie in the floodplains of the Mississippi River. The soils are formed from alluvial material washed down from northern parts of the watershed. They are fertile, and under proper management, they are some of the best producers of hardwood timber. Four major types of soils occur in the Delta—recent natural levee, old natural levee, slackwater, and depressional soils—each of which is more suitable for some species than others (table D.1).

Variations in soils of natural levees can be traced to differences in drainage and texture. The alluvial sediments are in the first stages of development because they have been in place such a short time. The soils are usually neutral to alkaline because of lack of leaching. They are light in color because organic matter has not had time to build up.

The old natural levee soils are acid because they have been leached. These soils, in addition to species common on the younger natural levees, support oaks and hickories, as well as sassafras.

The slack-water areas are nearly level or gently sloping, occupy broad areas, and are usually some distance from the present and former channels of the Mississippi River. Their clay content is high and has developed under conditions of poor drainage. These sites support a high species diversity.

Depressional soils occur in old, partly filled river channels throughout the Mississippi River floodplain. These channels provide means for the slow return of flood waters to the bayous and main river. They are the lowest lying soils of the region and are subject to periodic flooding by local runoff. Hardwood species on these soils are limited to those most tolerant of poor drainage and aeration.

Loess

This is the narrow band of wind-deposited soils lying immediately east and west of the Delta. These are mostly upland soils, but support many of the same species found on higher bottomland sites. Soil texture is uniform, usually silt loam to silty clay loam. These soils are highly erodible; if enough erosion has occurred so that a site has less than six inches of topsoil, the site is considered more suitable for pines than hardwoods. Some soils have pans or are underlaid with stiff clays. Pine should also be favored on these sites along with species such as cherrybark, Shumard and white oak and sweetgum. The general soil classes in the Loess area are upland, terraces, acid bottoms, and neutral to alkaline bottoms (table D.2).

Terrace soils in the Loess area show considerable profile development. A number of the terrace soils are poorly drained and have strong pans that seriously limit root development and height growth of hardwoods. Presence of pans should be investigated by use of the soil survey or field inspection.

A number of river floodplains in the Loess area border the Delta on the east. Generally, the same variety of species found on the terraces of this soil are on the bottoms. The middle and lower slopes of the upland and the acid bottoms are particularly productive.

Table D.1. Soil suitability for southern hardwoods in the Delta area. Tree nomenclature follows Little (1953).

Important commercial species	Natural-levee soils					Slackwater soils		Depressional soils	
	Recent		Old						
	Crevasse, Robinsonville	Commerce, Mhoon	Beulah, Bosket	Dubbs, Dundee	Forest-dale	Bowdre, Tunica	Sharkey, Alligator	Ark	Dowling, Souva
Ash, green	●	■	---	○	□	○	■	■	■
Baldcypress	---	●	---	---	○	---	■	●	■
Cottonwood, eastern	■	■	●	●	●	■	■	●	○
Elms, slippery and American	□	□	○	□	□	□	□	○	—
Hackberry and sugarberry	■	■	○	○	□	□	□	□	○
Hickory, water	---	---	---	○	□	○	□	○	□
Honeylocust	○	○	—	○	□	○	□	○	●
Maple, red	—	—	—	○	□	■	■	●	—
Maple, silver	●	■	---	---	---	---	---	---	---
Oak, cherrybark	○	○	■	■	■	●	●	●	---
Oak, Nuttall	---	○	---	●	■	●	■	●	●
Oak, overcup	---	○	---	○	■	○	■	○	■
Oak, Shumard	---	---	●	■	○	●	○	---	---
Oak, swamp chestnut	---	---	○	■	■	●	○	○	---
Oak, water	○	●	■	■	■	■	■	●	—
Oak, willow	—	—	■	■	■	■	■	●	○
Pecan	■	■	○	●	○	●	○	---	---
Persimmon, common	○	○	○	○	□	●	■	●	●
Sassafras	○	---	■	■	○	○	○	---	---
Sweetgum	●	■	■	■	■	■	■	●	○
Sycamore, American	■	■	■	■	●	●	●	○	—
Tupelo, black (black gum)	—	—	□	■	○	○	○	—	—
Tupelo, water	—	—	—	—	—	—	—	●	●
Willow, black	○	■	---	---	○	---	○	■	■

Post and specialty species: black locust, catalpa, and flowering dogwood on moderately to well-drained acid soils; Osage-orange on neutral to alkaline soils; mulberry on all soils.

