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NATURAL REGENERATION OF LONGLEAF PINE

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Abstract.--Natural regeneration is now a reliable alternative for existing longleaf pine forests. The shelterwood system, or modifications of it, has been used experimentally to regenerate longleaf pine for over 20 years, and regional tests have confirmed its value for a wide range of site conditions. Natural regeneration, because of its low cost when compared to other alternatives, should be particularly suited to the needs of the small forest landowner.

Tough regeneration problems have given longleaf pine a bad reputation among foresters, and as a result longleaf is commonly replaced, upon harvest, by other species. Major problems associated with longleaf natural regeneration include:

(1) Poor seed production. Goad seed crops are few and far between. With scattered seed trees, the land is out of production until a good seed crop comes along. By then, hardwood brush may have occupied the site.

(2) Uncertain establishment. Relatively few of the dispersed seeds become established seedlings. