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GYMNOSPERMS

Atlantic White Cedar—*Chamaecyparis thyoides*

Cupressaceae

This evergreen tree has foliage reminiscent of southern red-cedar but much softer, not prickly, somewhat flattened, and generally oriented in one plane. Male and female flowers are monoecious, occurring on the same tree. Pollen, produced in mid-December, sometimes floats on the air like puffs of smoke. The fruits are small cones, about a quarter inch in diameter. The winged seeds are about an eighth of an inch in length and width. The bark is dark reddish- or grayish-brown with vertical, flat-topped ridges that often spiral around the trunk.

The growth habit of Atlantic white cedar is tall and straight, with a narrowly conical crown in youth that broadens somewhat as it reaches its mature height of about 80 feet with a trunk diameter of about 2 feet. The largest one reported from Florida, on Mormon Branch in the Ocala National Forest, was 87 feet tall with a trunk diameter of 3 feet and a crown spread of 31 feet (Ward and Ing 1997). Atlantic white cedar is slow growing and can reach ages of 200 years or more, with a maximum age of perhaps 1,000 years (Little and Garrett 1990).

The geographic distribution of Atlantic white cedar is unusual. It grows in a narrow strip along the Atlantic coast from Maine to the North Carolina–South Carolina border and in a narrow strip along the Gulf Coast from the Apalachicola River in the Florida Panhandle west to the Mississippi–Louisiana border (Little and Garrett 1990). In addition, there are three small disjunct populations along the fall line between the coastal plain and the Piedmont in South Carolina and Georgia. Finally, there are two small, disjunct populations on the peninsula of Florida, one in Putnam County and one in Marion County.

Throughout its wide range Atlantic white cedar grows in wetlands. In New Jersey and North Carolina, where it is most common, it often grows in shallow standing water in isolated wetlands. In North Carolina, it occurs most commonly in isolated wetlands known as “pocosins” or “Carolina bays.” These unusual

wetlands, each surrounded by a low ridge, are oval in shape and have a shallow wet center. The wetlands' oval shapes are all oriented in the same direction. These wetlands are thought to be the result of the impact of a cluster of meteorites. In all the isolated populations along the fall line and in the populations in Florida and along the Gulf coast, Atlantic white cedar grows in floodplains and seepage wetlands associated with streams.

Atlantic white cedar is dependent on an abundant and continually available water supply. It is not at all drought tolerant, nor is it especially flood tolerant. It will not grow in wetlands or next to wetlands where the water depth fluctuates widely and remains high for extended periods because the high water phases of these fluctuations will kill it. Due to its shallow root system, Atlantic white cedar is also susceptible to being toppled by high winds. It is especially vulnerable to such action when dense stands are thinned. The largest Atlantic white cedar in Florida, at Mormon Branch, was toppled in 1993 by the March superstorm called the "Storm of the Century." Atlantic white cedar has few insect or disease problems.

In Florida, the tree associates of Atlantic white cedar are primarily swamp tupelo, sweetbay, loblolly bay, swamp red bay, red maple, slash pine, and pond pine. Other associates include swamp laurel oak (diamond-leaf oak), water oak, water tupelo, pond-cypress, bald-cypress, and sweetgum. At Mormon Branch, cabbage palm is a common associate. In the other isolated population on the Florida peninsula, at Deep Creek in Putnam County, tulip tree is a common associate. Among both of these southernmost populations, Florida willow is another, very rare, associate, as is Grass-of-Parnassus and a large number of other unusual plants. One of these, climbing fetterbush (*Pieris phillyreifolius*), is an ericaceous vine-like shrub with evergreen foliage and pretty white flowers. When its stem grows upward, burrowing underneath the outer bark of pond-cypress and Atlantic white cedar trunks, it pushes through the bark at intervals, producing what appear to be branches coming out of the trunk of the host tree.

The wildlife value of Atlantic white cedar is moderate. Deer browse the foliage (Little and Garrett 1990), and the Hessel's hairstreak butterfly depends on it as its larval food plant (Glassberg et al. 2000). Up to nine million of the small, winged seeds can be produced per acre per year in a dense, healthy stand of Atlantic white cedar (Little and Garrett 1990), but whether or not these provide a food resource for birds or rodents has not been reported in the literature. At five sites in eastern North Carolina, an average of 7 percent of the seeds of Atlantic white cedar have been found to contain the larvae of the tiny wasp *Megastigmus thyoides* (Turgeon et al. 1997). From personal observation, the largest of Florida's Atlantic white cedars at Mormon Branch in the Ocala National Forest was, during its lifetime, repeatedly scarred by black bears that apparently used it as a territorial marker.

