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Planting Cypress[1]

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Landowners in Florida are increasingly interested in planting cypress trees for a number of economic and ecological reasons. Cypress has been a highly prized timber tree for hundreds of years, and landowners can expect to benefit from the sale of wood products. More recently, wetlands dominated by cypress have been recognized for additional values, including provision of habitat for a variety of wildlife species, flood control, water quality improvement, and recreational opportunities for people (Ewel 1990). Cypress plantings may also yield less tangible benefits to landowners, such as personal satisfaction and enjoyment in watching a forest grow. People in both urban and rural areas can benefit from planting cypress. For example, these trees can enhance the aesthetics and functioning of stormwater drainage systems (See Figure 1). Some landowners may voluntarily plant cypress to provide these services, while others may be required to construct or restore cypress wetlands to mitigate for wetland destruction.

Since the early 1980s, harvesting of cypress swamps has intensified to satisfy the demand for dimensional lumber and a growing market for landscape mulch (Duryea and Hermansen 1997). After harvest, cypress can regenerate naturally by sprouting from the stump and by seed. A recent study of eight cypress wetlands in north Florida found that the proportion of stumps with live sprouts ranged from 23 to 54% two years after harvest (Randall et al., in press). Cypress regeneration from seed is also highly variable (Brandt and Ewel 1989). Because of the unpredictability of natural regeneration and because landowners often would like rapid re-stocking of harvested sites, planting cypress may be a good option.

Figure 1. Cypress trees can enhance the aesthetics and functioning of stormwater retention ponds.

This publication provides guidelines on where, how, and when to plant cypress. It identifies the factors most likely to influence the success of

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planting and explains how the landowner can plan and implement an effective planting program. Incentives for planting cypress may be available; more information can be obtained from your Division of Forestry county forester or UF-IFAS county extension agent.

Two Varieties of Cypress

Two varieties of cypress, baldcypress (Taxodium distichum (L.) Rich. var. distichum) and pondcypress (Taxodium distichum var. nutans (Ait.) Sweet), are commonly found in swamps in the southeastern United States. Both varieties are deciduous conifers, shedding their leaves and cones in the fall, and both are known for their tolerance of flooding, their root outgrowths--called knees--and their buttressed trunks.

Baldcypress trees can live for hundreds of years, growing to 150 feet (46 m) in height and 12 feet (3.7 m) in diameter. About 200 years are required for baldcypress stems to develop a high proportion of heartwood, renowned for its decay resistance (Wilhite and Toliver 1990). The leafy branchlets of baldcypress appear feather-like because the flat leaves (about 1/2 inch, or 1 cm, long) grow in one plane on either side of the twig (See Figure 2a).

Pondcypress generally does not reach the massive size of baldcypress and has thicker, shaggier bark. Typically its nearly scale-like leaves are tightly pressed to, and spiral around, the twig (See Figure 2b).

The differences in foliage structure are not always marked, however. Seedlings and fast-growing shoots of pondcypress usually have feathery leaves, and crown leaves of baldcypress are often scale-like.

Both pond- and baldcypress grow naturally in areas that are inundated much of the time, but other features distinguish their habitats (Brandt and Ewel 1989). Baldcypress grows on river floodplains, along spring runs, and on lake margins--sites with moderate water flow, high nutrient availability, and infrequent fire. Pondcypress generally is limited to isolated, shallow ponds and poorly drained areas of the coastal plain, where water is still or slow moving, low in nutrients, and low in oxygen. Many cypress ponds (also called cypress domes) draw down one or more

Figure 2. Baldcypress (a) has feather-like branchlets with flat leaves (needles). Pondcypress (b) often has short, scale-like leaves that are tightly pressed to, and wrap around, the twig.

times a year. These periods are required for pondcypress seed germination, and they allow occasional fires to enter from pine flatwoods and marshes, fire-adapted habitats that commonly surround cypress ponds. With its thicker bark, pondcypress is much more fire-resistant than baldcypress. On poor wetland soils, such as the marl soils in the Everglades, growth of pondcypress is extremely slow and the trees are stunted.

Where to Plant Cypress

Choosing the planting site is the first step in cypress reforestation and should be done well in advance of the planting date. Hydrology and soil characteristics largely determine whether sites are suited to grow cypress, but landowner objectives in planting cypress also influence site selection. Assessing a site's hydrology may take some time, which is one reason why it is important to start early. Also, once the site is selected there must be sufficient time to order the planting stock, to prepare the site (if needed), and to ensure the availability of labor and equipment for planting.

The guidelines presented here are for selecting wetland sites favorable for growing cypress. Cypress trees can also flourish on many upland soils, but continual maintenance is usually required to control competing vegetation and watering may be necessary.

Hydrology

The most critical factor in selecting an appropriate wetland site is hydrology: how often, for how long, and to what depth water covers the site. Cypress is well suited for lands that are intermittently to permanently flooded with water up to several feet (1 m) deep (See Figure 3).

Figure 3. Water level fluctuations are typical of cypress swamps. The buttressed trunks indicate that water level in this pondcypress wetland is often higher than when the photograph was taken.

The site should not be too dry or too wet. If the duration of flooding is less than six months, then cypress is likely to be out-competed by hardwoods. During the growing season, the soils should be inundated or saturated, with the water table close to the ground surface. Too much water is also detrimental to cypress growth. Cypress trees tolerate short periods of deep flooding, particularly during the winter, but cypress seedlings usually cannot withstand more than a month of total submergence (Williston et al. 1980).

Landowners can assess the hydrology of a site by direct observation, preferably over a period of a year or more. Observations of water depth and flooding duration can be supplemented with historical records (for example, personal accounts or photographs), and sometimes there are natural indicators in the field, such as lichen lines on trees, which can be used to estimate high water levels. If you suspect that the site is too dry during the growing season, then dig a hole to measure the depth to the water table. In addition, information about local site elevation, which often indicates hydrological conditions, can be obtained from topographic maps prepared by the U.S. Geological Survey.

Soils

Cypress grows on a wide variety of soils, ranging from sands to clays to mucks and peat, provided that moisture is adequate (Williston et al. 1980). Probably the best soils are moderately well drained, moist sandy loams, but these are likely to favor other tree species as well. Cypress can grow on poorly drained clays, and pondcypress, especially, can grow well on acidic, organic soils. Growth of cypress is slow if planted over shallow limerock or hardpan. Soils maps for each county are available from the USDA Natural Resources Conservation Service. These include information about soil fertility, drainage class, seasonal high water table, and general suitability for various forest types.

Vegetation

In addition to hydrology and soils, the extent and type of existing vegetation should be considered during site selection. Cypress is only moderately tolerant of shade, so for best growth, do not plant cypress seedlings under a dense stand of trees. If a thick overstory is present, then some trees will need to be killed and possibly removed to provide adequate sunlight. Another concern is whether the site is bounded by plant communities that burn frequently, such as pine flatwoods and freshwater marshes. The thin bark of baldcypress offers little protection against fire and so pondcypress should be the variety planted on these sites. However, intense fires that burn into the forest floor can kill both varieties.

Landowner Objectives

Site selection also depends on your objectives in planting cypress. If timber production is the main goal, then site quality--especially soil fertility--is an essential factor to consider, and accessibility may also be important. Achieving other objectives may depend on selecting an appropriate location in the landscape. For example, if your intent is to intercept agricultural runoff and improve water quality, then you may want to plant a buffer of cypress trees between a field and a waterway. Establishing cypress trees around the edge

of an impoundment may enhance the pond's wildlife value by providing roosting habitat and shelter for birds. If aesthetics is your objective, then you may wish to plant cypress within sight of your residence.

Cypress Variety

We recommend that landowners plant the cypress variety, bald or pond, better matched to the hydrological regime, soils, and landscape setting of the selected site. Sites that are periodically flooded by stream overflow are favorable for baldcypress, whereas isolated depressions with stagnant water, mainly from rainfall, are better suited to pondcypress. The latter sites are likely to have organic, acidic soils and be more exposed to fire and drought, conditions that are better tolerated by pondcypress than baldcypress.

