Good Seed Trees Pay Off

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Foresters familiar with the management of the Francis Marion National Forest in Coastal South Carolina know that the silvicultural system for loblolly pine requires leaving four or more good seed trees per acre for regeneration purposes (Figure 1). Where needed a preparatory cut is made to develop seed trees. Four to twelve seed trees per acre are left at regeneration cut. A removal cut is made after reproduction is safely established. Large trees, 16 inches or more in diameter at breast height, are generally selected for seed production. Those showing evidence of past good production by the presence of many old cones in the tops are preferred, providing they are of good vigor and form. Results obtained from the first timber tract handled under this system clearly show that good seed trees can bring about rapid restocking. In spite of some adverse weather and a period of only poor fair cone production in general, satisfactory regeneration was obtained in three growing seasons.

The Area

The area under discussion is known as the Able Chance. It encompasses about 200 acres in an area along a winding farm road known as Able Chance Road about five miles west of Witherbee, Berkeley County, S. C. Before logging, this typical upland site was occupied by a moderately well-stocked stand of mature loblolly pine. The under-story, mostly gum, oaks, and myrtle, had reduced the area to a rather heavy rough, consisting mainly of pine needles and grass. As a further consequence of fire exclusion, fairly dense groups of advance pine reproduction of sapling size occupied some of the natural openings. Elsewhere a hardwood under-story, mostly gum, oak, and myrtle, had become established. This varied in density but was heaviest in the wetter locations, such as in natural depressions scattered over the area and along the course of a small stream. Together with the 15-year accumulation of pine litter, the under-story hardwoods presented a formidable obstacle to the establishment of pine reproduction.

Primarily as a hardwood-control and rough-reduction measure, all of Able Chance was prescribed burned in mid-winter of 1948-49. Best results were obtained on the highest ground, but very little hardwood reduction was accomplished in the more poorly drained sections where an accumulation of longleaf pine litter, because of a patchy burn and generally light fire, total seed-bed improvement was small. Fortunately most of the logging was with crawler tractors which in the course of the cutting operation scratched down most of the residual hardwoods. Some logging was done in May and June 1949, but the main effort was during the interval from December 1949 to May 1950.

The seed-bed was further improved on about half the area as a result of a wildfire which occurred in April 1950, just before the end of logging. This was a very clean burn and was hot enough to consume all except the heaviest limbs in the slash piles which had covered about 25 per cent of the ground surface. Hardwoods up to saw-timber size were killed by the fire, as were a small number of the seed trees—later salvaged. A pulpwood operation, following the removal of the saw-timber, helped to improve the seed-bed in the unburned area by utilizing some topwood and thus slightly reducing the area of slash.

To summarize the foregoing, it can be said that Able Chance presented a unique opportunity to measure on a large area (200 acres) the capacity of good loblolly pine seed trees to establish regeneration. Two quite typical seed-beds were involved. Each had in common a relatively ineffective burn in advance of logging and partial scarification by tractor during logging. Each had the following individual characteristics

Area No. 1 (80 acres)—Unburned after logging. Resultant seed-bed consisted of areas of mineral soil (7%), disturbed by logging (49%), no disturbance (20%), and slash (24%). Patches of advance reproduction were present.

Area No. 2 (120 acres)—Burned after logging. Rough-reduction complete except for scattered remnants of slash piles. Most advance reproduction destroyed.

Because of advance reproduction, Area No. 1 was only partially dependent on the seed trees to complete its restocking. A survey made in December 1950, showed that 27 per cent of the milacres tallied contained one or more stems of this established reproduction, numbering 435 per acre, with dominants averaging 11 feet in height. Although other similar seed-beds may vary as to the amount of advance reproduction, this serves to demonstrate that it should not be overlooked in planning for regeneration.

In contrast, Area No. 2 contained only 77 stems of advance reproduction per acre for an estimated stocking of 5 per cent.1 Obvi­ously this area would have to depend almost entirely upon the seed trees.

The prescribed fire on the whole Chance in mid-winter of 1948-49, coming after the main seedfall, destroyed most of the 1948 seed crop. Consequently, complete restocking of Able Chance was dependent upon the seed crops of 1949 (before cutting) and those after cutting. Even so, the 1949 seed crop affected only Area No. 1, inasmuch as the post-logging fire destroyed the seed in Area No. 2.

Seed Production

Permanent seed traps maintained at the Santee Experimental Forest five miles away showed only fair seed years for 1949, 1951, and 1952 and that 1950 was a very poor year. Seed trapping on the Able Chance dates from 1950. Figure 2 shows the fall of viable seeds per acre for the years of record, ranging from 7½ thousand sound seeds in 1950 to almost 90 thousand in 1952. In other words, the output per tree jumped from a low of 1900 seeds to a high of 22,000 three years later. This checks with Trousdell's (1) findings of greatly increased seed production three years after cutting. This stimulation of seed production probably arises from an increase in flower-

Figure 1.-General view of Able Chance, Francis Marion National Forest in mid-summer of 1950 showing residual stand of four seed trees per acre. Foreground and on right burned by post-logging fire of previous April. Unburned area on left marked by older slash. Fresh slash is from recent pulpwood operation.

