MODIFICATIONS OF PLANTING TECHNIQUE NOT RECOMMENDED FOR LOBLOLLY ON ERODED SOILS

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Deep planting, puddling, and soaking of seedling roots are not recommended for loblolly pine in reforesting eroded soils in north Mississippi. This conclusion is based on a 2-year study of modifications of standard planting procedures, which have shown promise of improving survival or stimulating growth in other areas (2,3,4,5). The two .faulty planting techniques most frequently encountered on eroded soils, planting with U-roots and shallow planting, also were studied.

Methods

Two deep-planting methods were tested--to one-half the stem length and to the terminal bud. Puddling and soaking were done for periods of 4 hours just before trees were planted. The puddling mixture was a slurry of topsoil; before they were placed in trays and planted, seedlings were exposed for several minutes to allow the mud to dry slightly.

Treatments to evaluate improper planting were setting the seedlings with 2 inches (one-fourth) of the root system exposed, and planting with U-roots. U-root plantings were at normal depth, but with the up-pointing tips of the main roots 2 inches below the soil surface. Control trees were planted with straight roots and to rootcollar depth.

The study was installed in 1957 in four randomized blocks on sparsely vegetated sandy loam soils that represent a poor planting risk in years of growing-season drought. Exposures were southeast to southwest and slopes from 8 to 25 percent. Each block included a 25-tree plot of each treatment, with seedlings bar-planted at a spacing of 3 by 3 feet.

Seedlings were of grade 1 and grade 2, with roots pruned to 8 inches. Deep planting was facilitated by welding a footrest 18 inches above the bottom of the planting bar blade. Seedlings planted shallow had 1.9 inches of the root exposed. Those in the two deep-setting treatments had 55 and 78 percent of the stem buried.

A similar test was installed on eroded loess soils the same year, and the depth of planting and faulty-planting treatments were repeated on sandy soils the following year.

Results

None of the treatments proved beneficial. Deep planting, soaking the roots, and shallow planting depressed survival of the 1957 planting on sands (table 1). Differences among treatments on loess soils in 1957 (average survival 89 percent) and on sandy soils in 1958 (average survival 94 percent) were not significant.

Deep planting. --Seedlings with half-buried stems grew 0.03 foot more than the controls on sands in 1957 and 0.10 foot more on loess. The differences were-limited to the first year and did not compensate for the respective 0.35-foot and 0.29-foot losses in original height due to deep planting.

TABLE 1.--Survival and growth of 1957 plantings on sandy soils

Treatments	Survival		Four-year growth[1]	Total height after 4 years
	First year	Fourth year		
	Percent	*Percent*	*Feet*	*Feet*
Deep planting:				
One-half stem.....	76	73*	5.86	6.15
To terminal bud.....	69*	66**	5.45	5.58
Conditioning:				
Root soak.....	80	66**	5.81	6.44
Puddling.....	72	70	5.69	6.26
Faulty planting:				
U-roots.....	75	75	5.99	6.53
Shallow.....	54**	54**	4.67	5.45
Control[2].....	87	86	6.04	6.66

[1] Significant differences in height growth did not continue past the second growing season.

[2] Seedlings planted with straight roots at normal depth.

* Differences between treatment and control significant at 5-percent level of probability.

** Differences between treatment and control significant at 1-percent level of probability.

Slocum (3) and Slocum and Maki (5) reported that deep planting on a well-drained Georgeville clay improved height growth of loblolly seedlings through the second growing season and had no effect on survival. Their warning that similar results might not be expected elsewhere has proved accurate for several Coastal Plain soils. Deep planting depressed loblolly survival on poorly drained silt and clay soils in Mississippi (6), and on sandy loams in east Texas (1). It increased survival on well-drained light and medium soils in Louisiana one year, but next year planting to the terminal reduced survival on both well and poorly drained soils, while planting one-half the stem had no effect. Early height growth was stimulated in some of these Coastal Plain studies, but not enough for the deep-planted seedlings to overtake the controls. Increased growth and survival also have been reported for small, deeply set slash pine seedlings on droughty sands (2), but undersized stock is not recommended for erosion-control plantings.