Site Preparation

Site preparation is often unnecessary before planting cypress. On harvested sites, plant seedlings as soon as possible after logging. Mechanical site preparation--by chopping, disking, or shearing--should be done only on dry sites when needed to remove dense shrubs and no more than two months prior to planting. On some sites, prescribed fire may be a useful alternative method for removing unwanted vegetation.

Sources and Types of Seedlings

Direct seeding of cypress in the field is not recommended because seedling establishment is unreliable. Cypress seeds germinate only on moist soil: they are susceptible not only to dry soil conditions but to flooding as well. The seedlings, too, require wet soil for optimal growth, yet in most cases they cannot survive more than a few weeks of total submergence. Thus, successful seeding requires a long period of drawdown during the growing season, a rare and unpredictable event in the Southeast, where summer is the major rainy season.

Cypress seedlings can be purchased from a Florida Division of Forestry nursery or private nurseries. Growing your own seedlings requires considerable effort and is probably cost-effective only for large, commercial operations. If possible, select a nearby nursery and check to make sure the seedlings are grown from seed, preferably locally collected. Baldcypress seedlings are available at more nurseries and in greater quantities than pondcypress.

Nursery-grown plants are obtainable as bare-root or containerized seedlings. Bare-root seedlings are grown in soil in nursery beds and lifted at the time of sale. They are less expensive than seedlings grown in containers and easier to transport and plant. Seedling size and quality are important determinants of survival and growth. The top of a bare-root cypress seedling should be at least 12 inches (30 cm) in height, the diameter of the root collar (the part of the root just below ground level) should be at least 1/4 inch (0.6 cm), and the roots should be well developed with numerous fibrous roots (Conner 1998)**.** Roots should be undercut at about 6 to 8 inches (15 to 20 cm) in the nursery beds, not pruned after lifting.

Containerized seedlings are usually enclosed in plastic tubes, cones, or pots. Their cost increases with the size (age) of the plant. Because containerized seedlings are less susceptible to transport and planting shock than bare-root seedlings, they may be worth the extra expense, and site conditions may warrant additional investment in older, taller seedlings. Where deep flooding is expected, height is of particular concern; cypress seedlings should be tall enough to avoid being overtopped by water. On sites with flowing water, the developed root system of larger seedlings may provide a more secure hold. Larger seedlings may also be good insurance against mortality from grazing or trampling by animals such as deer, rabbits, and hogs.

Nurseries should be contacted well in advance of planting (several months to a year), especially if large quantities are required. Coordinate a date for delivery or pick-up of your seedlings that closely coincides with the planting date. Shipping delays and storage, especially under unfavorable conditions, can result in greatly reduced survival of seedlings after planting.

Landowners can grow cypress seedlings, but this takes at least a year or more and requires facilities such as a greenhouse or outdoor nursery. Several hurdles must be overcome to successfully produce cypress seedlings. Availability of cypress seed varies from year to year and with location. (However,

collected seeds can be held for up to several years in cold storage.) Cypress seeds have an innate dormancy that can be overcome by a chilling treatment (cold stratification) (Wilhite and Toliver 1990). A survey of seven Florida nurseries indicated high variability in germination rate, from 10% to 90% (average of 57%) for baldcypress seeds and 10% to 60% (average of 42%) for pondcypress (Vince and Duryea, unpub. data). When kept watered and fertilized, the seedlings are usually large enough at the end of one growing season for planting.

Planting Steps

Successful establishment of cypress seedlings depends on the selection of an appropriate site, acquisition of good quality seedlings, proper handling of the seedlings, and--not the least--use of correct planting techniques. Careless or incorrect planting can result in failure of the project. In wetlands, foot and equipment traffic should be kept to a minimum. Seedlings are vulnerable and the soils can become compacted, altering their physical and chemical properties and reducing their capacity to sustain plant growth.

Timing of Planting

The best time to plant bare-root cypress seedlings is while they are dormant (November to March). Freezing temperatures should be avoided because the roots are sensitive and will die if frozen. Containerized cypress seedlings can be planted year-round.

The most important consideration is avoiding the exposure of newly planted cypress seedlings to drought. Seedlings should be planted when the soil is moist or shallowly flooded and likely to remain so for several months. Planting cypress in water is fine provided that the seedlings are not completely submerged (See Figure 4).

