Taxodium distichum (L.) Rich. Baldcypress

Taxod iaceae Redwood family

T. distichum (L.) Rich. var. distichum Baldcypress

T. distichum var. *nutans* (Ait.) Sweet Pondcypress

L. P. Wilhite and J. R. Toliver

Baldcypress *(Taxodium distichum)* is a deciduous conifer that grows on saturated and seasonally inundated soils of the Southeastern and Gulf Coastal Plains. Two varieties share essentially the same natural range. Variety *nutans,* commonly called pondcypress, cypress, or black-cypress, grows in shallow ponds and wet areas westward only to southeastern Louisiana. It does not usually grow in river or stream swamps. Variety *distichum,* commonly called baldcypress, cypress, southern-cypress, swamp-cypress, red-cypress, yellow-cypress, white-cypress, tidewater red-cypress, or gulf-cypress, is more widespread and typical of the species. Its range extends westward into Texas and northward into Illinois and Indiana.

Pondcypress is less likely than baldcypress to have knees, and its knees are shorter and more rounded. Its fluted base tends to have rounded rather than sharp ridges and its bark usually is more coarsely ridged *(24).* Its branchlets are more ascending than those of baldcypress *(44),* but unfortunately it was given the varietal name *nutans* (nodding) from observation of a cultivated variation having drooping branches *(43).* Typical specimens of pondcypress have nearly scale like leaves, which are appressed along the twig in several ranks. Seedlings and fast-growing shoots of pondcypress, however, often have disichous (two-ranked) leaves much like typical baldcypress foliage (39). Despite the usual differences in appearance between the two varieties, not all specimens are typical, and it is often difficult and sometimes impossible to distinguish them (44).

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BALDCYPRESS

Habitat

Native Range

The native range of baldcypress (fig. 1) extends along the lower Atlantic Coastal Plain from southern Delaware to southern Florida and thence along the lower Gulf Coast Plain to southeastern Texas. Inland, baldcypress grows along the many streams of the middle and upper coastal plains and northward through the Mississippi Valley to southeastern Oklahoma, southeastern Missouri, southern Illinois, and southwestern Indiana *(31).*

Climate

Humid, moist subhumid, and dry subhumid climatic types occur within the range of baldcypress. Normal precipitation increases from about 1120 mm (44 in) per year in southern Delaware and southern Illinois to about 1630 mm (64 in) along the central Gulf Coast, then decreases to about 760 mm (30 in) in southeastern Texas *(31).* It should be noted, however, that baldcypress usually grows on intermittently flooded sites. Drainage, therefore, may be more important than rainfall in determining site suitability for baldcypress.

The growing season within the natural range of baldcypress increases from about 190 days in southern Illinois to virtually 365 days in southern Florida, and average annual minimum temperatures increase from about -18" C (0° F) to about 4" C (40" F) across this range (31). Baldcypress trees planted in the Northeastern United States and southern Canada withstand minimum winter temperatures of -29" to -34" C (-20" to -29" F) *(23).*

Thus, baldcypress can grow across a wide climatic range. Few seeds mature in the extreme northern

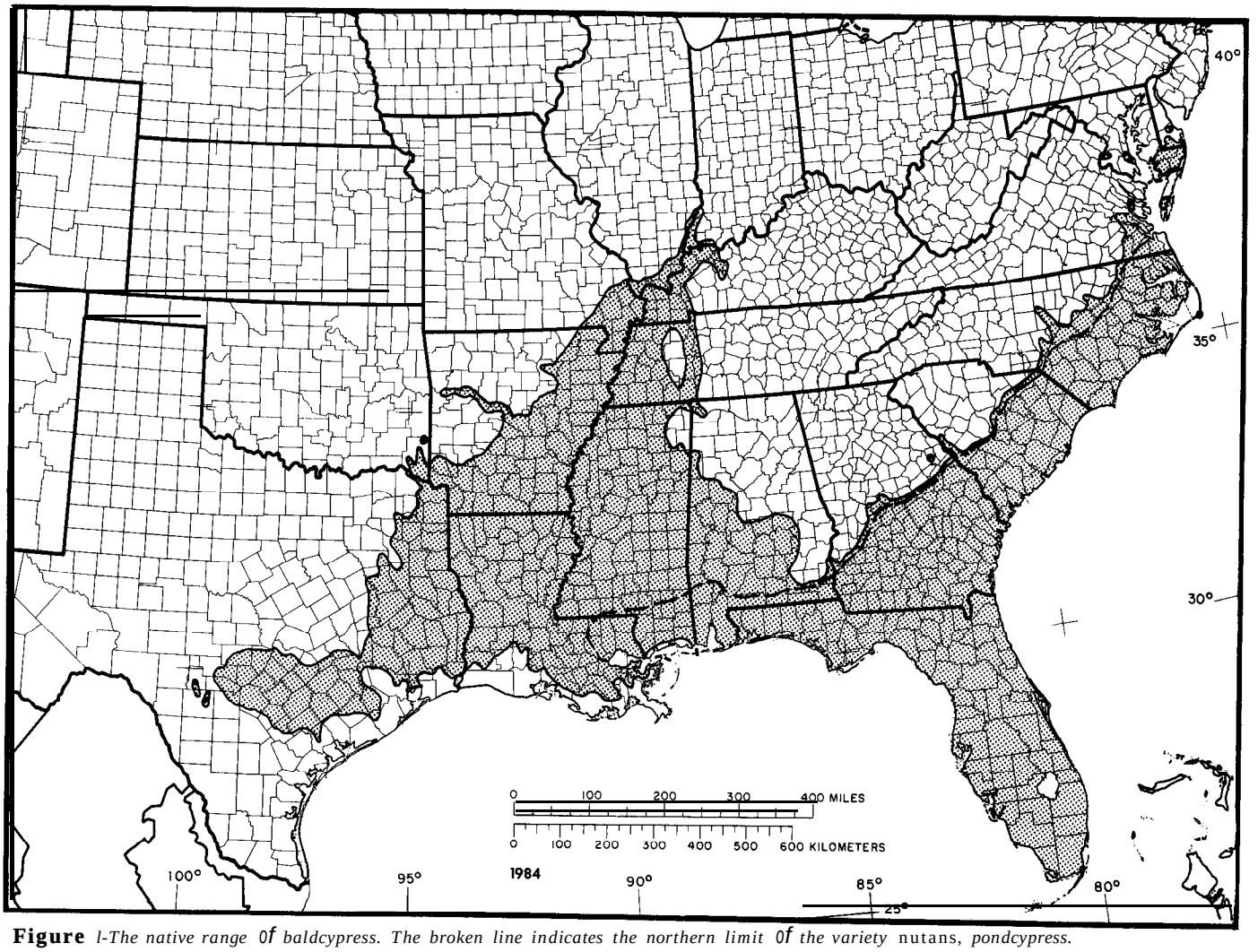

Figure *l-The native range of baldcypress. The broken line indicates the northern limit of the variety* nutans, *pondcypress.*

part of the species' native range (44) however, and baldcypress grows best in warm climates (28).

Soils and Topography

More than 90 percent of the natural baldcypress stands are on flat topography or in slight depressions at elevations of less than 30 m (100 ft) above sea level. The upper limit of its growth in the Mississippi Valley is at an elevation of about 150 m (500 ft). A few isolated stands occur at elevations of 300 to 530 m (1,000 to 1,750 ft) bordering deep hollows on the Edwards Plateau of Texas (44). Because baldcypress usually grows on nearly flat topography, little is known about its growth in relation to topographic factors.

Baldcypress sites are characterized by frequent, prolonged flooding. Floodwaters may be 3 m (10 ft) deep or more and may flow at rates up to 6 km (4 mi) per hour or may be stagnant at times *(17) (fig.* 2).

Normally, baldcypress is found on intermittently flooded and very poorly drained phases of Spodosols, Ultisols, Inceptisols, Alfisols, and Entisols (40). The native range of the species is in the thermic and hyperthermic soil temperature regimes.