Excavations of loblolly seedlings planted at normal depth on both light- and medium-textured soils in north Mississippi gave some insight into the poorer performance of deeply set seedlings. Most of the new roots, at least through May of the first growing season, occurred in the upper 4 inches of soil. Since new roots do not form on the buried stem of deeply planted seedlings, deep planting may bypass the soil horizon most favorable for early growth. In a study repeated in 3 successive years, seedlings with 4inch roots set at normal depth survived and grew about as well as those with longer roots.

Shallow planting.--The heavy mortality of shallow-planted seedlings confirms the results of other studies in indicating that shallow setting is probably the most serious error in planting For this reason (and despite the indication of lower survival of seedlings planted with half or more of the stem buried), setting seedlings up to 2

inches deeper than normal is still considered good insurance on bare, gullied areas in north Mississippi, where an inch or more of the surface may erode during the first growing season.

U-roots.--U-root planting decreased first-year survival on sands by 12 percent. The difference approached significance, but was due largely to the poor survival of one replication. U-root planting had no effect on growth during the first 4 years.

Ten seedlings planted with U-roots were excavated from sandy loam soils in the third growing season and three seedlings from silty clay loam subsoils during the fourth season. No attempt was made to recover entire root systems, but the larger roots in a block of soil 12 inches square and 18 inches deep were kept intact. Examination showed that the U-roots had either turned to grow downward or that new roots had developed along the U (fig. 1). All seedlings excavated had been well anchored in the soil and had substantial roots growing into the soil perpendicular to the plane of the original planting slit.

These results do not mean that U-root planting should be condoned, because bad effects may develop as trees grow. Nevertheless, observations of other U-rooted seedlings on thin soils, subsoils, and parent materials suggest that the dangers have

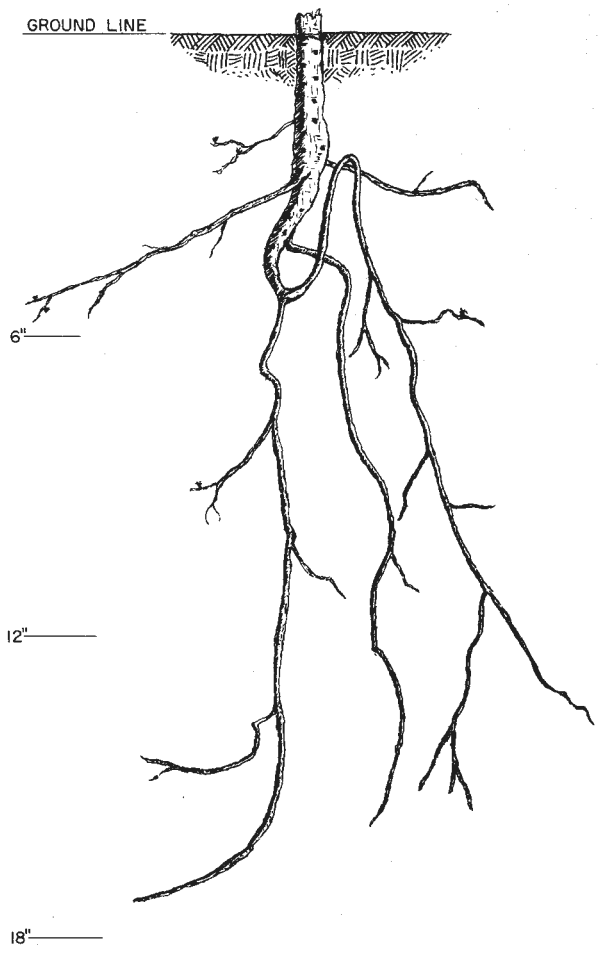

Figure 1.--Tips of U-roots commonly turned to grow downward, and often new anchor roots were initiated along the U. This seedling was excavated from light-textured soil in April of the third growing season.

been exaggerated. Other excavations indicate that twisting the roots while inserting the seedlings in the planting slit may be of more serious consequence, because the tree tends to girdle itself as it develops (fig. 2).

Figure 2.--Twisting the lateral roots at time of planting reduced the growth of this seedling.

Conclusions

Further tests of deep planting on Coastal Plain soils may be desirable in areas where observations of root growth or of the moisture regime indicate a favorable effect. Until then the safest practice on vegetated areas where excessive erosion is not a problem is to plant at normal depth, or slightly deeper, to reduce the incidence of shallow planting. Planting 2 inches of the stem is recommended on rapidly eroding slopes. Puddling and root soaking cannot be recommended since they increase costs and may depress survival.

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