North Florida often experiences drought during the spring (April to June). Bare-root cypress seedlings should be planted well in advance of this period, and containerized seedlings can be planted either well before the dry period or once the wetlands have flooded again. In South Florida almost all the rain falls in the summer, and the water table in some wetlands can drop far below the ground surface for several months in winter and spring. Successful plantings on these sites are more likely if you wait until the rains begin, and then you plant containerized seedlings to allow sufficient establishment before the winter-spring drawdown.

Figure 4. Cypress seedlings can be planted in shallowly flooded soil.

Care and Handling of Seedlings

Tree seedlings should be protected from temperature extremes and never be allowed to dry out. A refrigerated truck is the best means of transporting seedlings from the nursery to the field site. If seedlings are carried in an open vehicle, they should be covered with a reflective tarp to prevent drying or overheating.

Try to plant cypress seedlings immediately upon receipt from the nursery. If that is not possible, store the seedlings in a cool, dark place, preferably in a refrigerated storage unit. Dense shade or a shed will do for a few days, provided the roots are not allowed to dry out or freeze. Bare-root seedlings are especially vulnerable and require careful handling. They are packed in bundles of 50 to 200 and should be watered to prevent drying unless they have already been coated with absorbent material and are completely enclosed in lined bags or boxes. Bare-root cypress seedlings retained in cold storage have a higher post-planting survival than those held in tubs of water (Conner et al. 1993).

Take only as many seedlings to the field as you can plant in a day. A good way to protect bare-root seedlings is to transfer them to a planting bag

containing moist sphagnum or peat moss. Leave the planting bag or containerized seedlings in the shade (preferably under a reflective tarp) until ready to plant, and work quickly once the seedlings, especially the roots, are exposed to air and sunlight.

Spacing

Planting density depends on landowner objectives and, in the case of harvested swamps, the likelihood of natural cypress regeneration from seed and remaining stumps. When fiber production is the primary objective, a common recommendation for spacing of cypress seedlings is 8 x 8 feet (2.5 x 2.5 m), requiring 680 seedlings per acre or 1700 per ha (Bull 1949, Williston et al. 1980). A less dense spacing of 10 x 10 feet (3 x 3 m**,** 437 seedlings per acre or 1090 per ha) is likely to be sufficient if sawtimber production is the overriding goal. Even lower densities can satisfy other landowner objectives, such as enhancement of wildlife habitat. Remember to plant more than your target to compensate for seedlings that will die in the first few years (see What to Expect).

Most wetlands have gradients of water levels and uneven topography. The best strategy is to plant seedlings throughout a site, provided that they are not likely to be fully submerged or subjected to long periods of dry soil conditions.

Planting

Cypress seedlings are usually planted by hand. The cost of mechanical planters is too high for most small reforestation projects, and on wetland sites, flooded conditions may prevent their use during much of the year.

Various tools can be used for hand planting cypress, including dibbles, bars, and shovels. Once you create the hole with one of these tools, insert the seedling with the root collar at or just below the ground surface. Place the roots of bare-root seedlings so that they can spread out naturally, without twisting or bending. Then close the hole and pack soil firmly around the seedling. If you are planting into soft, flooded soil, hold the seedling at the root collar and push it in until your hand reaches the soil.

Although planting a tree by hand is a simple task, it is often done incorrectly. Frequent mistakes include: planting the seedling either too deep or not deep enough; digging a hole too shallow for proper placement of the roots; planting the seedling in a non-vertical position; and leaving an air pocket near the roots after closing the hole, which may allow the roots to dry out. If the planting crew is inexperienced, make sure that you take the time to demonstrate clearly the proper way to plant.

Seedling Management

For two years after planting, survival of the seedlings should be closely monitored. This period is critical: if a reforestation project fails, it most likely happens then. A common cause of death of cypress seedlings is extended drought in the post-planting period. Others include inundation coupled with high temperatures, poor quality seedlings, poor planting practices, animal predation, and fire. If fewer trees remain than expected after two years (see the next section), replanting may be necessary.