On the Atlantic Coastal Plain, baldcypress grows best in the bottom lands of "red water" rivers, which originate in the Piedmont and mountains and during floods deposit a reddish, nutrient-rich silt into the bottom lands. Growth is poorer on the less fertile, coarser textured soils of the bottom lands of "black

***Figure 2—Baldcypress–tupelo swamp in** a **wildlife sanctuary** main tained by the National Audubon Society, Dorchester County, SC.*

water" rivers, which originate in the Coastal Plain and are dark-colored with organic matter. Besides these alluvial soils, there are broad interstream areas of baldcypress swamps where soils range from heavy clays to coarse sand to mucks and peats, and where site quality is extremely variable *(41)*. Baldcypress also grows along estuaries near the coast but apparently cannot tolerate water containing more than 0.89 percent salt (36). Stomata1 conductance and net photosynthesis of l-year-old baldcypress seedlings was reduced when salinity exceeded three ppt (.003 percent), indicating that salt water intrusion can adversely affect cypress at much lower concentrations (37). Horticulturally, baldcypress can be grown on many upland soils, and it is seen in cities as a shade tree or ornamental.

Associated Forest Cover

Baldcypress is a dominant species in forest cover types Baldcypress (Society of American Foresters Type 101) and Baldcypress-Tupelo (Type 102). It is an associate species in Cabbage Palmetto (Type 74), Sweetgum-Willow Oak (Type 92), Black Willow (Type 95), Pondcypress (Type 100), Water Tupelo-Swamp Tupelo (Type 103), and Sweetbay-Swamp Tupelo-Redbay (Type 104) *(17)*.

Tree associates of baldcypress include water tupelo (Nyssa ***aquatica),*** swamp tupelo ***(N. sylvatica*** var. ***biflora),*** red maple *(Acer rubrum)*, sweetbay ***(Magnolia virginiana),*** southern magnolia ***(M. grandifolia),*** sweetgum ***(Liquidambar styraciflua)***, and various oaks ***(Quercus*** spp.), ashes ***(Fraxinus*** spp.), and pines *(Pinus* spp.) *(2,29,46)*. Lesser vegetation associates include common buttonbush *(Cephalanthus occidentalis),* poison-ivy ***(Toxicodendron radicans)***, muscadine grape *(Vitis* ***rotundifolia),*** Spanish moss ***(Tillandsia usneoides),*** cattail *(Typha* ***latifolia),*** lizardtail ***(Saururus cernuus),*** and various hollies *(Ilex* spp.), viburnums ***(Viburnum*** spp.), lyonias ***(Lyonia*** spp.), sedges, grasses, and ferns *(2,44)*.

Baldcypress grows along streams that can deposit or remove soil to the extent that the soil surface, and consequently the depth to the water table, can fluctuate a few meters (several feet) during the life of a stand. Therefore, its understory and even arboreal associates can vary from species tolerant of prolonged flooding to species requiring well-drained conditions (44).

Life History

Reproduction and Early Growth

Flowering and Fruiting-Baldcypress is monoecious. Male and female strobili mature in one growing season from buds formed the previous year. The male catkins are about 2 mm (0.08 in) in diameter and are borne in slender, purplish, drooping clusters 7 to 13 cm (3 to 5 in) long that are conspicuous during the winter on this deciduous conifer. Pollen is shed in March and April. Female conelets are found singly or in clusters of two or three. The globose cones turn from green to brownish purple as they mature from October to December. The cones are 13 to 36 mm (0.5 to 1.41 in) in diameter and consist of 9 to 15 4-sided scales that break away irregularly after maturity. Each scale can bear two irregular, triangle-shaped seeds that have thick, horny, warty coats and projecting flanges *(19,39,44,45)*. Number of seeds per cone averages 16 and ranges from 2 to 34

(20). Cleaned seeds number from about 5600 to 18,430/kg (2,540 to 8,360/lb) *(39,44,45)*.

Seed Production and Dissemination-Some seeds are produced every year, and good seed crops occur at 3- to 5-year intervals (45). At maturity, the cone scales with their resin-coated seeds adhering to them, or sometimes entire cones, drop to the water or ground (42). This drop of mature seeds is often hastened by squirrels, which eat baldcypress seeds but usually drop several scales with undamaged seeds still attached from each cone that they pick (5). Floodwaters spread the scales or cones along streams and are the most important means of seed dissemination (44).

Seedling Development-Germination is epigeal (45). Under swamp conditions, germination generally takes place on a sphagnum moss or a wet-muck seedbed. Seeds will not germinate under water, but some will remain viable for 30 months under water. On the other hand, seeds usually fail to germinate on better drained soils because of the lack of surface water. Thus, a soil saturated but not flooded for a period of 1 to 3 months after seedfall is required for germination (44).

