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DELTA TIMBER LANDS THRIVE AFTER UNDESIRABLE TREES ARE CUT

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The forests of the Mississippi Delta, which once produced some of the finest hardwood saw timber in the world, are badly in need of a weeding.

Forest fires, logging that took the best trees and left the worst, wholesale cutting of desirable trees for firewood, and other mismanagement have left thirty percent of the trees so rotten, fire-scarred, limby, or otherwise undesirable that they have no present or future utility for anything but firewood. Many other stems are fit only for low-grade, low-value products. Such trees are weeds in the forest, and drag down the productivity of the stand just as grass and field weeds cut the yield of cotton and corn.

What Delta forests need, almost without exception, is an improvement cutting to remove the undesirable trees. But how much growth can be expected from the remaining trees?

A partial answer to this question is available from improvement cuts made in 1940 on a part of the Delta Experimental Forest, near Stoneville, Mississippi.

Marking Rules

The study was made on 80 acres of typical second-growth bottomland forest with a high proportion of undesirable trees, including many culls.

Tree species were lumped into three groups according to their value for lumber and their suitability for the site. The most desirable species were considered to be sweetgum, green ash, cottonwood, persimmon, baldcypress, mulberry, Nuttall oak, willow oak, and water oak. Next came intermediate species like American elm, hackberry, red maple, sweet pecan, willow, and sycamore. The species classed as poorest were overcup oak, bitter pecan, honeylocust, waterlocust, cedar elm, boxelder, hawthorn, swamp-privet, and planertree.

Three treatments were compared — light cut, heavy cut, and a check area in which no trees were removed at all. No treatment affected any trees smaller than 5½ inches in diameter at breast height (4½ feet above the ground).



Figure 1. Left: In 1940, when it was partially released from the competition of other trees, this thrifty Nuttall oak was 8.8 inches in diameter. Right: In 1951, it measured 15.6 inches, a gain of 6.8 inches in 11½ growing seasons. For the inside story of this growth, see Figure 2. (Photos by Mississippi Agricultural Experiment Station and U. S. Forest Service.)

In the light cut, all trees 5½ to 13½ inches in diameter were marked for removal if they were damaged, decayed, badly infested with grubs, poorly formed, likely to die, or seriously interfering with much better trees. Of the trees larger than 13½ inches in diameter, all those of the poorest species were cut, along with those of the other species that did not contain or seem capable of developing a

log suitable for factory lumber or slack staves. Lastly, all trees of intermediate species were cut if they were interfering with trees of the best species that were more than 3½ inches in diameter.

The heavy cut removed everything larger than 5½ inches in diameter except thrifty, high-grade trees that belonged to the most desirable species and contained or were capable of producing a log suitable for factory lumber or slack staves. In practice, the heavy cut differed from the light chiefly in that it took out more cordwood-size trees.

Probably these requirements were too severe, particularly as they removed

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Table 1. Development of Delta hardwood stands during 10 years subsequent to cutting.

Cutting	Trees per acre ¹						Basal area per acre ¹					
	Left in 1940		1945		1950		Left in 1940		1945		1950	
	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
	Number						Square feet					
Heavy	21.6	2.2	45.7	4.5	65.7	9.5	8.8	3.4	17.0	7.1	23.6	14.6
Light	38.7	2.4	65.7	5.7	80.2	11.5	14.6	3.7	24.3	8.3	30.9	17.4
Check; no cutting	76.2	17.8	88.8	21.4	94.3	24.7	28.8	34.5	35.6	43.0	39.5	46.9

¹"Small" refers to trees 5½ to 13½ inches in diameter at breast height.

"Large" refers to trees larger than 13½ inches in diameter at breast height.

many well-formed, fast-growing trees solely because they were not of the most desirable species. Marking for improvement cutting now depends more on the quality of the individual tree than on species alone. Nevertheless, the 1940 cutting was a step in the right direction.

The cut was made in spring. As many marked trees as possible were used for lumber or timbers, and the rest were cut into fuel wood. Logging was done with especial care to prevent damaging the trees that were to be left for growth.