Predation by nutria, an exotic rodent, is a serious threat to cypress plantings in Louisiana wetlands, where seedlings are unlikely to survive unless guarded by seedling protector tubes or chicken wire (Myers et al. 1995). In Florida, nutria are uncommon, and the most frequent predators of cypress seedlings are rabbits, deer, and feral hogs. Planting large cypress seedlings (3 gallon container or greater), which can survive grazing and produce new sprouts in response, is an alternative method of protecting seedlings against these predators. However, unless you are certain of dense populations on the site, these protection measures are probably not worth the expense. Usually the most cost-effective course is to expect some predator damage and to initially plant more seedlings than the target density.

Cypress seedlings, even pondcypress, are susceptible to fire, and so the newly planted site should be protected if burning is expected nearby. Create a fire break around the site by disking and maintain it periodically, especially during extended dry periods.

Post-planting weed control is often recommended for cypress plantings (e.g., Williston et

al. 1980). Vegetation management is usually achieved by the use of chemical herbicides, hand cutting, or mowing, and if water control structures are available, then controlled flooding can also be used. However, the benefits of weed control to cypress plantings are not certain on all wetland sites, and they may be outweighed by the costs. In one study, growth of cypress seedlings was enhanced when vines that overtopped and entangled them were cut back (Myers et al. 1995). In several others, control of herbaceous vegetation (mainly cattails and grasses) did not result in increased survival or growth of planted cypress (e.g., Rushton 1988).

What to Expect

Planting success of cypress is often very high. Five years after establishment, 90% of winter-planted baldcypress seedlings survived in a Louisiana crayfish pond (Conner et al. 1993). In wetlands constructed on Florida's phosphate-mined lands, cypress consistently has had the highest survival rate of any wetland tree species planted. A survey of six of these wetlands indicated that the average survival after four years was 85% for both baldcypress and pondcypress (Brown and Best, unpub. data).

Lower survival rates are usually attributable to drought or predation in the first year following planting. In a Louisiana pond, summer-planted baldcypress seedlings experienced high temperatures and low water levels soon after planting, and only 42% survived at the end of four years (Conner et al. 1993). The survival of bare-root pondcypress seedlings planted in eight harvested swamps in north Florida ranged from 37% to 89% (overall 63%) after four years (Vince, Duryea, and Randall, unpub. data). The region entered a prolonged drought soon after the seedlings were planted, and the lowest survival rates were in swamps that did not flood during the growing season.

Growth rates of planted cypress vary substantially among sites (See Table 1) and even within sites (Denton 1990), depending upon light availability, nutrient supply, soil characteristics, and water depth. Cypress seedlings grow slowest where light levels are low, such as beneath a full tree canopy; nutrients are in low supply; and water levels are either too high or they are so low that the soil in the root zone is dry for long periods.

Cypress trees planted in yards and kept well watered and weeded can grow very rapidly, even 12 feet (3.7 m) in three years (Williston et al. 1980). Those planted in more natural settings grow more slowly, but require much less maintenance. By taking care in selecting an appropriate site and in handling and planting the seedlings, you can expect to establish a healthy, flourishing cypress stand (See Figure 5).

Figure 5. Cypress saplings seven years after being planted on a floodplain site near Pensacola, Florida.

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Table 1. Height Growth of Planted Cypress Seedlings

Cypress Variety	Site Description and Location	Growth Rate Inches per year (Cm per year)	Source of Data
Baldcypress	Crayfish pond, Louisiana	11 - 18 (27 - 47)	Conner et al. 1993
Pondcypress	Cypress pond, North Florida	5 (12)	Deghi 1984
Bald- and Pondcypress	Cypress ponds with sewage effluent, North Florida	8 - 23 (21 - 58)	Deghi 1984
Pondcypress	8 Harvested cypress ponds, North Florida	1 - 16 (2 - 41)	Vince, Duryea, and Randall, unpub. data
Pondcypress	Wetland restoration on limerock, Big Cypress National Preserve	6 - 7 (16 - 18)	Vince and Snyder, unpub. data
Not Specified	15 Wetland mitigation sites, Central Florida	17 - 37 (43 - 94)	Denton 1990