Limited commercially or in occurrence: boxelder on neutral to alkaline soils; bur oak, American holly, winged elm on acid soils; post oak, river birch, hickories (exc. water), and white oak on well-, cedar elm, buckeye, and Kentucky coffeetree on all soils.

Weed species: American hornbeam and

■ Occurs frequently; favor in management.
● Occurs occasionally; favor.
□ Occurs frequently; manage, but do not favor.
○ Occurs occasionally; manage, but do not favor.

Table D.2. Soil suitability for southern hardwoods in the Loess area. Tree nomenclature follows Little (1953).

Important commercial species	Uplands						Terraces		Acid bottoms		Neutral to alkaline bottoms	
	Memphis-Loring, Natchez		Lexington, Atwood, Brandon		Grenada, Providence, Franklinton, Dulac, Lax, Tippah	Calloway, Henry, Falkner, Bude, Tickfaw, Hurricane	Lintonia, Richland, Dexter, Freeland	Olivier, Calhoun, Carroll, Hatchie, Almo	Vicksburg, Collins	Falaya, Waverly	Morganfield, Adler	Wakeland, Birds, Dekoven
	Ridge and upper slope	Middle and lower slope[1]	Ridge, upper, and middle slope	Lower slope								
Ash, green and white	○	■	---	○	○	□	○	□	□	■	○	■
Baldcypress	---	---	---	---	---	---	---	---	○	■	○	■
Basswood, American	○	■	---	○	●	○	●	○	●	---	---	---
Beech, American	○	□	---	□	○	○	□	○	□	□	---	---
Cherry, black	○	■	○	●	○	○	●	○	●	○	---	---
Cottonwood, eastern	---	●	---	○	---	---	○	○	■	■	■	■
Elms, slippery and American	○	□	○	□	□	○	□	□	□	□	□	□
Hackberry and sugarberry	---	○	---	○	○	○	○	○	●	●	■	■
Hickories (exc. water)	□	□	□	□	□	○	□	○	□	○	---	---
Honeylocust	---	○	---	○	---	○	---	○	○	□	○	□
Magnolia, southern	○	■	○	○	○	○	●	○	●	●	---	---
Maple, red	○	□	○	□	□	□	□	□	□	■	○	○
Oak, cherrybark	□	■	●	■	■	■	■	●	■	■	○	○
Oak, Nuttall	---	---	---	---	---	---	●	●	●	■	○	○
Oak, overcup	---	---	---	---	---	---	---	○	○	■	---	○
Oak, Shumard	■	■	■	■	■	●	■	●	■	●	○	○
Oak, southern red	□	■	□	■	□	○	●	○	●	○	---	---
Oak, swamp chestnut	○	●	---	○	●	○	●	●	●	■	○	○
Oak, water	□	■	□	■	●	■	●	■	■	■	○	○
Oak, white	■	■	■	■	■	■	●	●	●	●	---	---
Oak, willow	○	●	○	●	○	○	○	○	●	■	---	---
Persimmon, common	□	●	□	○	□	○	□	○	●	■	■	■
Pines	●	○	■	○	○	●	○	●	○	○	---	---
Sassafras	□	●	○	○	○	○	●	○	●	○	○	○
Sweetgum	□	■	□	■	■	■	■	■	■	■	■	■
Sycamore, American	○	●	---	●	●	○	●	○	■	■	●	●
Tupelo, black (black gum)	□	■	□	■	□	□	●	○	●	○	---	---
Yellow-poplar	□	■	□	■	□	○	■	○	■	●	---	---

[1]Includes all slopes greater than 17%.

