PLANTING LOBLOLLY PINE FOR EROSION CONTROL: A REVIEW

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One of the best ways to eliminate soil erosion on many locations in the South is to establish a stand of pines. Those who face serious soil erosion problems may benefit from the experience obtained in reversing the inroads of erosion on one of the Nation's most vulnerable areas, covering a large part of northern Mississippi.

The techniques of planting pines for erosion control in the South (fig. 1) were largely established by foresters at the Oxford Mississippi Research Center during the decade of 1955-65. Building upon the tremendous foundation of knowledge of Phil Wakeley, and with his advice and assistance, the procedures and techniques cited below were gradually worked out. Three-quarters of a billion pine trees planted on 700,000 acres of eroding land in north Mississippi now bear witness to the success of these methods (fig. 2). These trees were planted primarily to abate further erosion; however, their performance exceeded expectations—they restored the productivity of the land, created a tremendous resource, and greatly enhanced the economy of the area.

Seedling Selection and Handling Before Outplanting

Workers planted various seed sources of loblolly, longleaf, shortleaf, slash, sand and Virginia pines, and eastern redcedar. Loblolly pine did the best. Not only did loblolly survive and grow best, but it produced more litter faster to stabilize the soil. The first year in the field was critical, with three-fourths of the mortality occurring then.

Modification of nursery practices did not improve field performance. In fact, fertilization had adverse effects. Prelifting fertilization with 160 pounds of nitrogen plus 200 pounds of potassium per acre decreased first-year survival 12 percent, but had no apparent effect on vigor or height growth. Pruning the roots of loblolly pine at 4, 6, 8, and 10 weeks before they were lifted did not consistently improve first-year survival or growth on old field sites. Top pruning at various times before lifting was not beneficial.

Figure 1.—*A 57-acre gully, near Holly Springs, Miss., planted with loblolly in 1953.*

Storage of seedlings by heeling-in is virtually a thing of the past. Seedlings in kraft-polyethylene (K-P) bags packed with or without moss can be held in cold storage for at least 3 months. For more than 4 weeks of warehouse storage or storage after March 15, the bags must be packed with moss. Three to 5 pounds of damp moss well distributed among the roots is sufficient. Forest Service bales packed with moss also can be held in cold storage for 3 months without special attention; those stored in warehouses should be watered twice a week. With either type of packaging, warehouse storage should be limited to 8 weeks. Baled loblolly seedlings can also be stored safely during the winter if buried in pits of well-drained, sandy earth for at least 6 weeks.