1The amount of reproduction required for full stocking has not been exactly determined. The stocked quadrat method of estimating stocking provides a basis. Here full stocking indicates one or more seedlings established per sample milacre. Partial stocking can thus be expressed as a percentage thereof.
in this connection is the 1952 seed crop, which amounted to almost 90,000 sound seeds per acre. According to Trousdell (1) this is enough seed to restock a completely un­

disturbed seed-bed during the first year after logging. What differences arise as a con­

sequence of the fourth growing season and present stocking remain to be seen. As a minimum, further improvement over the present satisfactory stocking can be ex­

pected during 1953. Not to be overlooked is

the fact that the post-logging fire of April 1950 com­
pletely killed many hardwoods and reduced the vigor of surviving root systems.

Though a tally of hardwoods was not made during the first growing season, counts made during the following two years showed that sprouting hardwoods were definitely becoming re­
established (Table 2). So far, these hard­
woods were not affording any real competi­tion to the pine except in the vicinity of the small stream. Here, some low release by cutting or chemical treatment seems de­
sirable if a dominant stand of pine is to be established. Elsewhere, pine is present in sufficient number or large enough to over­
whelm most hardwood competition. Substan­
tially fewer and shorter hardwoods in Area No. 2 compared with Area No. 1 indicate that the post-logging fire of April 1950 com­
pletely killed many hardwoods and reduced the vigor of surviving root systems.

TABLE 2.—Hardwood regeneration second and third year after logging. Able Chance, Francis Marion National Forest, S. C.

<table>
<thead>
<tr>
<th>Area</th>
<th>Forest</th>
<th>Number Feet</th>
<th>Height of Average</th>
<th>Number</th>
<th>Number Feet %</th>
<th>Number</th>
<th>Number Feet %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area No. 1</td>
<td>1951</td>
<td>500</td>
<td>100</td>
<td>1500</td>
<td>60</td>
<td>2360</td>
<td>52</td>
</tr>
<tr>
<td>Area No. 2</td>
<td>1952</td>
<td>14</td>
<td>40</td>
<td>1200</td>
<td>99</td>
<td>1250</td>
<td>88</td>
</tr>
</tbody>
</table>

*Per cent of sample micres with one or more stems.

**Sprout clumps counted as one stem.

Cost of Seed Trees

Most forest managers working in the lob­

billy pine area should be well satisfied with obtaining a degree of regeneration compar­

able to the foregoing. Regeneration by plant­

ing requires initially about 1200 seedlings per acre. In three years, four seed trees per

acre established about three times that many. Furthermore, these were about as uniformly distributed as in a plantation. Artificial re­

forestation in the locality ranges in cost from $10 to about $15 per acre, depending upon the difficulty of planting. Because of the logging debris, the cost of planting the Able Chance

would approach or exceed the higher figure.

On the other hand, the cost of regenerating Able Chance by seed trees is little or nothing. Interest accruing on the capital value of the stumpage left, unless offset by growth, can be charged as a cost of the seed tree method.

The seed trees on Able Chance averaged about 18 inches d.b.h. and 3½ logs each. Average volume per acre was about 1300 board feet, Scribner log rule. As insurance against loss by fire these seed trees will probably be held for a number of years be­

yond the time needed for regeneration. The trees should be about 10 years. During that time it is conservatively estimated that growth rate, including mortality, would amount to about 4 per cent compounded annually or 63 board feet per acre per year.

If four per cent can be considered a satis­

factory rate of return, there are no costs chargeable to the seed tree area except those for protection and general administration, and such costs are incurred on all areas. During the 10-year period stumpage values may de­

cline, but as in any permanent business that is a chance that must be taken.

Selection of Good Seed Trees

Seed trees may not all be as fruitful as those on the Able Chance. But the forest manager can increase the possibilities of a more abundant seedfall in most stands by a careful selection of trees to be left. Large trees, particularly those with many old cones, are generally the most productive (2). Produc­
tion can also be greatly increased by release of selected seed trees three years in advance of the main harvest cut (2, 3, 4).

This is important in dense stands, particularly in younger age groups, where trees have not had the opportunity to establish their ca­
pacity to produce seed. Consideration should also be given to advantages of cutting during years of high seed production, at least in those areas most difficult to regenerate. This is made possible through cone-crop estimates, which are reliable up to 12 months in advance of seedfall (4). Better progeny should also be an objective of all seed-tree cuttings and trees of best form, vigor, and quality given preference over all others.

References

(1) Trousdell, K. B. 1950. Seed and seedbed requirements to regenerate loblolly pine. Southeastern Forest Experiment Station Paper No. 8.

(2) Pomeroy, K. B. 1949. Loblolly pine seed trees: Selection, fruitfulness, and mor­tality. Southeastern Forest Experiment Station, Station Paper No. 5.


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