Post and specialty species: black locust, flowering dogwood, and catalpa on well-drained acid soils; eastern redcedar and mulberry on all soils.

Lim
ac
willow on all poorly drained soils; pecan, chinaberry, cedar elm, winged elm, and buckeye on all soils; spruce pine on acid lower slopes, terraces and bottoms.

Weed species: Eastern hophornbeam, and American hornbeam on acid terraces and bottoms; blackjack oak and smooth sumac

■ Occurs frequently; favor in management
□ Occurs frequently; manage, but do not favor
● Occurs occasionally; favor
○ Occurs occasionally; manage, but do not favor

Coastal Plain

Many soils supporting hardwoods in the midsouth are on terraces and bottoms within the Coastal Plain. In general, they are sandy, acid, and lacking in natural fertility, but some have adequate moisture and drainage for good bottomland hardwood development. Table D.3 lists the major Coastal Plain soils and some of the major hardwood species that naturally occur on them.

Blackland

The Blackland soils occur in Alabama, Mississippi, and eastern Texas, with smaller areas in Louisiana and Arkansas. They are found within the Coastal Plain area, but differ in their prairie-like nature and color. The principal soil classes are shown in table D.4.

Most soils are neutral to alkaline, but some have weathered enough to become slightly acid. Texture is

Table D.3. Soil suitability for southern hardwoods in the Coastal Plain area. Tree nomenclature follows Little (1953).

Important commercial species	Terraces			Bottoms from Coastal Plain materials					
	Cahaba, Kalmia, Amite	Flint, Prentiss, Tilden, Izagora	Stough, Wahee, Myatt, Leaf	Ochlock-onee, Iuka, Bruno	Mantachie, Urbo	Bibb	Chastain		Johnston
							Coarse surface	Fine surface	
Ash, green and white	---	○	○	○	□	■	○	●	●
Baldcypress	---	---	---	---	○	■	○	●	●
Beech, American	---	---	---	○	□	○	○	○	---
Birch, river	---	---	---	□	○	---	---	---	---
Cherry, black	●	○	○	■	○	---	---	---	---
Cottonwood, eastern	---	---	○	●	●	●	●	●	---
Elms, slippery and American	○	○	○	□	□	□	○	---	---
Hackberry and sugarberry	---	○	○	●	●	○	○	○	---
Hickories (exc. water)	□	□	○	□	□	○	○	○	---
Magnolia, southern	○	○	---	■	■	○	○	---	---
Maple, red	○	○	□	■	■	■	■	●	□
Oak, cherrybark	●	■	■	■	■	■	■	■	---
Oak, laurel	---	---	○	○	●	■	■	■	---
Oak, Nuttall	---	---	---	---	●	■	●	■	---
Oak, overcup	---	---	---	---	○	□	○	□	---
Oak, Shumard	●	●	●	●	●	●	●	○	---
Oak, southern red	■	■	○	●	●	○	---	---	---
Oak, swamp chestnut	---	●	○	●	■	■	●	○	---
Oak, water	□	■	□	■	■	■	□	□	---
Oak, white	■	■	□	■	■	●	●	○	---
Oak, willow	○	○	□	●	■	●	●	□	---
Persimmon, common	○	○	○	○	●	●	●	●	---
Pines (exc. spruce)	□	□	■	○	○	○	○	○	---
Pine, spruce	---	---	---	●	●	●	●	○	---
Sweetgum	■	■	■	■	■	■	■	■	○
Sycamore, American	---	---	---	■	■	●	●	●	---
Tupelo, black	■	■	□	■	■	□	□	□	---
Tupelo, water	---	---	---	---	---	●	●	●	■
Walnut, black	●	○	○	●	●	○	○	---	---
Yellow-poplar	■	■	□	■	■	■	●	---	●

Post and specialty species: black locust and flowering dogwood on moist, well-drained soils; mulberry on all soils.