Atlantic white Cedar is rarely planted as an ornamental because of its exacting moisture requirements. However, if its needs can be met, it makes a handsome tree.

Eastern Red-Cedar—*Juniperus virginiana* var. *virginiana*
and Southern Red-Cedar—*J. virginiana* var. *silicicola*

Cupressaceae

The common red-cedar of the eastern United States, including all of Florida, is now generally considered to be one species with two varieties: eastern red-cedar and southern red-cedar. Eastern red-cedar, located throughout most of the eastern United States, extends into Florida only on the extreme northern border of the eastern panhandle (and, where planted, elsewhere). Southern red-cedar extends along the coast of the southeastern United States, including most of the state of Florida (Wunderlin et al. 2020). The traits used to distinguish these two varieties are not very consistent and show considerable overlap (Adams 1986). Southern red-cedar has reddish bark, pendulous small branches, pollen cones 4 to 6 mm long, seed cones 3 to 4 mm long, and often a flat-topped crown at maturity, whereas eastern red-cedar tends to have gray bark, upright to horizontal branches, pollen cones 3 to 4 mm long, seed cones 5 to 6 mm long, and a conical crown at maturity (Wilhite 1990; Wunderlin et al. 2020).

Both eastern and southern red-cedar trees are medium-sized trees, normally reaching heights of 30 to 50 feet and having eventual trunk diameters in old age of 1 to 3 feet. The largest southern red-cedar in Florida is located in Archer. In 2014 it was 77 feet tall, had a trunk diameter of 5½ feet at breast height, and an average crown spread of 56 feet (American Forests 2015).

Southern red-cedar has evergreen foliage that is dense, fine textured, and prickly, with the juvenile foliage often much pricklier than the adult foliage. The trunk is often straight, but instead of being round in cross section, it is often composed of round bulges and folds. This growth form may provide some defense against being girdled by the antler rubbing of deer. The bark is thin, reddish-brown, and flakes off in long thin vertical strips. It has a conical growth form when young but is quite variable in shape when older. Some red-cedars, particularly open-grown ones near the coast, are very short with wide, irregular crowns. Others retain the straight trunk and conical crown shape until mature.

Southern red-cedar is most commonly found on calcareous soils in low-lying situations near the coast and along the St. Johns River. However, it is quite adaptable. It grows well on either clay or sand and on both excessively well-drained soils and poorly drained soils. It constitutes an important part of the coastal hammocks of Florida, Georgia, and the Carolinas in association with live oak and cabbage palm and extends westward from northern Florida along the Gulf Coast

into eastern Texas (Wilhite 1990). It also occurs as a scattered tree in other upland and lowland forests, being especially common where limerock is near the surface. It will invade sandhills and other upland pine forests, pine plantations, and fencerows in the absence of fire.

Red-cedar can live a long time. Fowells (1965) reports a maximum age of about 300 years for eastern red-cedar. However, the age of large red-cedars can be deceptive. A southern red-cedar with the largest trunk diameter I have seen to date (well over 5 feet)—an ancient looking, gnarled, hollow tree between Micanopy and Payne's Prairie—appears to be only about 80 years old based on ring counts from the trunk above the hollow part, combined with an estimate of how long it would take to grow to the height where the ring counts were taken.

Southern red-cedar is moderately shade tolerant as a seedling but becomes shade intolerant as it grows older. It is highly drought tolerant and is one of the most salt tolerant of Florida trees, being roughly equal in this regard to cabbage palm and live oak. It is also somewhat tolerant of flooding and wet soils, being able to withstand, for instance, a week of deep flooding by brackish water as happened along the Gulf Coast north and south of Cedar Key during hurricane Elena in 1985. Even so, red-cedar does not normally occur in swamps or seepage areas. On the negative side, both varieties of red-cedar are quite susceptible to root rot fungi, are easily wind-thrown, often have their tops or large branches broken by high winds, and are easily killed by low intensity ground fires.

In the forest, red-cedar is often killed as a sapling by the antler rubbing of buck white-tailed deer. Of all the trees in Florida, red-cedar is the tree most preferred by bucks for this purpose. Once a cedar has been chosen by a buck, it may be rubbed repeatedly, sometimes for a period of several years if it survives that long. The end result for the tree is usually death by girdling. In some hammocks where red-cedar occurs as a scattered tree, most of the young cedars may be killed this way.

Cedar-apple rust sometimes damages red-cedar foliage and is considered a problem for apple growers farther north, where red-cedar is often exterminated near apple orchards. In Florida, where apples are not commonly grown, hawthorns and the southern crabapple serve as the alternate hosts for this fungus. The evergreen bag-worm also sometimes feeds on the foliage.

The wildlife value of red-cedar is moderately good. Its berry-like seed cones, which are only produced by the female trees (red-cedars being dioecious) are nutritious and remain on the tree from fall through winter, providing an important food source for cedar waxwings, robins, mockingbirds, blue birds, tree swallows, and yellow-rumped warblers (Martin et al. 1951). The cones are, to some extent, also eaten by other birds and some mammals. Aside from providing ideal antler rubbing posts, red-cedar is also used as a browse plant by deer. Finally, its dense foliage provides good nesting and roosting sites for various bird species.

The commercial value of red-cedar wood is high. Because of its beautiful

red-brown heartwood, which contrasts sharply with the white sapwood, and because of its long-lasting aroma, it is used for making cedar chests, paneling, furniture, lamps, bowls, and all sorts of specialty items. The heartwood is highly rot resistant and was sometimes used for making fence posts. The wood, though moderately hard, is easily worked and ideal for whittling. It is evenly textured and smooth, moderately strong, but very easy to split. Historically, the most important use of red-cedar wood was for making pencils. Two pencil mills at Cedar Key were major world suppliers of pencil slats from about 1870 to 1896, when the mills were destroyed by a hurricane (Burtchaell 1949).

Red-cedar is a valuable landscape plant. It is adaptable and hardy and makes a handsome evergreen tree. It will grow in parking lots and other urban situations where many other trees do poorly. It is sometimes planted as a hedge to form a tall, dense visual screen, often on the border of a property.

Bald-Cypress—*Taxodium distichum*

Cupressaceae

Bald-cypress is, in many ways, an exceptional tree. It is potentially enormous, getting larger than any other tree in the eastern half of North America. It is also the longest-lived tree in that region, with one bald-cypress tree growing in a flood-plain swamp along North Carolina's Black River documented to be at least 2,624 years old (Stahle et al. 2019). David W. Stahle began working in this wetland area in the 1980s, documenting climate changes during the past two millennia by using tree ring analysis of cores from bald-cypress trees (Stahle et al. 1988). Bald-cypress is a conifer, yet it is also deciduous, losing its feathery branchlets in the fall. Together with the closely related pond-cypress, bald-cypress is more tolerant of flooding by freshwater than any other tree, sometimes living in locations where its root system is submerged beneath several feet of water for years at a time. Bald-cypress grows naturally on the Atlantic and Gulf coastal plains from Delaware into Texas, including all of mainland Florida, and up the Mississippi into the southern tip of Indiana (Wilhite and Toliver 1990). It has been planted well outside this area, including in southern Canada, where it withstands winter temperatures as low as -20 to -29 degrees Fahrenheit (Wilhite and Toliver 1990).

A point of confusion and contention remains over whether or not there are, in fact, two types of cypress trees in the southeastern United States: bald-cypress and pond-cypress. They are very similar in most respects. However, pond-cypress has much thicker bark than bald-cypress, doesn't get nearly as large, and grows in habitats that are usually less fertile, lower in soil pH, and much more likely to burn. They also leaf out at different times. At Gainesville, Florida, bald-cypress begins leafing out about the first of March, whereas pond-cypress begins leafing

out around the first of April. The timing of pollination is different for each tree type as well.

Bald-cypress grows at the moderate rate of about 1 foot in height per year in most situations, though it can grow considerably faster under ideal conditions and very much slower under adverse conditions or when old. The trunk is typically tall and straight and the crown conical in youth, but after its first 100 years, the crown becomes flat-topped and the trunk continues to add girth.