After germination, seedlings must grow fast enough to keep at least part of their crowns above floodwaters for most of the growing season *(10,12,13)*. Baldcypress seedlings can endure partial shading but require overhead light for good growth (49). Seedlings in swamps often reach heights of 20 to 75 cm (8 to 30 in) their first year (7). Growth is checked when a seedling is completely submerged by flooding, and prolonged submergence kills the seedling (44).

In nurseries, *Tuxodium* seeds show an apparent in ternal dormancy that can be overcome by various treatments that usually include cold stratification or submerging in water for 60 days *(19)*. Nursery beds are sown in spring with pretreated seeds or in fall with untreated seeds (45). Seedlings usually reach 75 to 100 cm (30 to 40 in) in height during their first (and usually only) year in the nursery (49). Average size of 1-O nursery-grown seedlings in a seed source test including 72 families was 81.4 cm (32 in) tall and 1.1 cm (0.43 in) in diameter (19).

Control of competing vegetation may be necessary for a year or more for baldcypress planted outside of swamps. Five years after planting baldcypress on a harrowed and bedded poorly drained site in Florida, survival was high but heights had increased only 30 cm (12 in), probably because of heavy herbaceous competition (25). Seedlings grown in a crawfish pond in Louisiana, where weed control and soil moisture were excellent through June, averaged 2.9 m (9.7 ft) and 3.5 cm (1.4 in) d.b.h. after 5 years. However, a replicate of the same sources planted on an old soybean field, where weed control and soil moisture were poor, resulted in the same d.b.h. but a smaller average seedling height of 2.1 m *(7.0* ft) *(John R. Toliver, unpublished data)*. When planted in a residential yard and weeded and watered averaged 3.7 m (12 ft) tall 3 years later (49).

Vegetative Reproduction-Baldcypress is one of the few conifer species that sprouts. Thrifty sprouts are generally produced from stumps of young trees, but trees up to 60 years old also send up healthy sprouts if the trees are cut during the fall or winter. However, survival of these sprouts is often poor and those that live are usually poorly shaped and do not make quality sawtimber trees *(10,13,38)*. Stumps of trees up to 200 years old may also sprout, but the sprouts are not as vigorous and are more subject to wind damage as the stump decays (44). In the only report on the rooting of baldcypress cuttings found in the literature, cuttings from trees 5 years old rooted better than those from older trees (30).

Sapling and Pole Stages to Maturity

Growth and Yield-Baldcypress is reputed to be slow growing and very long-lived, but during some growing seasons, perhaps in response to soil-moisture fluctuations, many baldcypress appear to produce more than one ring of stemwood. Counting these false rings in with true annual rings has led to overestimations of ages and consequently to underestimations of growth rates.

A study in three baldcypress plantations of known age revealed that on increment cores under magnification, true latewood appeared as narrow bands of small, thick-walled cells, and the stains that cause false latewood tended to disappear. The larger trees in the study had more apparent rings than smaller trees of the same age, and conventional ring counts averaged about 1.6 times the actual age (44).

Many years before that study, an investigator having no trees of known age to confirm his age counts, but stating that he could distinguish the stains of false latewood from true latewood bands, concluded that trees 400 to 600 years old were common in many virgin stands of baldcypress and that a few trees reached about 1,200 years (44).

Under forest conditions, baldcypress stems generally require about 200 years to reach sufficient size to yield a high proportion of heartwood lumber (28). Also at about age 200, height growth ceases (44). After this age many baldcypress slowly die back

from the top as a fungus-caused rot progresses downward through the stem.

Baldcypress is noted for the large size it can attain (fig. 3). In virgin forests, the largest trees were 215 to 365 cm (84 to 144 in) in d.b.h. and 43 to 46 m (140 to 150 ft) in height (44). In the 1982 "National Register of Big Trees," the champion baldcypress, which grows in Louisiana, was reported to be 520.7 cm (205 in) in d.b.h. and 25 m (83 ft) tall *(1)*.