Limited commercially or in occurrence: basswood, pecan, post oak, and silver maple on well-drained soils; shingle oak, sweetbay, and swamp tupelo on poorly drained soils; boxelder, winged elm, honeylocust, black willow, sassafras, American holly, buckeye, chinaberry, and common sweetleaf on all soils.

Weed species: blackjack oak and smooth sumac on well-dra
hornbeam, devils-walking-stick, hawthorn, and flatwoods plum on all soils.

■ Occurs frequently; favor in management
□ Occurs frequently; manage, but do not favor
● Occurs occasionally; favor
○ Occurs occasionally; manage, but do not favor

Table D.4. Soil suitability for hardwoods in the Blackland area. Tree nomenclature follows Little (1953).

Important commercial species	Bottom soils						
	Terrace soils:[1] Kipling, Geiger	Recent coarse and medium-textured: Marietta, Verona	Fine-textured acid			Fine-textured calcareous	
			Kaufman	Houlka	Una	Catalpa, West Point	Leeper, Tuscumbia
Ash, green and white	□	■	○	■	■	■	■
Cottonwood, eastern	●	■	●	●	○	■	■
Elms, slippery and American	○	□	○	□	○	□	□
Hackberry and sugarberry	○	■	●	■	□	■	■
Hickories (exc. water)	○	○	□	□	○	---	---
Maple, red	○	□	○	■	□	---	○
Maple, silver	○	○	---	---	---	○	○
Oak, cherrybark	●	●	■	■	■	---	---
Oak, Durand	●	●	■	■	---	●	●
Oak, Nuttall	---	---	●	■	■	○	○
Oak, overcup	---	---	○	○	□	---	○
Oak, post	□	---	---	---	---	---	---
Oak, Shumard	●	●	■	■	○	---	---
Oak, swamp chestnut	○	●	●	■	○	○	---
Oak, water	□	■	●	■	□	○	○
Oak, white	●	---	●	●	●	---	---
Oak, willow	○	■	●	■	□	○	---
Persimmon, common	○	○	○	□	○	---	---
Sweetgum	●	●	■	■	■	●	●
Sycamore, American	○	●	●	●	●	●	●
Tupelo, black	○	○	●	●	○	○	○
Yellow-poplar	---	●	●	●	○	---	---

[1]Noneroded phases only.

Post and specialty species: black locust and catalpa on all wel

Species limited commercially or in occurrence: boxelder, winged elm, honeylocust, and pecan on all soils; American beech, southern magnolia, spruce pine, American holly, shingle oak, sassafras, and chinaberry on all acid soils; black walnut and black cherry on a poorly drained soils.

Weed species: hawthorn and privet on all soils; American hornbeam, eastern hophornbeam, roughleaf dogwood, and flatwoods plum on all acid soils; smooth sumac on all moist, well-drained soils; redbud and Hercules-club on terraces and acid soils.

■ Occurs frequently; favor in management
□ Occurs frequently; manage, but do not favor
● Occurs occasionally; favor
○ Occurs occasionally; manage, but do not favor

mostly fine or clay-sized. The alluvial soils are fertile enough to support excellent growth of some hardwoods provided moisture and drainage are adequate.

Red and Arkansas River Floodplains

Reddish-brown soils occupy the floodplains of the Arkansas and Red Rivers, and include acid to alkaline sands, silts, and clays. The more alkaline soils occur in the Red River floodplain and the more acid soils occur in the Arkansas River floodplain. The two main soil classes described for this area are terrace and bottom soils (table D.5).

Terrace soils range from moderately to well drained acid soils to somewhat poorly drained to poorly drained acid soils. Bottomland soils range from acid to neutral to alkaline to calcareous in pH. They are generally moderately to well drained.

Table D.5. Soil suitability for hardwoods in the Red area. Tree nomenclature follows Little (1953).

