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WEED CONTROL AND SITE PREPARATION FOR NATURAL REGENERATION OF COTTONWOOD[1/]

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Some of the finest forest land in the country is in the batture of the Mississippi River--the area between the levees and the river. Many of these sites once bore nearly pure stands of cottonwood, and cottonwood probably is the most valuable timber crop that could be grown on them today. After the old-growth was harvested, though, the sites were taken over largely by trees of inferior species and form.

Cottonwood can be regenerated by clearing, setting out cuttings, and cultivating during the first year to keep down weeds. These measures are reliable, but their difficulty and expense have stimulated interest in securing natural regeneration from the cottonwood seed trees still scattered through many batture stands. They cast abundant seed every year, but no new stands develop because the seedlings can become established only on bare, moist soil and can develop only in direct overhead sunlight and where weeds and brush are sparse.

To regenerate cottonwood by seeding, it is necessary to: (1) remove the overstory, (2) prepare a bare seedbed, and (3) prevent the invasion of weeds for at least one year. To achieve all three requisites at one time is not easy. Removal of the overstory stimulates immediate, lush growth of weeds and vines.

Good Regeneration on Bulldozed Strips

In a study begun in the spring of 1960, the Anderson-Tully Company and the Stoneville Research Center tried a number of site treatments on the riverfront north of Vicksburg, Mississippi. The stand consisted mainly of boxelders 6 to 16 inches in diameter. Soil was Commerce silt loam, and the site index for cottonwood (expectable height of trees at age 30 years) was 120 feet or better.

Two overstory treatments, clearing and deadening, were tested in combination with five methods of ground preparation: plowing, disking, and bulldozing to depths of 5 to 10 inches, 10 to 15 inches, and 15 to 20 inches. The 10 treatments were replicated three times in a randomized block design. Plots were one-half acre in size.

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2/ Stoneville, Mississippi, Research Center, maintained in cooperation with the Mississippi Agricultural Experiment Station and the Southern Hardwood Forest Research Group.

Overstory trees were deadened during April by injection of 2,4,5-T in diesel oil. Except for an occasional sycamore or sweet pecan, all trees above 2 inches in diameter were treated. Clearing was done early in May with a D-8 tractor equipped with a KG blade. Cleared trees were windrowed at the edges of the plots. The deadened trees cast some shade during spring and summer, while cleared plots had full light from the first.

The ground-preparation treatments were installed early in May, by which time most weed seeds from the previous year had fallen and many had germinated. In the bulldozing treatments, a D-8 with a dozer blade cut a strip 10 feet wide and 200 feet long down the center of each plot. Furrowing was accomplished with a D-4 tractor and a fireplow; the furrows were 3 feet wide and 5 to 10 inches deep. On cleared plots they were parallel to each other and about 5 feet apart, center to center. Where the overstory had been deadened the furrows meandered somewhat, to avoid the standing trees. Disked plots were worked with the D-4 and an 8-foot tandem disk. Soil was stirred to a depth of 4 or 6 inches all over the cleared plots and in three strips on plots where the overstory trees were still standing.

Female, seed-producing cottonwoods averaged 1.3 per acre. Most were 30 to 40 inches in diameter and more than 120 feet tall. Seedfall began about May 12 and continued at a high rate until the second week in June, when it reached a peak. It declined rapidly for the next month and stopped in mid-August. About 8.5 million seeds per acre fell on the plots.

Seedlings became established on some plots by the middle of May. They were thickest, up to 2 million per acre, in low, moist depressions in the bulldozed trenches. Very few started on the disked plots or under crowns of seed trees. New germination following rains, and mortality following droughts, caused fluctuations in seedling counts from May until about the middle of July. Thereafter stocking remained fairly stable. Despite the fluctuations, the May count gave a good indication of the stocking at the end of the growing season. Plots with the most seedlings in May also had the most in August.

