DIRECT SEEDING OF LOBLOLLY PINE IN NORTH MISSISSIPPI

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The direct seeding of loblolly pine has shown excellent promise on the Yazoo-Little Tallahatchie Watershed in north Mississippi. Since 1948, more than 543,000 acres have been planted with pine on badly eroded land in the 4.2 million acre Project area. More than 500,000 acres still need planting to stabilize the soil for slow runoff, and to improve the hydrologic condition of the soil. The work will be largely conversion of blackjack-post oak stands at $30 or more per acre. As costs mount and the labor supply grows ever smaller, direct seeding becomes increasingly attractive as an economical means of reforesting the area still needing treatment.

Field Trials

In 1958 repellent treated and untreated loblolly seed were sown on burned and unburned upland hardwood areas. In 1959 and 1960 treated loblolly seed were sown on burned, unburned, and scarified plots in fields and in the woods on four soil "areas"-Loess, Pontotoc Ridge, Sand-Clay Hills, and the Flatwoods. By 1961 Russell Burns (1) had developed a seeding hoe with which more than 350 acres were direct seeded that year.

Results of these early trials were erratic. The catch was better on the burned than unburned areas, better in the woods than in the fields, better on the wetter soils than on the sand, and directly related to the amount of rainfall during the summer of the year in which it was sown. Leaves blew back over many of the seed spots, smothering the seedlings.

In March 1964 the next trials were direct seeded; each of the 11 field units extended from Lexington, Mississippi, to the Tennessee line; and 5 acres were selected and regenerated, each acre by a different method. The treatments were as follows:

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1. Prescribe burn and seed with a cyclone seeder (fig. 1) .
2. Spot seed with a Panama or Burns' hand seeder.
3. Scuff a spot and drop five seeds.
4. Direct seed with a cyclone seeder without burning.
5. Plant 1-0 loblolly seedlings on a 6 ft. by 8 ft. spacing.

The planting results were best with an 11-unit average of 712 seedlings per acre and a stocking of 70 percent at the end of the first growing season. Results of the other treatments were as follows: Cyclone seeding on burn-1,223 seedlings per acre with 44 percent stocking; spot seed with tool-377 seedlings per acre with 24 percent stocking; spot seed on scuff-418 seedlings per acre with 27 percent stocking; and cyclone seeding on unburned area-664 seedlings per acre with 24 percent stocking.

By 1965 it had become apparent that of the direct seeding methods tried, prescribed burning followed by broadcast seeding offered the greatest promise of success. For the next 3 years, each of the units burned and seeded 5 acres per year. First-

Figure 1.—Direct seeding a recent prescribed burn in a low-grade upland hardwood stand.

year planting survival project-wide for these 3 years was 71, 55,. and 81 percent, respectively. The percent of direct seeding stocking for the corresponding 3 years was 73, 77, and 74 percent. (First-year catch per acre for these years averaged 4,088, 4,180, and 2,840 seedlings.) Thus, if we can equate firstyear direct seeding survival with that of planted seedlings 2 years from seeding, our direct seeding experience for the last 3 years was as good as our planting.

Some Considerations

The temporary and negative effects on the hydrological condition of an area of prescribed burning to secure favorable seedbed conditions are recognized as intelligent chance-taking. The risk of high intensity storms striking the denuded soil surface can be reduced by shortening the time between burning, seeding, and the assurance of lesser vegetation regrowth. The size of the area to be reseeded in relation to other physical factors influencing erosion is also considered in identifying practical areas for treatment.

In studies in this area by Ursic and Dendy (2), the average annual sediment yield per acre from cultivated land was 21.75 tons, from pasture 1.61 tons, and from depleted hardwoods 0.10 tons; average annual runoff from cultivated land was 16 inches, from pasture 15, and from depleted hardwoods 5. Other data available indicate that scrub hardwood stands burned and converted to pine will produce an extra one-half ton of sediment and 15 inches of extra runoff during the first 5 years. But projections indicate that over a 30-year rotation, sedimentation would be reduced by $1\frac{1}{2}$ tons, and runoff would be about 60 inches because of the ameliorating effect of a mantle of pine litter starting about the fifth year.

Criticism has often been expressed that burning and direct seeding in this area would be prohibitively expensive because the tracts are small size. Burning costs on small tracts are high because of the expense of transporting a fireplow to the area and the number of men standing by to take care of breakovers. Because these costs are high, concentrating our early direct seeding efforts on wildfires seems to be an attractive possibility. Refining our prescribed burning techniques to the point where firelines would be unnecessary should also be possible, and litter-moisture content alone would prevent the fire from burning off the area dedicated to growing hardwoods. In our early prescribed burns, we frequently got such a hot burn on the ridges that we killed the overstory but were unable to burn off the hardwood hollows on the lower and middle slopes.

Forty acres of ridges and upper slopes, the slope not exceeding 10 percent, is a good-sized burn. A burn in March, the month when the incidence of wildfire is highest, will generally remove the L layer and leave most of the F layer of the forest floor. This provides an adequate seedbed and affords some protection against spring rains in an area where the average rainfall in a 2-year 1-hour storm is 1.7 inches.

In fiscal year 1967, it cost $19.81 an acre to plant pine on the Project and $10.18 per acre to deaden the hardwoods where pine was underplanted. Costs have risen since then, but we believe we can direct seed for approximately half the cost of planting.

Conclusions

Direct seeding coupled with burning is a feasible method of reforesting low-grade upland hardwood sites with pine. But sites must be carefully selected to insure success. The forester prescribing the treatment must have an excellent knowledge of sites, direct seeding, and use of fire. This work is not a job for a neophyte.

Our conclusions pertinent to the Project area were as follows:

1. Direct-seed Project plantations that have been destroyed by fire and qualify for replanting at Project expense. (From 1960-65 about 1,500 acres of pine plantations were destroyed by fire each year. Approximately 70-80 percent of this acreage was burned over during the period of October to April, an ideal time to burn for seedbed preparation.)

2. Require that all areas to be direct-seeded be approved by an experienced forester taking into consideration the following:

a) Seed only good planting chances.

b) Avoid seeding deep, dry sands; sites subject to spring floods; steep, eroded areas where the seed would wash away; areas with heavy sod; and those areas heavily grazed.

3. Broadcast only repellent-treated, stratified seed at the rate of 1 pound (dry weight) per acre.

4. Use primarily loblolly seed collected within the Project area. (In 1968, 171 acres of burned plantations were sown with local seed.)

5. Sow the seed normally from March 1st to April 15th.

6. Evaluate the success of the direct seeding operation by an inventory taken early in June and October.

7. Deaden the hardwoods immediately if competing hardwoods are a problem and if the June inventory reveals that 50 percent or more of the area is stocked.

8. Confine direct seeding on the Project to wildfire areas for 2 or 3 years until the necessary experience is gained, and a pattern for success is clear.

Literature Cited

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2. Ursic, S. J., and Dendy, F. E.
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