

Regenerating Loblolly Pine With Four Seed Trees

A Case History

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A loblolly pine seed tree stand with four trees per acre as required by the Virginia Seed Tree Law.

The Virginia Seed Tree Law requires that a minimum of four seed trees per acre be left when a stand of timber is harvested, in order to provide adequate natural regeneration of desirable species. Opinion varies on how well the law fulfills this objective for loblolly pine, but evidence is accumulating that indicates compliance with the law does not necessarily assure establishment of an adequate stand of loblolly pine seedlings. Good natural regeneration depends on an adequate amount of seed at a time when

seedbed conditions are most favorable, usually right after the stand is harvested. Four seed trees per acre may not produce enough seed the first two years following harvest cut to regenerate an area adequately.

The problem is to increase seed production of the seed trees to coincide with the better seedbed conditions that occur right after logging. Earlier studies and observations have indicated that seed production is stimulated if a loblolly pine tree is released (that is, if the surrounding trees are

cut). The timing of this release was found to be quite important. Loblolly pine released in the winter showed an increase in seed production in the fall of the third growing season after release. Seed trees released in April and May also produced heavier seed crops in the fall of the third growing season, but seed trees released in July and August did not produce heavier seed crops until the fourth fall.

STUDY

The earlier studies of seed tree release led to a pilot-scale test on the concept of releasing seed trees before the main part of the stand was harvested. Initial work on this test began in 1951. The area chosen was a 90-acre stand of loblolly pine on the Camp Experimental Forest maintained by the Southeastern Forest Experiment Station in Sussex County, Virginia, in cooperation with the Union Bag-Camp Paper Corporation, Camp Division, Franklin, Virginia. The 90-acre area was divided into four blocks, labeled A, B, C, and D, each to be regenerated in different years. Success or failure to restock the areas adequately with loblolly pine was to be determined when the reproduction was 3 years old.

Four seed trees per acre were selected by foresters of the Virginia Division of Forestry in accordance with the Virginia Seed Tree Law. Pre-harvest release of the seed trees was scheduled so that cutting would be completed by the first week in May, three growing seasons ahead of the final harvest cuttings. The seed trees were released by cutting all adjacent trees if their crowns were within 10 feet of a seed tree crown.

Although the plan called for completion of the release cutting by mid-May, only the seed trees in Block C were ready by the target date (May 5, 1953). In the other three blocks release cuttings were not completed until June 7, one month later than Block C.

The main harvest cuts were made in each study block in the summer of the third growing season following the seed tree release. Block A was cut in 1953, and Blocks B, C, and D, in 1954, 1955, and 1956, respectively.

At the time of the main harvest cut, the pine was skidded to loading points by crawler tractor. All hardwoods were left standing, and no type of special ground preparation or hardwood control was done. This procedure is a common practice throughout the region.

RESULTS

Seed production.—Estimates of the seedfall were made by seed trapping throughout the period of the study. A similar uncut stand was trapped for comparison (table 1). The first two amounts for each block, shown in parentheses in table 1, are from the entire stand less the trees cut in the release operation. The underlined figures indicate the number of seed produced by four seed trees in the first fall and winter following the summer harvest cut.

The plan anticipated that the seed crops following the main harvest cuts would be large as a result of our pre-harvest release cutting. However, only in Block C, where release cutting was completed by the fifth of May, was the cone crop increased on schedule. In the other three blocks increased seed crops occurred one year later than planned.

The seed production of the uncut stand shows how loblolly pine seed crops vary from year to year. The 1958-1959 crop was 16 times the size of the 1956-1957 crop. The seed crop of 1956-1957 was unusually poor over a broad geographic region. An unseasonably warm period during the first three weeks of March 1955 was followed by severe freezing weather



Released seed tree showing degree of release.

in late March when flowers were being formed. This freeze apparently killed most of the flowers that would have produced seed in the 1956-1957 season. Crop failure was apparent in all four blocks and the uncut area.

The harvest cut, leaving four seed trees per acre in each of the 4 years, ended in the last week of June or the first week in July. With these late dates the size of the first three cone crops following this cutting was not affected by complete release. Compared with the uncut stands, and excluding the crop failure year 1956-1957, there are seven estimates which indicate the size of the seed crops was increased by pre-harvest release. In two of these seven comparisons, seed production was greater in

stands with four seed trees than in the uncut stand. These seed estimates range from 24 to 169, and average 93, thousand sound seed per acre from four trees. This means an average tree produced annually 23,200 sound seeds; or about 1.3 pounds of seed, or one bushel of cones, or 400 cones per tree.

Seedling establishment.—At the end of the third growing season the number of pine seedlings and their distribution were estimated by sample milacre counts (table 2). On three (A, C, and D) of the four blocks there were more than 3,000 pines per acre and at least 78 percent milacre stocking. Although some of the seedlings were beneath hardwoods, free-to-grow milacre stocking averaged at least 56 percent. Each of these three stands was judged to be stocked adequately for intensive forest management.

The fourth stand, Block B, had nearly 1,500 pine seedlings per acre, with 41 percent milacre stocking, but only 26 percent were well spaced and free-to-grow. If a 50 percent stocking of free-to-grow seedlings is used as a minimum standard for intensive pine management, then this block must be considered inadequately stocked to pine. However, it did qualify as a pine-hardwood type. Controlling the hardwoods could have greatly improved this block. In fact, after regeneration measurements were completed in 1960, the hardwoods were controlled on all blocks. Block B, now 8 years old, might qualify as a pure loblolly pine timber type.

CONCLUSIONS

Acceptable loblolly pine regeneration was obtained from released seed trees, selected in accordance with the Virginia Seed Tree Law. Three well-stocked pine stands and one pine-hardwood stand resulted from this demonstration. These stands were obtained with no special site preparation or hardwood control.

The seed crop records for 1956-1957 demonstrate that a combination of unfavorable weather, such as an early warm period followed by severe freezing, can greatly reduce future cone crop. Fortunately these unfavorable weather combinations occur infrequently in the coastal plain. Until more is known of the effect of release cutting date on seed production, it is safest to complete pre-harvest release cuttings in the dormant season, or not later than the first of May to get increased seedfall within three calendar years.

TABLE 1.—ESTIMATED LOBLOLLY PINE SEED PRODUCTION

Seed Year	Uncut Stand	BLOCKS			
		A	B	C	D
		Thousands of sound seed per acre			
1951-1952	18	¹ (26)			
1952-1953	72	¹ (47)	¹ (47)		
1953-1954	29	² 7	¹ (10)	¹ (16)	
1954-1955	49	24	² 16	¹ (26)	¹ (54)
1955-1956	128	164	73	² 85	¹ (195)
1956-1957	9	5	3	2	² 4
1957-1958	96	94	112	78	57
1958-1959	145	159	204	120	169

¹Amount of seed produced by original stand after release cutting.

²First record for block of the amount of seed produced by the four seed trees.

TABLE 2.—NUMBER AND STOCKING OF LOBLOLLY PINE SEEDLINGS PER ACRE AT 3 YEARS OF AGE

Block	Seedlings	Stocking ¹	
		Total	Free-to-grow ²
	Number	Percent	
A	5,204	81	63
B	1,488	41	26
C	3,322	87	71
D	3,475	78	56

¹Stocking is the percentage of milacres containing one or more established seedlings.

²Free-to-grow indicates that one pine on a stocked milacre is not overtopped and is expected to survive and grow.