Important commercial species	Terraces			Bottoms			
	McKamie, Hortman, Muskogee	Morse, Asa	Gore, Acadia, Wrightsville	Pulaski, Gallion, Lonoke, Mer Rouge	Yahola, Norwood	Hebert, Portland, Perry	Miller, Buxin, Roebuck, Pledger
Ash, green and white	□	○	□	□	■	■	■
Cottonwood, eastern	---	---	---	●	■	●	●
Elms, slippery and American	□	□	○	□	□	□	□
Hackberry and sugarberry	□	□	○	□	■	□	□
Hickories (exc. water)	□	---	□	□	---	○	○
Honeylocust	---	□	---	○	○	○	□
Oak, cherrybark	■	○	●	■	---	■	---
Oak, Nuttall	●	○	●	●	○	■	○
Oak, overcup	---	---	○	○	○	□	○
Oak, swamp chestnut	□	---	○	■	---	■	○
Oak, water	■	○	●	■	○	■	○
Oak, white	■	---	●	●	---	○	---
Oak, willow	□	○	●	●	---	■	○
Pecan	○	■	---	■	■	○	■
Pines	□	---	□	---	---	---	---
Sweetgum	■	■	■	■	■	■	●
Sycamore, American	●	●	---	■	■	●	●
Tupelo, black	○	---	□	○	---	---	---

Post and specialty species: baldcypress on all poorly drained soils; all soils.

Species limited commercially , winged elm, sassafras, and Shumard oak on , pumpkin ash, water hickory, and pin oak on all poorly drained soils; cedar elm, chinaberry, and red maple on all soils.

Weed species: American hornbeam and eastern

■ Occurs frequently; favor in management

□ Occurs frequently; manage, but do not favor

● Occurs occasionally; favor

○ Occurs occasionally; manage, but do not favor

References Cited

Broadfoot, W.M., 1964, Soil suitability for hardwoods in the Midsouth: U.S. Forest Service Research Note SO-10, 10 p.

Little, E.L., Jr., 1953, Check list of native and naturalist trees of the United States (including Alaska): U.S. Department of Agriculture Handbook 41, 472 pp.

Appendix E
Species-Site Relationships in the Southern Atlantic Coastal Plain

Recognizing the increasing demand for hardwoods for both pulpwood and sawtimber, the American Pulpwood Association developed a booklet on stands of bottomland hardwoods (Kellison and others, 1988). In this booklet the authors discuss site types, stand assessments, and silvicultural systems and regeneration methods. Kellison and others (1988) discussion on site types is reproduced here with permission.

Recognition of site type is essential for proper management of bottomland hardwoods. Site types are land formations with unique soil and water characteristics and species compositions. Bottomland site types best suited for hardwoods include muck swamps, red river bottoms, black river bottoms, branch bottoms, cypress strands, cypress domes, and Piedmont bottomlands. Hydrologic characteristics and species composition of the bottomland types are shown in table E.1.

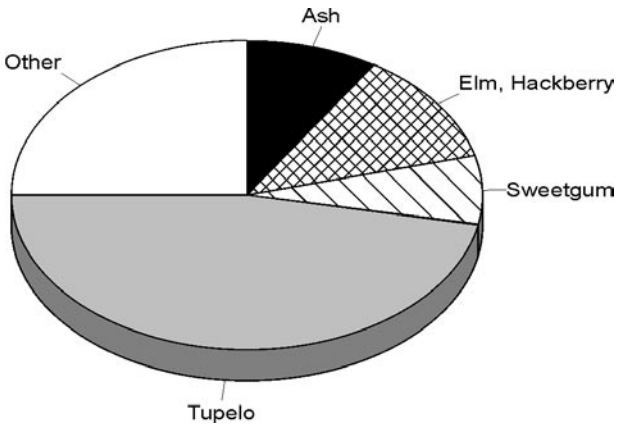
Reference Cited

Kellison, R.C., Martin, J.P., Hansen, G.D., and Lea, R., 1988, Regenerating and managing natural stands of bottomland hardwoods: Washington, D.C., American Pulpwood Association, APA 88-A-6, 26 p.