Before cutting began, the stand on the lightly cut area was 1,300 board feet (International ¼-inch rule) per acre, while that on the heavily cut and the check areas was about 1,800 board feet. Table 1 shows the number of trees, the basal area per acre of the stands left after cutting, and the increase through growth at the end of 2 five-year periods following the cut. Basal area is shown because it is one of the most useful ways of describing the density and growth of a stand of timber. It is the cross-sectional area in square feet, outside the bark, of the tree stems measured at a point 4½ feet above the ground. Volume per acre of trees with diameters larger than 13½ inches is shown in table 2.

Jungle to Forest—1940 to 1950

Both the heavy and the light cuts reduced the total volume of the stands drastically. After cutting was completed, a person standing on one edge of a 10-acre cut area could see almost all the way across it. Here and there in patches stood the remaining poles and small timber, and an occasional large tree. These stems were the cream of the original stand, of course, and were all well provided with growing space.

This open aspect of the cut areas did not last long. Quickly the stands took on the appearance of a jungle, as openings made by the cutting filled in with weeds, briars, vines, and tree seedlings. As usual, the seedling crop was almost invisible from outside the jungle but it was there. After about 5 years, the jungle began thinning as the shade of the growing trees began killing the briars and vines. This process, incidentally, is

still underway, but the area is readily recognizable as a forest again.

After 1940 nothing was done to the stands except to protect them from fire and further cutting. In 1945 benefits of the cutting began to appear, and by 1950 the stands showed a very encouraging response to the improvement work.

In these ten years, the basal area of trees larger than 5½ inches in diameter increased 30 square feet per acre in the lightly cut stands and 26 square feet in the heavily cut areas. Where no cutting was done, the increase was 23 square feet. Sawlog volume on lightly cut areas in 1950 was 1,825 board feet per acre, or almost six times as much as had been left in 1940. The heavily cut stands grew from 330 feet in 1940 to 1,630 in 1950.

The uncut stands went from 1,815 board feet per acre in 1940 to 4,340 feet in 1950, an increase of 2,525 board feet. This would have been very satisfactory if all of the trees had been of high quality, but unfortunately the bulk of them were of low quality.

In the last 5 years, growth per acre per year in the cut areas has been 200 board feet, or 2½ times what it was in 1940 to 1945. The uncut stands are still growing the most wood yearly (about 250 board feet per acre), but as table 1 shows, their rate of growth is not increasing much. Before 1955, yearly growth on the cut areas should equal or exceed that on the uncut.

Much — perhaps most — of the board foot growth on the areas with the im-

Table 2. Volume per acre of trees larger than 13½ inches in diameter at breast height.

Cutting	Left in 1940	1945	1950
		Board feet (Int. 1/4-inch rule)	
Heavy	330	710	1,630
Light	315	730	1,825
Check; no cutting	1,815	3,010	4,340

provement cut resulted from trees smaller than 13½ inches in diameter (minimum size for saw timber) in 1940 becoming larger than that by 1950. This emphasizes the importance of careful logging to preserve good trees that are close

to sawlog size and can therefore contribute a lot to future volume.

None of this information means much unless stand quality is considered also. The cut areas are now stocked with sound, vigorous trees, largely of the most suitable species for the site. In the uncut stands the growth of the good trees is severely handicapped by a heavy stand of damaged, defective, poorly formed trees that probably will never produce sawlogs.

If an improvement cut were made now, even under the less stringent present-day marking rules, 67 percent of the board-foot volume of trees larger than 13½ inches in d.b.h. would have to be removed from the uncut area. The areas that were treated in 1940 do not need another improvement cut. If one were made, however, it would remove only 7 percent of the volume on the lightly cut area and only 4 percent on the heavily cut area.

Conclusions

Even though the improvement cuttings were somewhat drastic, volume growth has been quite satisfactory, and stand composition has been greatly improved. In terms of potential value, there is no question but that the improvement cutting was eminently successful.

Despite their limitations, the marking rules used in 1940 met the basic requirement for successful improvement cutting. That is, they left a nucleus of the very best trees of all sizes, including saw timber, and they removed the undesirable trees so that this nucleus had almost complete freedom to grow. Equally as important, the trees not marked to cut were given every reasonable protection from logging damage.

These two actions—leaving well-formed, vigorous saw timber to grow, and releasing well-formed, vigorous poles from undesirable competition—account for the healthy stands which are now growing high quality saw timber at constantly increasing speed. By 1960, the cut stands will have much more sawlog volume than they had before the cut in 1940, and most of this volume will be in trees of better quality and vigor.