Baldcypress also is noted for its high merchantable yields. In virgin stands, yields of 112 to 196 m3/ha (8,000 to 14,000 fbm/acre) over tracts hundreds of hectares in extent were common, and some stands likely exceeded 1400 m^3/ha (100,000 fbm/acre). One tree in Okefenokee Swamp in Georgia scaled 168 m^3 (12,000 fbm) (44).

Some second-growth stands are approaching the yields of the best virgin stands. A 96-year-old stand in Mississippi contained 980 m^3/ha (70,000 fbm/acre) and its crop trees averaged 36.3 m (119 ft) tall *(49)*.

Figure 3—*Virgin baldcypress in Dorchester County, SC.*

A 63-year-old second-growth stand in Louisiana averaged 1,260 cypress and 258 swamp tupelo trees per hectare, respectively (504 and 103/acre), resulting in volumes of 409 and 107 m^3/ha (6,356 and 1,423 ft^3/acre), respectively *(15)*.

The sample is limited, but some plantations, at least, grow faster than natural stands. In Mississippi, one plantation established on abandoned cropland had dominants averaging 21 m (69 ft) tall at 41 years *(49)*, and another plantation that had been cultivated or mowed for the first 10 years contained 175 m^3/ha (2,333 ft^3/acre) at age 31 and the 30 largest trees averaged 21.6 m (72 ft) tall and 36 cm (14.2 in.) d.b.h. Ten-year volume growth (from age 21 to 31 yrs) of the trees in this plantation was 77.5 m^3/ha (1,033 ft^3/acre) *(29)*.

Baldcypress grows well at high stand densities. From age 60 to 70 years, a baldcypress-hardwood stand in Florida increased from 39 to 43 m^2/ha (168 to 189 ft^2/acre) in basal area and from 359 to 428 m^3/ha (57 to 68 cords/acre) in volume. The baldcypress grew at a faster rate than the tupelo and sweetgum. Thinning plots within the stand to various densities at age 60 resulted in faster growth of individual crop trees, but in slower growth per unit area than for the unthinned part of the stand *(33)*.

Density was even higher in a second-growth stand of baldcypress in Mississippi: 61 m^2/ha (265 ft^2/acre) at age 78. Thinning that stand to 46 m^2/ha (200 ft^2/acre) increased growth through age 96 more than did no thinning or a heavier thinning (49). Volume growth of a 63-year-old second-growth stand in Louisiana, with an average density of 50 m^2/ha (220 ft^2/acre) in basal area, was 54 m^3/ha (716 ft^3/acre) over a 5-year period. Crown thinning in this stand increased diameter growth and appeared to increase sawtimber volume per hectare after 5 years. Heavier thinning intensities stimulated epicormic branching on many trees, which could lower log quality However, the largest dominant crop trees were least affected by epicormic branching *(15)*.

Cypress swamps and other forested wetlands that receive periodic nutrient subsidies from floodwaters probably are some of the world's most productive ecosystems. The annual above-ground production of biomass in a baldcypress-ash floodplain forest in Florida was 15 700 kg/ha (14,000 lb/acre) *(4)*. In comparison, terrestrial forest communities in the temperate region often produce 12 300 to 15 000 kg/ha (11,000 to 13,400 lb/acre) annually *(11)*.

Stillwater forested wetlands do not receive nutrient subsidies from floodwaters, and they have production rates comparable to, or lower than, those of terrestrial forests. Such wetlands, however, offer

additional benefits such as storage of water and peat *(4)*.

Rooting Habit—Baldcypress seedlings develop a taproot *(49)*, and at least some planted baldcypress up to 25 cm (10 in) in d.b.h. maintain taproots (43). Older, naturally seeded baldcypress in swamps develop several descending roots that provide anchorage, and numerous lateral roots from which rise peculiar conical structures known as "knees" (23). These knees vary in height from several centimeters to more than 3.7 m (12 ft), depending apparently upon the average water level of the site *(44,47)*. Knees are less likely to form in absence of flooding or where permanently standing water is 30 cm (12 in) or more in depth (48). However, small knees have been observed on many trees not subjected to flooding *(3)* and it is not uncommon for ornamental trees to produce knees. Research has found no physiological function for cypress knees. They may be beneficial as aeration organs but are not of critical importance to survival *(17)*. *Knees* may also help to anchor trees because they develop large masses of roots.