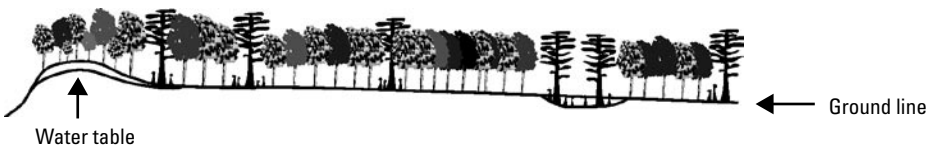
Table E.1. Bottomland hardwood site types by surface water classification and indicator species.

Hardwood Site Type	Surface Water Classification	Indicator Species
Muck swamp	Flooded 10 to 12 months	Baldcypress, tupelo
Red river bottom	Flooded winter, spring	Sycamore, sweetgum, cherrybark oak
Black river bottom	Flooded winter, spring	Tupelo, swamp black gum
Branch bottom	Boggy throughout year	Swamp black gum
Cypress strand	Flooded winter, spring, summer	Baldcypress
Cypress dome	Flooded throughout year	Pondcypress, baldcypress
Piedmont bottomland	Flooded winter	Yellow-poplar, sweetgum

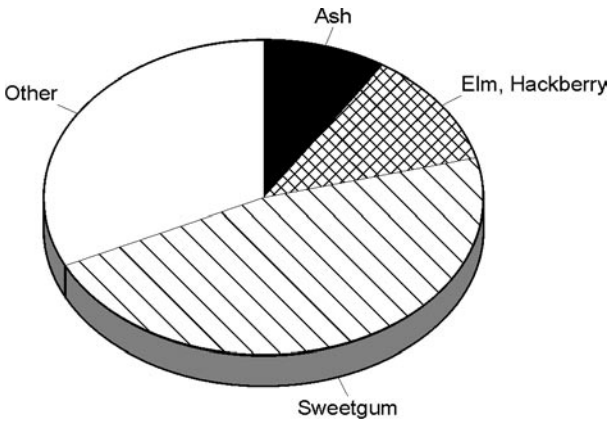
MUCK SWAMP



Very poorly drained area, usually with standing water, broad expanses between tidewater and upstream runs and along black rivers and branch bottom stands; also found in miniature in sloughs and old oxbows of red rivers and branch bottoms characterized by accumulation of organic matter (amorphous, lacking structure). Soils range from silt loam through clay. Water tupelo and baldcypress are common in deeply flooded areas and swamp blackgum predominates toward the fringes.