In November, stocking (i.e., proportion of sample milacres having at least one tree) on the bulldozed strips ranged from 70 percent for shallow bulldozing after clearing to 98 percent for medium bulldozing after deadening of the overstory. On plowed plots average stocking was 32 percent. The stand was a complete failure on disked plots. For all treatments except plowing, stocking was a little better where the overstory had been deadened than where it had been cleared.

The seedlings made a slow start but then grew well. On June 15 the tallest were less than 5 inches, and a month later they were still not over 20 inches. From July through September the best seedlings gained more than an inch a day and ended their first season 9 feet tall.

On the average, seedlings on cleared plots grew faster than those under deadened trees. In November the average height of dominants was 4 feet where the overstory had been cleared and 3 feet where it had been deadened. Most seedlings directly under the crowns of seed trees were less than 2 feet tall.

As stated earlier, one objective of the soil treatments was to eliminate weed competition for at least 1 year. Bulldozing accomplished that purpose best, because it moved weeds and weed seeds off the strips. In scattered spots, vines--mainly morning-glory, Ipomoea sp.--formed mats that halted the establishment of reproduction and killed or deformed established seedlings. In November, standing vegetation, not vines, was measured on all plots by estimating the percentage of the soil surface directly under the crowns of living weeds. Results showed that 90 to 100 percent of the area in bulldozed strips was free of competition. All three depths of bulldozing gave adequate weed control.

The fireplow did not adequately check weeds. The sides and bottoms of the furrows stayed clear, but on the intervening strips poke (Phytolacca americana) and ragweed (Ambrosia artemisiifolia) grew so freely that the plots appeared to be solidly covered. The percent of plot area actually overtopped was 60 to 65.

Disking did not control, and may have stimulated, the occurrence and growth of weeds. From 75 to 80 percent of the disked ground was under weed crowns. By late summer poke and ragweed completely overshadowed most seedlings on disked plots.

Where the overstory had been deadened weed growth was a little less than where it had been cleared.

Giant Plow

The 1960 test was so encouraging that E. C. Burkhardt of Anderson-Tully Company developed a giant plow to simulate bulldozing. This machine, which is capable of making a furrow 7 feet wide and 8 to 10 inches deep, was used in the spring of 1961 in another boxelder stand in the batture. Strips about a quarter of a mile long and 25 feet wide were cleared in a round trip--up and back--with a D-8 having a KG blade. A second round trip with the giant plow in tow then made two parallel furrows on the cleared strips. The edges of strips were about 25 feet apart and the trees between were injected with 2, 4, 5-T.

Plowing was completed on May 15. A few days later the Mississippi rose and flooded the area until about the first of June. Many seedlings became established as soon as the water went down, and survived and grew well throughout the summer. A heavy rain in mid-June flooded parts of furrows and killed some seedlings, but new ones became established as late as the middle of August.

By September 95 percent of the area in the furrows was stocked at a rate of 1,000 seedlings or more per acre. Stocking was best where the soil was sandy and where moisture was available throughout much of the growing season. It was poorest under crowns of seed trees, where moisture in the top 2 or 3 inches was scarce. There was no regeneration on unfurrowed parts of the strips.

Dominant seedlings averaged 3.5 to 4 feet tall by the end of the growing season. Their late start probably explains why they were shorter than those of the previous year.

Weeds and vines were sparse in the furrows. They were numerous elsewhere on the strips but could not overshadow the wide furrows and thus offered very little competition to the trees. Poke and ragweed, the main species, grew to 4 or 6 feet. Like the trees, they were shorter than in 1960.

Plow or Plant?

Depending on the situation, the plow treatment may be as good as planting for starting cottonwood stands. In either case the overstory must be deadened, but from that point on plowing may be simpler.

A plantation requires that cuttings be grown or purchased, that the site be cleared and disked smooth, and that the trees be cultivated for one and sometimes two growing seasons. The plow treatment avoids the expense of procuring and planting cuttings and requires no attention after the first operation. Many features must be perfected before the technique can be regarded as proven, but three firms have already used it to regenerate a total of about 100 acres. Several times that acreage will probably be attempted during 1962.