The extensive root system along with a buttressed base make baldcypress windfirm in soft, wet soils. Even winds of hurricane force rarely overturn them *(44)*.

Reaction to Competition-The relative shade-tolerance of baldcypress has not been definitely established. Seeds often germinate in heavily shaded places but usually do not survive or develop into large trees *(10,13)*. Most successful stands regenerate in large openings. The species grows slowly in partial shade but the best growth occurs with full overhead light. For these reasons, intermediate shade tolerance seems the most appropriate classification. In fully stocked stands baldcypress characteristically has a clean, smooth stem and small crown, readily pruning itself of branches, but in poorly stocked stands it is very limby (44).

Damaging Agents-A fungus, *Stereum taxodi,* that causes a brown pocket rot known as "pecky cypress" attacks the heartwood of living baldcypress trees, especially the overmature ones. The fungus most frequently gains entrance in the crown and slowly works downward, sometimes destroying a considerable part of the heartwood at the base of the tree. The action of the fungus ceases when the tree is felled. The durability of baldcypress lumber, so far as is known, is not affected by the presence of pecky material *(28,44)*.

A few other fungi attack the sapwood and heartwood of baldcypress and a few needle and twig fungi have been reported, but none of these is known to cause serious damage (26).

Several insects attack baldcypress, but damage is generally minor *(21)*. However, the fruit tree leafroller, *(Archips argyrospila),* previously unreported on baldcypress, became epidemic in 1983, in the lower Atchafalaya Basin and adjoining drainages to the east and south in Louisiana. The leafroller larvae commence webbing and feeding on cypress needles as soon as buds break and small leaflets expand. Large-scale killing of trees has not been observed, but those suffering repeated leafroller defoliation show die-back. Mortality of pole-sized trees has been linked to defoliation *(21)*.

The cypress flea beetle *(Systena marginalis)* causes discoloration of foliage and the cypress looper *(Anacamptodes pergracilis)* causes defoliation (44). Another common defoliator is the bagworm *(Thyridopteryx ephemeraeformis)* (42). The southern cypress bark beetle *(Phloeosinus taxodii)* tunnels beneath the bark of limbs and trunks (27). The baldcypress coneworm *(Dioryctria pygmaeella)* is a serious pest of cones of baldcypress and pondcypress, capable of destroying more than 75 percent of a single year's crop (34).

Nutria *(Myocastor coypu)* often clip or uproot newly planted cypress seedlings before the root systems are fully established, thus killing the seedlings *(12)*. Where high nutria populations occur, entire plantings are often destroyed in a few days. The Soil Conservation Service recommends cessation of baldcypress planting until control measures are found. To date, the only successful control has been placement of a chicken wire guard around each seedling *(12)*. Deer and swamp rabbits clip seedlings above the ground and eat the tender stems and branches, but these seedlings generally resprout and continue to grow *(18,44)*.

Special Uses

The unusual and pleasing appearance of baldcypress-its knees, buttressed base, massive bole, and irregular crown often festooned with Spanish moss-has led to its introduction as an ornamental in many parts of the world *(3,45)*.

Baldcypress seeds are eaten by wild turkeys, squirrels, evening grosbeaks, and wood ducks (6); they are a minor part of the diet of other waterfowl and wading birds (32); and they were an important food for the now-extinct Carolina parakeet (6). Large old baldcypress furnish unique habitats for some wildlife. Bald eagles and ospreys nest in the tops.

Yellow-throated warblers forage in the Spanish moss or resurrection fern *(Polypodium polypodioides)* often found on old trees. Prothonotary warblers achieve their highest densities in baldcypress-tupelo stands where they find nesting cavities in old decaying baldcypress knees. Catfish spawn in submerged hollow cypress logs (22).