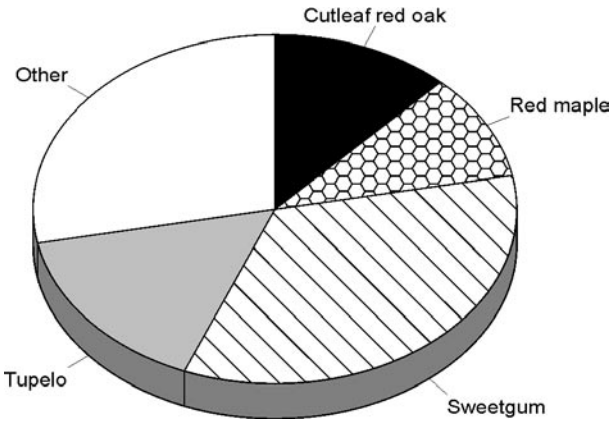


RED RIVER BOTTOM



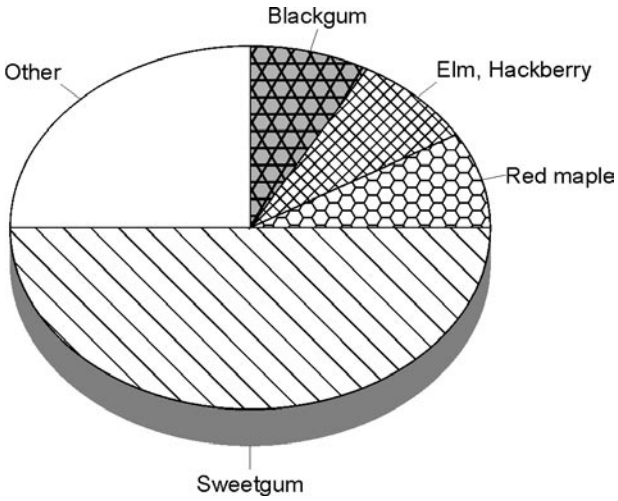
Floodplain of major drainage system originating in the Piedmont or Mountains. Immediately adjacent to the drainage systems, sloughs and oxbows are commonly found; if of sufficient size, they are classified as muck swamps. Some organic matter may accumulate on the clay soils. Water tupelo predominates over cypress, red maple, swamp blackgum, swamp cottonwood, laurel oak and others. Beyond the sloughs and oxbows are first bottoms (low ridges) which flood periodically to considerable depths. However, drainage is fairly rapid because of higher elevation. Soils range from sandy loams or clay loams. Species include sweetgum, ash, water hickory, sycamore, red maple, river birch, elm, hackberry, and willow, water, laurel and overcup oaks. At still higher elevations second bottoms and terraces are found. Flooding is infrequent or rare, and more mesophytic species of cherrybark, swamp chestnut and white oaks, hickories, beech and occasionally yellow-poplar occur. Examples of red river bottom are: Roanoke-Virginia, North Carolina; Santee-South Carolina; Oconee-Georgia; and Alabama-Alabama.

BLACK RIVER BOTTOM



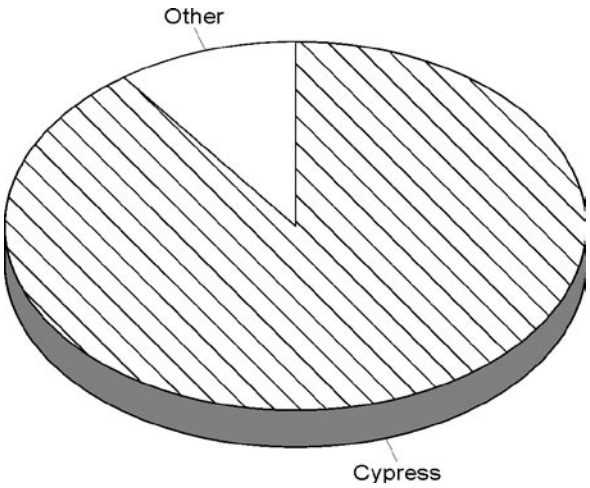
Floodplain of major water system originating in the Coastal Plain. Classification of minor site types and species similar to red river bottom, with exception of muck swamps being more prevalent and first and second bottoms and terraces being on a more modest scale. Predominant species are sweetgum, tupelo, red maple and cut-leaf red oak. Examples of black river bottoms are Blackwater-Virginia; Waccamaw-North Carolina, South Carolina; Black-South Carolina; and St. Mary's-Georgia and Florida.

BRANCH BOTTOM

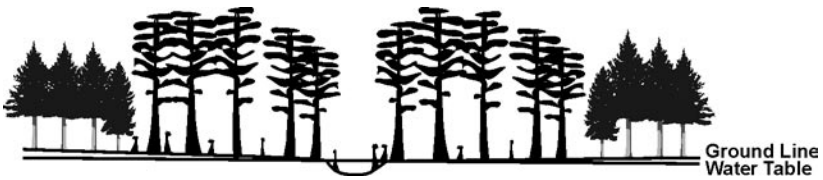


Relatively flat, alluvial land along minor drainage system which is subject to minor overflow. On wetter portions with heavier soils, the predominant species are willow, water and laurel oaks, swamp black gum, sweetgum, red maple and ash. The lighter soils of second bottoms and terraces support cherrybark, Shumard, swamp chestnut, and white oaks, sweetgum, hickory, yellow-poplar and loblolly pine. Sloughs and oxbows of limited extent along the main channel support tupelo and swamp blackgum. Examples: Big Swamp-North Carolina; Wambaw-South Carolina.

