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Water Tupelo in the Atchafalaya Basin Does Not Benefit from Thinning

Harvey E. Kennedy, Jr.

SUMMARY

Water tupelo occurs on about 4 million acres in the South and Southeast. Its wood is exceptionally clear and defect-free and is used primarily for veneer and box lumber. Most stands are dense, stagnated, and appear to need thinning or some other type stand improvement work. But in a typical stand in the Atchafalaya Basin residual trees showed no significant growth response to thinning. Reasons could be age of stand, small live crown ratio, and yearly defoliation by the forest tent caterpillar. Greatest benefit from thinning is probably salvage of trees that would otherwise be lost through mortality.

Additional keywords: *Nyssa aquatica,* wetlands, flooding, growth, volume.

INTRODUCTION

Water tupelo (*Nyssa aquatica* L.) grows most commonly in swamplands and bottomlands along watercourses in the South and Southeast. It normally grows in even-aged dense stands with or without cypress (*Taxodium distichum* (L.) Rich) and other tupelos. The wood is exceptionally clear and defect-free and is used primarily for veneer and box lumber. Small dimension trees are used for crossties and pulpwood.

Water tupelo typically has a long, clean bole strongly buttressed at the base. Trees are cut near the top of the butt swell, which may be as much as 8 feet aboveground, or they are felled and bucked to leave the basal wood. Laundrie and McKnight (1969) reported that bleached kraft and neutral sulfite semichemical pulps made from butt swells of water tupelo were well suited for manufacture of greaseproof papers and a good quality corrugating medium.

There are about 4 million acres of water tupelo in the South and Southeast. Most of this acreage is dense, stagnated, and appears to need thinning or some type of stand improvement work. Growth rates are usually low. This paper reports on the growth response of water tupelo to four thinning intensities in a typical stand in the Atchafalaya Basin. The results are probably applicable over most of the area where water tupelo is found.

METHODS

The stand was fairly uniform and well stocked except for remnants of some old pullboat roads used in logging the virgin cypress and tupelo. It is typical of forests found on thousands of acres of swampland in the South and Southeast (fig. 1). When the study was started in 1967, stand basal area was about 250 square feet per acre; trees averaged about 13 inches in diameter above the butt swell and 65 feet in height. Two crown classes, codominant and suppressed, were represented although most trees were codominant.

The individual crop-tree approach was used. Forty codominant trees, which normally should be left as crop trees during thinning, were randomly selected.

One of the following treatments was randomly assigned to each:

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1. Check—no thinning.
2. Light thinning—measure out 10 feet on each side from center of sample tree and cut all trees within the 20- × 20-foot square.
3. Medium thinning—same as light thinning, except measure out 15 feet from center of sample tree.
4. Heavy thinning—same as light thinning, except measure out 20 feet from center of sample tree.

These thinnings would leave about 109, 48, and 27 trees per acre, respectively. Individual tree thinning treatments appear open to question by some, but our data are sound and similar to those reported by McGarity (1979).

After treatments were assigned, trees to be removed were marked and diameter of each measured at a point above the butt swell. This was considered to be where diameter of merchantable stem would be measured—about 6–7 feet above ground line. These were used to calculate basal area removed around each tree. Stand age was determined by representative ring counts.

Study trees were marked so diameter measurements could be made at the same location each time. Measurements of diameter above the butt swell, total height, merchantable height, crown width, and live crown ratio were made when the study was installed, and at the end of 5 and 12 growing seasons.

Diameter measurements were made on 30 cut trees at 1 and 4 feet above groundline, then up every 4 feet to a 4-inch outside bark diameter. Total tree height and length of butt swell were also measured. Cubic-foot volumes in butt swell, merchantable stem, and total tree were calculated using Smalian's formula. Percent volume in butt swell in each tree was computed using the ratio of volume in butt swell to volume in total tree.

A completely randomized design with 10 replications of each treatment was used for the study. Analysis of variance using a completely randomized design was used to test differences between treatments at the 0.05 level of significance.

RESULTS AND DISCUSSION

Ring counts on cut trees showed the stand to be about 55 years old (table 1). An average of four trees and 2 square feet of basal area was removed around each tree in the light thinning treatment, nine trees and 5.6 square feet of basal area in the medium thinning, and 16 trees and 10 square feet of basal area in the heavy thinning.