Baldcypress wood has a multitude of uses and is well known for its ability to resist decay. Cypressene, an oil extracted from the wood, is believed to give baldcypress high decay resistance. Older baldcypress, particularly old-growth, virgin trees growing in the deep swamps, is known as tidewater redcypress and is considered to be very resistant to rot (3). For this reason, cypress wood has long been favored in the building construction, fences, planking in boats, river pilings, furniture, interior trim, cabinetry, sills, rafters, siding, flooring and shingles, garden boxes, greenhouses, and many other uses (3). However, second-growth baldcypress lack the decay resistant heartwood of the old-growth trees *(8,9)*. At what age or size decay resistance develops is unknown, but wood from trees at least 63 years old is susceptible to rot (9). Caution is recommended in the use of lumber from these trees in exposed situations, and the wood should be treated if rot resistance is essential *(3,9)*. Pecky cypress, caused by the fungus *Stereum taxodii,* is used in products where durability rather than water tightness is required, and in decorative wall paneling *(14,28)*.

Riverine swamps of baldcypress cause floodwaters to spread out, slow down, and infiltrate the soil. Thus, these stands reduce damage from floods and act as sediment and pollutant traps (46).

Genetics

Recognized varieties of baldcypress are indicated in the introduction to this report. Baldcypress grows across a range of wetland sites and over a wide geographic area, however, so other races may exist. A cultivar, 'Pendens', having pendulous branches, has been developed (50). In Russia, hybridization of baldcypress with redwood *(Sequoia sempervirens)* has been reported (44).

Genetic variation of baldcypress seed, cone, and nursery-seedling growth was explored in two geographic seed source studies incorporating seed collected along the Mississippi River flood plain from Illinois to Louisiana. Variation among seed sources and families-within-source was of significant magnitude to indicate a potential for genetic selection and gain in growth. However, no specific pattern of variation was noted *(18,19,20)*.

PONDCYPRESS

Habitat

Native Range

Pondcypress grows from southeastern Virginia to southern Florida to southeastern Louisiana (fig. 1) and almost always at elevations below 30 m (100 ft).

Climate

Humid and moist subhumid climatic types occur within the range of pondcypress. Normal precipitation increases from about 1220 mm (48 in) per year in southeastern Virginia to 1630 mm (64 in) along the east Gulf Coast. The growing season increases from about 240 days in southeastern Virginia to about 300 days in southeastern Louisiana to virtually 365 days in southern Florida. Average annual minimum temperatures increase from about -12" C (10° F) in southeastern Virginia to 4" C (40° F) in southern Florida *(31)*.

Soils and Topography

Pondcypress grows on the very poor and poorly drained phases of Spodosols and Ultisols (40) of the thermic and hyperthermic soil temperature regimes. Soils range from sands to clays to mucks to peats.

Pondcypress occupies the shallow ponds and poorly drained areas of the Coastal Plain and rarely grows in the river and stream swamps as does baldcypress (44). There is evidence that pondcypress does not grow on soils with a pH above 6.8 and bald cypress does not grow on soils with a pH below 5.5 *(35)*, but it is not known if the range in which both grow might be narrower than pH 5.5 to 6.8.

Pondcypress sites in general are much less fertile than baldcypress sites. Pondcypress grows on more acid soils, and it seldom grows on sites that receive periodic subsidies of nutrients from floodwaters.

Pondcypress stands almost always are found on flat topography or in slight depressions often called domes *(16);* therefore, little is known concerning growth of pondcypress in relation to higher topographic features.

Associated Forest Cover

Pondcypress is the dominant species in the forest cover type Pondcypress (Society of American Foresters Type 100) *(17)*. It is an associate species in Longleaf Pine-Slash Pine (Type 83), Slash Pine (Type 84), Slash Pine-Hardwood (Type 85), Pond Pine (Type

98), Baldcypress (Type 101), Water Tupelo-Swamp Tupelo (Type 103), and Sweetbay-Swamp Tupelo-Redbay (Type 104).

The most common sites for pondcypress are the shallow ponds of the Coastal Plain (fig. 4). Here, its chief tree associate is swamp tupelo. Along the margins and on slightly elevated positions within the ponds, associates are pines *(Pinus* spp.), red maple, sweetbay, and loblolly-bay *(Gordonia lasianthus).* Lesser vegetation associates include common buttonbush, yaupon *(Ilex vomitoria),* swamp cyrilla *(Cyrilla racemiflora),* viburnums, swamp privet *(Forestiera acuminata),* southern bayberry *(Myrica cerifera),* bitter gallberry *(Ilex glabra),* ferns, and vines *(17).*

