The Importance of Seed-Bed Preparation in Loblolly Pine Management

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The prompt establishment of an adequate number of well distributed seedlings following harvest cutting is of major importance in the management of loblolly pine in the Coastal Plain of Virginia and North Carolina. If the pine doesn't seed in promptly, young hardwoods will take over. The demand for pulpwood and stave-bolt timber has resulted in short rotation management throughout much of the Tidewater region. Under seed tree or strip clear-cutting systems, which are common northern Coastal Plain practices, short rotation management means that young, immature seed-trees, often only 25 to 40 years old, are being relied upon to regenerate the stand. While open grown loblolly pine trees begin to bear cones at an early age, young trees in well stocked stands usually do not produce big seed crops even in good years. Therefore forest managers must make the most of whatever seed is available during the harvest year.

There is considerable evidence that mats of duff or other forest debris can retard germination of pines, and conversely, that mineral soil or ash surfaces are better seedbeds. The effect of these surface conditions upon germination and establishment of loblolly pine has been observed at the Bigwoods Experimental Forest[1].

Two 45-acre loblolly pine compartments, having an average volume of 25,000 board feet per acre, were tractor logged early in 1946 under a strip clear-cutting system. One compartment received a prescribed burning treatment in October of the same year. During the succeeding four months, trees in the uncut strips on both compartments released about 86,000 sound seeds per acre.

At the end of the 1947 growing season a reproduction survey indicated that both tracts were adequately stocked with loblolly pine seedlings, although considerable variation existed within each tract. The number of first year seedlings present was directly correlated with germination and survival as influenced by the surface condition of the seedbed. As indicated in Table 1, the greatest numbers of seedlings were found on surfaces where mineral soil had been exposed by burning or mechanical disturbance of the duff. Slash-covered and undisturbed duff surfaces were poor seedbeds because seeds resting upon dry litter could not imbibe sufficient moisture to complete germination.

Table 1.—Survival at the end of the first growing season

Surface Condition	Seedling distribution per acre *Number*	Stocking[1] *Per Cent*
Undisturbed	2,600	80
Some disturbance	8,796	100
Bare soil	12,107	100
Slash	1,062	56
Lightly burned	7,077	100
Medium burned	5,882	94
Severely burned	8,364	100
Logged comp. (wt. ave.)	5,144	83
Logged and burned comp. (wt. ave.)	8,063	97

[1]If each milacre contains one or more seedlings, the tract is classed as fully stocked.

While numbers and distribution of seedlings are of primary importance, rate of growth should also be considered, for seedlings must successfully compete with other vegetation before the stand can be classed as regenerated. Laboratory tests indicate that all viable seeds in contact with mineral soil will germinate within 20 days, whereas less than half of the seeds sown on litter surfaces will have germinated within 40 days. Furthermore, microchemical tests[2] show that destruction of the surface organic matter by fire increases the supply of several important mineral nutrients. The combined effect of early germination and more nutrients on first-year height growth is indicated in Figure 1.

Seedlings more than six inches tall were as follows:

Surface condition	*Number per acre*
Slash piles	188
Undistubed	401
Disturbed	2,154
Bare soil	3,143
Light burn	615
Medium burn	2,647
Severe burn	4,727

The above results were observed after a bumper seed fall. Following poor seed years, reproduction would probably occur in isolated patches if Bigwoods observations can be used as an index to normal logging practice. Logging activity disturbed only 49 per cent of the soil surface while leaving 17 per cent covered with slash and 34 per cent undisturbed. Logging followed by prescribed burning created desirable seed-bed conditions on 81 per cent of the surface, left one per cent covered with slash and 18 per cent undisturbed. The unburned area on the latter tract resulted from the practice of certain necessary protective measures. Therefore Bigwoods personnel have resorted to scarification in advance of logging in

[1]Maintained by the Southeastern Forest Experiment Station in cooperation with Camp Manufacturing Company, Inc., Franklin, Virginia.