Figure 1.—*Typical water tupelo stand similar to the study area.*

Thinning intensity had no significant effect on diameter growth, total height, or merchantable height. Diameters increased by 1.7, 1.4, 1.5, and 1.1 inches in the check, light, medium, and heavy thinning treatments, respectively, during the 12 years of this study. Heights increased by 6, 9, 8, and 9 feet, respectively.

Thinning intensity did significantly affect changes in crown area. Trees in the medium thinning treatment had a significantly larger crown change than the heavy thinning, with no difference between the check and light thinning. This is unusual as normally a larger increase in crown size in the heavier thinning would be expected. By treatment, 40 percent of the trees in check plots decreased in crown area over the 12 years, none in the light, 30 percent in the medium, and 40 percent in the heavy. Crown area decrease may be because of death of branches in the lower crown.

Harvey E. Kennedy, Jr., is Principal Silviculturist at the Southern Hardwoods Laboratory, maintained at Stoneville, Mississippi, by the Southern Forest Experiment Station, Forest Service—USDA, in cooperation with the Mississippi Agricultural and Forestry Experiment Station and the Southern Hardwood Forest Research Group.

Table 1.—*Average diameters above butt swell, total and merchantable heights, crown widths, and percent live crown by treatment and date*

Measurement	Check			10×10			15×15			20×20		
	1967	1972	1979	1967	1972	1979	1967	1972	1979	1967	1972	1979
Total height (*ft.*)	66	72	72	65	73	74	66	72	74	65	71	74
Diameter (*in.*)	13.0	14.4	14.7	13.9	14.8	15.3	13.7	14.5	15.2	13.6	14.6	14.7
Merch. height (*ft.*)	51	57	57	53	55	56	53	56	58	51	56	59
Crown width (*ft.*)	15×17	18×18	16×15	14×17	17×19	18×18	15×17	18×19	18×19	15×16	17×19	14×16
Live crown (%)	23	21	23	20	23	24	22	22	22	22	20	18

Live crown ratios averaged about 20–22 percent throughout the study period. The live crown is probably too small a proportion of the tree to respond to thinning. A general rule is to keep at least half of the tree in live crown for best growth.

Typically, water tupelo is cut near the top of the butt swell, which may be as much as 8 feet above ground, or they are cut low and bucked to leave the butt swell portion. Measurements on cut trees in this study showed that from 30–68 percent of the total cubic foot volume was in the butt swell, with an average of 47 percent of the total volume left when the butt swell portion was not used.

SUMMARY AND CONCLUSIONS

Trees showed no significant response to thinning in this stand. Reasons could be twofold: (1) trees were too old and the live crown ratio (20–22 percent) was too low before thinning, and (2) the stand was defoliated each year of the study by the forest tent caterpillar (*Malacosoma disstria* Hubner). Forest tent caterpillar defoliation each year may be a key to the lack of response. Morris (1975) reported that studies in Alabama showed 5-year growth losses of 70 percent or more in tupelos defoliated each year. Equal losses were estimated for trees in Louisiana. Morris reported that trees do not usually die when repeatedly defoliated but cannot grow. Within a month after feeding stops, new, stunted leaves appear. But these merely maintain life until the next season when the cycle is repeated.

McGarity (1979) reported on 10-year results from thinning and clearcutting in a cypress-tupelo swamp. However, because of within-replication differences of tree size, stocking, and species distribution, only a simple arithmetical summary was presented. From the 10-year growth data, it appears that McGarity's results are similar to this study except possibly in the control plot.

An average of 47 percent of the total tree cubic foot volume in this study is left in the woods if the butt swell is not utilized. But, this wood is suitable for manufacture of greaseproof paper and corrugating medium.

Results of this study indicate that even heavy thinning in water tupelo may not increase growth on the residual trees. The greatest benefit from thinning may be the salvage of trees that might otherwise die and the resultant increase in recoverable yield over the rotation of the stand.

Logging problems in a tupelo swamp require that substantial volume be removed or, more likely, clearcutting be done to justify the expense. It is possible that thinning may not be economically feasible even if a growth response is expected.

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