In addition to growing in the ponds of the Coastal Plain, pondcypress is found in some of the swamps along "black water" rivers and creeks, in Carolina bays, in the Okefenokee Swamp, and in pondcypress savannahs. On these various sites, associates of pond cypress include most of those listed above plus many others *(2,46).*

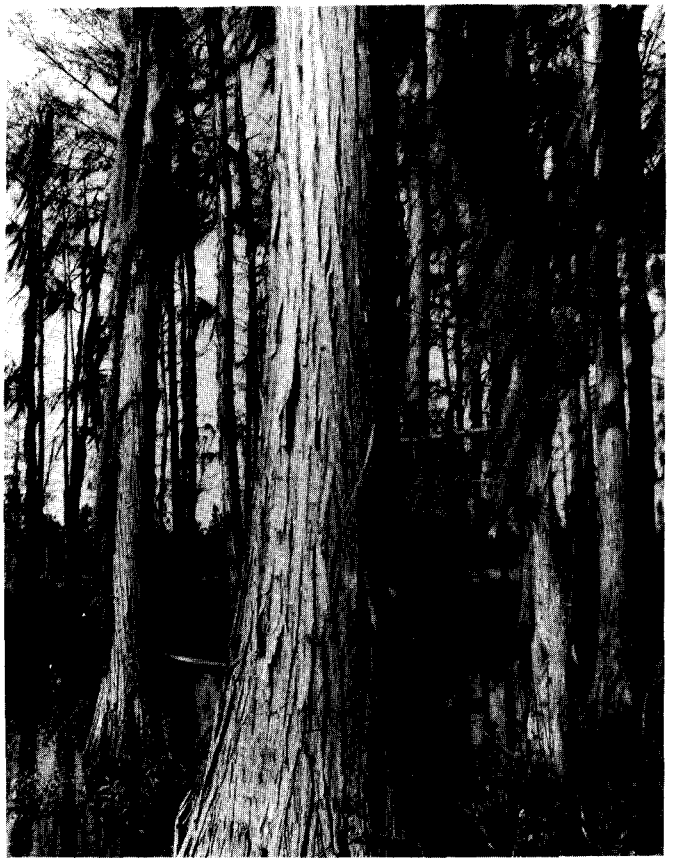

Figure 4—*Pondcypress trees near Gainesville, FL.*

Life History

Reproduction and Early Growth

A sample of pondcypress seeds numbered 8 900/kg (4,040/lb) (45). Generally, the flowering characteristics, seeds, seeding habits, vegetative reproduction, and reaction to competition appear to be similar to those of baldcypress. Trees are monoecious, seeds are distributed by gravity and water, germination is epigeal, and the species is capable of sprouting and is classed as intermediate in its tolerance to shade. In shallow ponds, both soil and water conditions appear singularly favorable for pondcypress seed germination and early growth, for here natural reproduction is almost always uniformly abundant *(44).*

Sapling and Pole Stages to Maturity

In the 1982 "National Register of Big Trees," the champion pondcypress, which grows in Georgia, was reported to be 229 cm (90 in) in d.b.h. and 41.1 m (135 ft) tall *(1).* This is approaching the size of the larger baldcypress. Such giants, however, are much more rare among pondcypresses than among baldcypresses. Although little information is recorded about the growth rate of pondcypress, general observations indicate that the tree does not attain the age and large size of baldcypress, nor does it grow as fast. The smaller size and slower growth of pondcypress may be inherent but are also attributable to the poor site conditions under which the tree usually grows (44).

Because of its generally thicker bark, pondcypress is more re sistant to fire than baldcypress *(24).*

Special Uses

Lumbermen commonly cut and sell pondcypress and baldcypress timber together without distinguishing between them (28).

Pondcypress ponds, domes (or heads), and savannahs provide the only breeding opportunity for a number of tree frogs, toads, and salamanders; provide nesting sites and habitats for herons, egrets, and many other birds; and are watering places for the birds, mammals, and reptiles of the surrounding pinelands. These wet areas serve as recharge areas for surface aquifers, and research has shown that pondcypress domes can serve as tertiary sewage treatment facilities in improving water quality, recharging ground water, and possibly increasing pondcypress growth rates (46). Functions of these

domes and cypress swamps are discussed in depth in the book "Cypress Swamps" *(16).*

Genetics

There are no known hybrids of pondcypress.

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