[2]Haig, Irvine T. Factors Controlling Initial Establishment of Western White Pine and Associated Species. Yale Univ., School of Forestry, Bul. 41, 1936.

order to realize a greater return from a poor 1948 seed crop.

Better Germination

An Athens, a six disk, heavy-duty, fire line maintenance plow, with an improvised stump drag attached at the rear, has been pulled through the woods in parallel strips. The strips, approximately 10 feet from center to center, were disked at right angles to the direction of tractor skidding. Shrubs and trees up to four inches in diameter were pushed over and frequently torn from the ground. At the completion of logging, made easier by the elimination of undergrowth, practically all of the surface not actually covered with slash was in a disturbed condition. Most of the ground now covered with slash has been sacrificed and this treatment may result in better germination in the slash areas.

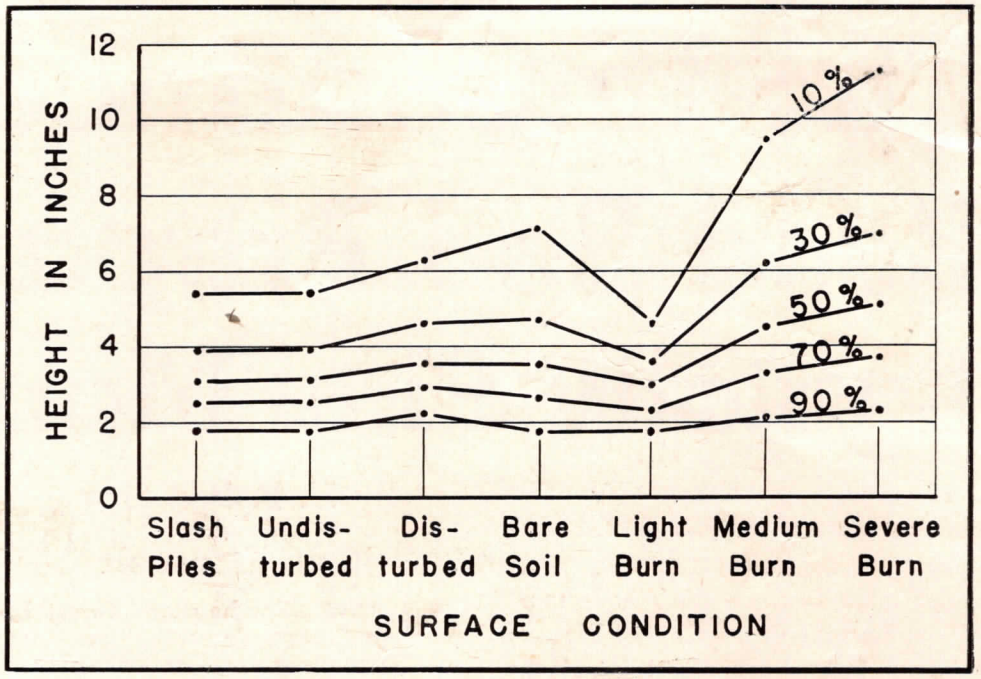

FIGURE 1. *Percentage of seedlings exceeding indicated height.*

Intensive treatments, such as scarification and prescribed burning, require the expenditure of time and money. Even prescribed fire often does damage and may be dangerous to use where slash concentrations are heavy. The forest manager must carefully weigh the benefits and damages of fire before he prescribes its use. Also he must determine for his own enterprise how much can be invested in future crops. As a starting point for such a determination, compare the loss in increment on idle land at one cord per acre per year with a scarification charge of two man-hours and one equipment hour for each acre treated, or with a prescribed burning charge of one to two man-hours per acre.

FIGURE 2. *Two years after logging, hardwood shrub and tree growth on this typical Coastal Plain site prevent loblolly pine seedlings from becoming established.*

Extensive treatments, while not requiring an immediate investment, may be more expensive than intensive management by the time the next crop is harvested. Figure 2 illustrates a typical result of extensive management coupled with a failure to provide an adequate seed source. Hardwood control, seed are required before loblolly pine can be re-established on that tract.

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