The maximum size of bald-cypress was best represented by the "Senator tree" in Seminole County, Florida. Unfortunately, this tree was carelessly killed by a person who set the hollow inside of it on fire, starting a chimney fire that completely destroyed the tree. In 1946, the American Forestry Association reported the growth data for this tree: diameter at the base—17½ feet; height—138 feet. The diameter 4½ feet above ground was just over 11 feet, and the height just before it was killed was about 120 feet. The trunk was hollow and had an estimated total volume of 3,731 cubic feet (including the hollow), which is nearly twice the trunk volume of the other big bald-cypress trees that have been listed as state and national champions for this species. These other trees have been listed as champions because of enormous butt swell that greatly exaggerates the single trunk measurement used for ranking trees on these lists.

Bald-cypress usually grows on river edges and river floodplains, the margins of lakes that have streams flowing into and out of them, and in swamps that have streams that flow into and out of them. It sometimes forms pure stands but is more commonly associated with one or more species of tupelo (swamp tupelo, water tupelo, and Ogeechee tupelo), one or more species of ash (green ash, pumpkin ash, and pop ash), and red maple. Other trees sometimes growing with it include coastal plain willow, overcup oak, swamp laurel oak, sweetgum, sweetbay, water hickory, water locust, Florida elm, cabbage palm, and dahoon holly. Buttonbush is probably the most closely associated shrub. In the Florida Panhandle, black willow, silver maple, cottonwood, and sycamore can be added to the list of associates.

Bald-cypress prefers fertile soil with an abundant supply of moisture. It is replaced by pond-cypress on infertile sites with low pH and on sites subject to fire. It will grow well on sandy soils, but it prefers at least some clay and organic matter. It does not tolerate shade, drought, or fire very well, and it is only slightly salt tolerant, being unable to tolerate salt content in the water above 0.89 percent (Montz and Cherubini 1973). However, it can withstand most other hardships better than most other trees. Bald-cypress is very firmly rooted, even in swamps and other wet situations, and it is rarely wind-thrown even though tall, slender, forest-grown, pole-sized trees are sometimes broken off by high winds, and the tops and crowns of ancient trees often show damage by hurricanes. It is not bothered by insects or diseases to any significant extent, and it is most famous for its ability to survive extended periods of flooding. A related ability is that it can withstand

soil accumulation on its root system better than any other tree with the possible exception of cabbage palm. It can also often survive being struck by lightning.

Bald-cypress is wind pollinated and reproduces almost entirely by seed, although it will grow vigorously from stump sprouts (Wilhite and Toliver 1990). Floodwaters are the most important means of seed distribution (Fowells 1965).

Bald-cypress grows conical woody structures called “knees,” which rise above the soil from the lateral roots. The knees of bald-cypress are taller, more numerous, and more pointed than those of pond-cypress. They are usually from 1 to 4 feet tall and from 6 to 12 inches in diameter at the ground, but sometimes grow to over 6 feet tall and 2 feet in diameter at the base. The function of these knees has been a topic of speculation for centuries. The most popular idea is that they provide oxygen to the root system when it is underwater or in saturated soil. However, the knees also provide anchors for the lateral roots so that they do not pull through the soil easily, thus presumably providing bald-cypress a better anchored root system for overall tree support than it would otherwise have. Another function may be that the forest of knees surrounding the tree provides an efficient litter trap in floodplain habitats, enabling the tree to gather nutrient-rich organic debris about its root system during floods and to prevent flowing water from eroding soil away from the root system area. None of these ideas have been proven scientifically.

Whatever the function knees serve for the tree, they clearly help reduce flood water speed and trap litter, thus helping to slow and disperse flood peaks and helping to remove some of the litter and sediment load. The bald-cypress root system as a whole is more effective than that of most trees at reducing the erosion of river banks.

The economic value of bald-cypress timber is quite high, although the available supply is very small compared to the original supplies from the virgin forests of the nineteenth and early twentieth centuries. It is mostly used for lumber, with the reddish-brown heartwood bringing high prices. Pecky heartwood, now milled mainly from logs dredged from river bottoms or the muck of deep swamps, is especially valuable. The current, principle use of bald-cypress lumber is for paneling, though the heartwood is ideally suited for any structural purpose where rot and termite resistance is needed. (Although the heartwood is not bothered by either the common subterranean termite or the dry wood termite, there are two uncommon, native termite species that specialize in eating this wood.) Pole-sized timber is used in the construction of log cabin-style houses. Stands of young trees are sometimes harvested and ground up to make the cypress mulch used in landscaping, although pond-cypress stands supply most of this market. There are also local markets for cypress knees and for cross-section slabs cut from the fluted bases of cypress trees. These items are used decoratively for various home furnishings and landscape adornments.