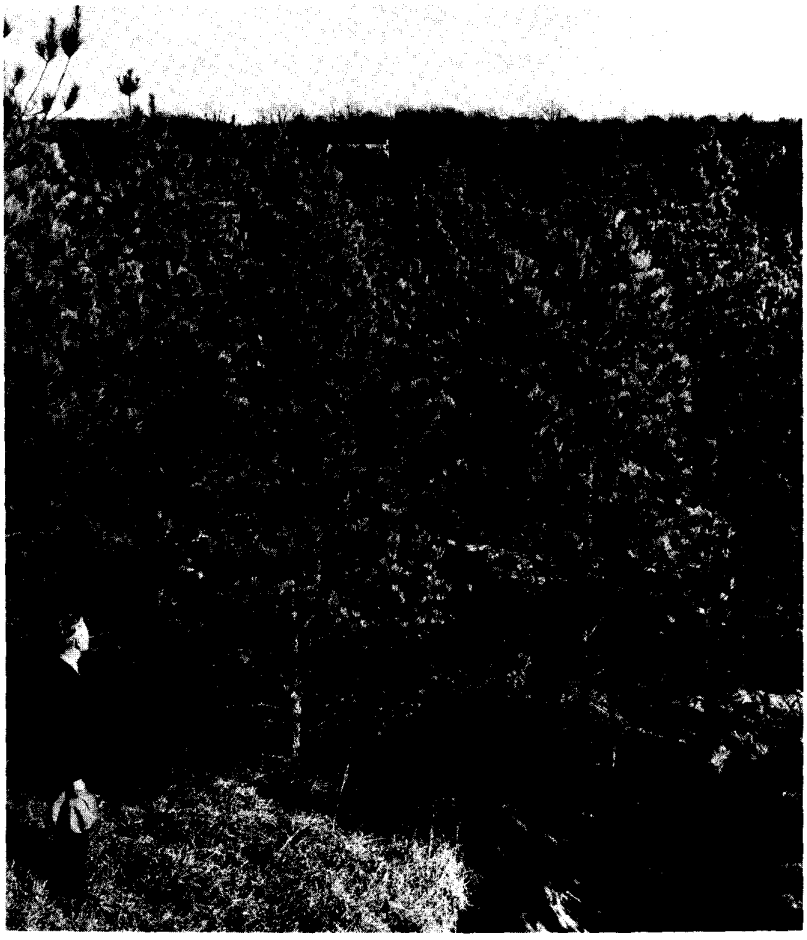

Figure 2.—*The 57-acre gully in 1969, fully stocked with 16-year-old loblolly.*

Seedling grades are important. Loblolly grades 1 and 2 consistently outgrew grade 3 seedlings and third-year survivals were consistently 10 percent higher. Grade 3's in these studies met require= ments for higher grades except for the minimum'/s-inch stem diameter. Furthermore, grade 1 loblolly seedlings when clipped through the epicotyl as if by rabbits or cattle, were more likely to sprout (55 percent) than grade 3 seedlings (46 percent) similarly damaged.

Planting Techniques

Effective Practices.—Some modifications of planting techniques were beneficial. Careful selection of planting spots such as an accumulation of soil behind a brush dam or at the toe of a slope (fig. 3) where moisture was most plentiful was most important.

Rigid spacing was a waste of time, money, and seedlings. About 500 seedlings per acre, carefully planted-where they can survive, were far superior to several thousand uniformly spaced seedlings planted without regard to the quality of the planting spot.

Because shallow setting was the most serious error in planting, setting the seedlings up to 2 inches deeper than normal is good insurance on bare, gullied areas where an inch or more of the surface may erode during the first growing season or on areas with high rabbit or livestock population. Planting pines in post holes dug 6 inches in diameter and 24 inches deep in the substrata and refilled with the nearest approximation of topsoil available has increased survival by 30 percent and 3-year height growth by 100 percent. Post-hole planting using a power auger is recommended where moist soils are not readily penetrated with a planting bar. Spot mulching with pine straw also increased survival and is worthwhile when planting loblolly pine to stabilize bare gully slopes.

Ineffective Practices.—Some modifications did not pan out. Deep planting to one-half of the stem and to the terminal bud on a variety of soils, root soaking 4 hours in water, and puddling in a slurry of topsoil were not beneficial. A kaolin clay root dip reduced survival of normally planted seedlings but was advantageous when seedlings were exposed to sun and air for 30 to 60 minutes before planting. Dipping seedling roots in a moisture control agent to reduce drying during storage and planting was detrimental. Wax coatings, applied to reduce the transpiration of loblolly on dry sites, also reduced survival.

Loblolly pines planted on eroded sites did not respond to fertilization with 300 pounds of nitrogen plus varying amounts of phosphorus per acre. Interplanting with legumes such as bicolor or sericia lespedeza and crimson clover did not improve survival or height growth during the first 5 years. Nor did pruning the roots to 6, 8, and 10 inches after lifting (a step that could ease or increase planting difficulty) significantly affect yearly survival and growth.

U-root planting did not significantly reduce survival and had no effect on growth during the first 4 years. Mortality among nondormant seedlings, even when frost-nipped, averaged only 1 percent more than among seedlings planted while dormant. Still, seedlings that are frozen before planting are a poor risk and should not be planted. Frost heaving can be a problem where planting is done on bare soil. More serious yet, though seldom recognized, is seedling desiccation and mortality resulting from prolonged soil freezing immediately following planting.

Timing.—Planting should be delayed until the seedlings in the nursery beds are hardened off and until the top 8 to 10 inches of soil on the planting site is moist. Transportation in refrigerated trucks is preferable, but slat-sided trucks with cross stickers and a tarpaulin overhead will keep the seedlings cool enroute from the nursery. All seedlings should be lifted and placed in cold storage before flushing, when planting will extend into the spring. The use of planting bags rather than metal trays has increased productivity as much as 300 seedlings per worker, daily.