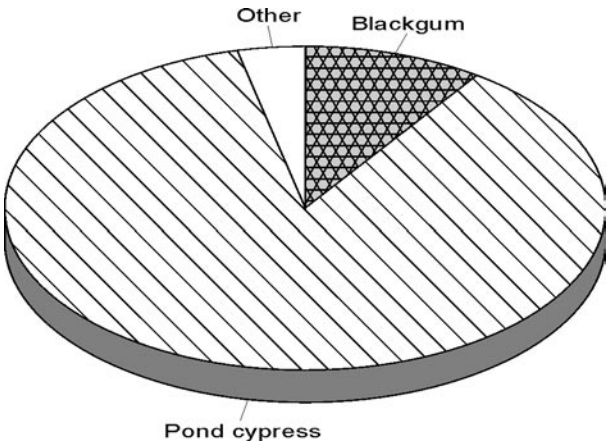
CYPRESS STRAND



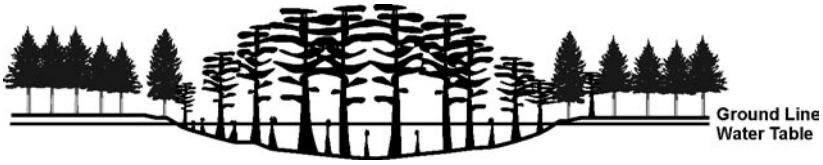
Low areas in south Georgia and northern Florida where shallow water flows during the wet season above the hardpan which is usually present. Such strands or stringers are common in the lower Apalachicola River region, including Tates Hell Swamp. Cypress forests in these strands are usually open with sedges beneath. Some cypress trees extend into adjacent savannahs and boggy flatwoods of slash pine and even longleaf pine. Blackgum is a common associate just beneath the cypress canopy. The soils vary in depth of the surface organic horizon and in the presence or absence of a spodic or an argillic horizon. The values for pH and available nutrients are generally low.



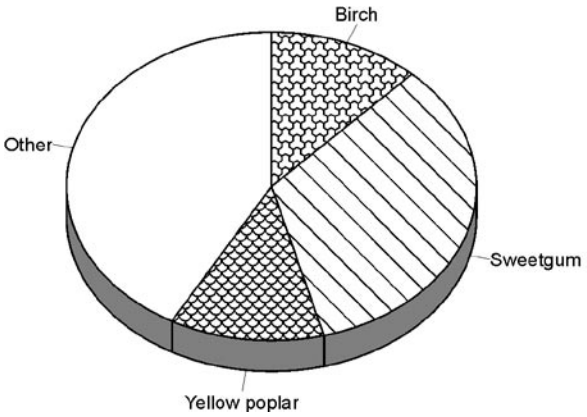
CYPRESS DOME



Isolated peaty acid depression (dome) usually found in Florida, which is moist or inundated for weeks or months at a time. Pondcypress predominates but other species such as blackgum, slash pine, sweetbay, and loblolly bay are found on small hummocks where the hydroperiod is less prolonged. Ground cover is usually absent except on hummocks. The tallest trees occur in the center of the domes where peat can accumulate to 2-4 feet in depth; other trees are progressively shorter to the periphery. Domes typically have clay pans or lenses beneath the sandy surface soils which serve to limit sub-surface groundwater recharge.



PIEDMONT BOTTOMLAND



In lower Piedmont, conditions identical to red river bottom are encountered. However, upstream, sloughs, oxbows and first bottoms decrease in frequency and area until only well-drained bottomland (second bottom and terrace) is encountered. Species include sycamore, birch, yellow-poplar, sweetgum, green ash, cottonwood, water and willow oak, loblolly pine and others. Examples of bottomland site-types are: Meherrin-Virginia; Neuse-North Carolina; Saluda-South Carolina; Oconee-Georgia; and Sipsey-Alabama.

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