



Fig. 8. A clearcut cypress swamp in central Florida.

seed-tree cutting. However, there is no clear evidence supporting any one method. The major areas of concern are damage to remaining trees, subsequent regeneration, and degree of growth response after thinning or other forms of partial cutting.

Clearcutting (Fig. 8) has been defended as a method of ensuring good post-harvest stocking (e.g., Hanna, 1981). Arguments supporting clearcutting are based on good regeneration that has been observed on experimentally clearcut plots, the efficient use of labor and equipment in swamps that are not readily accessible, and the economic impracticality of removing low volumes in intermediate thinnings (McGarity, 1979). A vegetation analysis of ten swamps in central Florida showed that in the absence of fire, cypress seedlings and sprouts are dominant among the woody species (Ewel et al., 1989). Lack of regeneration in a baldcypress stand where no trees had been left after logging and burning (Gunderson, 1984) suggests that a nearby seed source and absence of fire are necessary for baldcypress reproduction.

Seed-tree cutting is favored by the fact that advance regeneration of cypress is usually sparse (Stubbs, 1973; Johnson, 1981; Best et al., 1984). Cypress seed is relatively immobile, and seed trees can be left as long as it takes to establish a new stand after harvesting. Good natural regeneration has been observed in cypress forests in which trees have been left standing. For instance, Terwilliger and Ewel (1986) found that pondcypress regained its apparent original basal area and dominance within 45 years after selective logging. Recommendations have included leaving a heavy shelterwood of 75 to 100 trees per hectare (30 to 40 trees per acre) where there is little advance regeneration (Stubbs, 1973) and 10 to 20 trees per hectare (4 to 8

trees per acre) with diameters of 25 to 46 centimeters (10 to 18 inches) (Mattoon, 1915).

Some have found that thinning out smaller trees can be profitable (e.g., Johnson, 1979). Mattoon (1915) recommended thinning in small stands of pole-sized cypress and in dense second-growth stands to give better trees more space for crown development. Bull (1949) suggested thinning out poorer individuals at age 70 and holding the best trees until age 100 because the rate of increase in volume would still be high. Evidence of enhanced growth of remaining trees was provided for baldcypress by McClurkin (1965), Williston (1969), and McGarity (1979), but Terwilliger and Ewel (1986) found that selective logging did not increase the growth rate of remaining pondcypress trees.

McGarity (1979) preferred clearcutting to thinning. However, if early returns are desired, he recommended thinning to a basal area of 16 to 18 cubic meters per hectare (70 to 80 cubic feet per acre). He found that this degree of thinning left enough trees to utilize the site fully, and these so-called "leave" trees showed the same amount of diameter growth as did trees in more severely thinned stands.

Williston et al. (1980) advocated two thinnings before the final cut. The first, between the ages of 15 and 20 years, would yield fenceposts, but more importantly, would relieve the stagnation caused by the overstocking that can follow clearcutting. They advised leaving at least 750 trees per hectare (300 trees per acre); otherwise, the trees would not lose their lower limbs, resulting in undesirable knots in the wood (Smith, 1962). Mattoon (1915) also pointed out that side shading accelerates height growth and natural pruning. The second thinning, 10 years after the first, would yield poles and other small products.

Planting

To ensure cypress regeneration, Bull (1949) suggested planting seedlings tall enough to avoid inundation. Seedlings raised in a nursery by Gooch (1953) averaged 75 to 100 centimeters (30 to 40 inches) in height at the end of the first growing season. Rathborne (1951) found that seedlings 75 centimeters (30 inches) tall or greater were large enough to survive flooding in an experimental Louisiana planting.

Bull recommended a 2-meter by 2-meter (6-foot by 6-foot) or 2.5-meter by 2.5-meter (8-foot by 8-foot) spacing. Krinard and Johnson (1976) planted 896 seedlings on a 2-meter by 3-meter (6-foot by 10-foot) spacing. The plantation was cultivated three or four times annually for the first 4 years and mowed once a year for the next 6 years. After 21 years, 41% of the trees had survived, and their average diameter was 15.5 centimeters (6.1 inches).