We revisited many of the test plantings 15 to 20 years after installation (fig. 3) to see if seedling grade had continued to influence height growth; to learn whether or not the U-rooted plantings had suffered an inordinate amount of uprooting following severe icing; and to observe the development of the species planted. The dominant grade 1 and 2 seedlings averaged 2 feet taller than the best grade 3; wind-throw was minimal and in most situations all of the planted pines, except Virginia, had been harvested for pulpwood. The latter were so limby that the cutters left them alone, a fact worthy of consideration in future erosion control plantings.

In conclusion, erosion-control plantings require proper handling and careful planting of quality seedlings. Success depends on close, knowledgeable supervision.

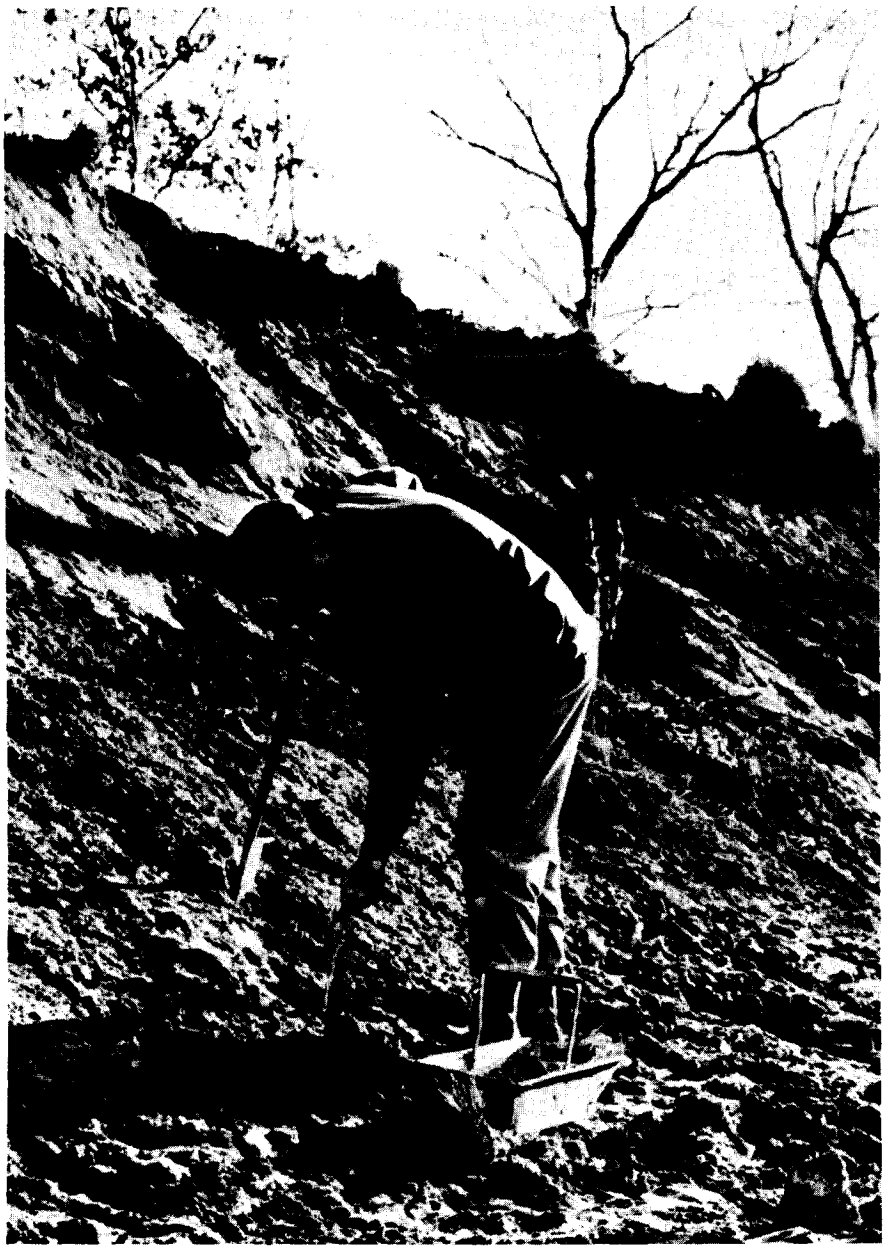

Figure 3.—*Loblolly pine planted at the toe of a slope will survive and grow rapidly.*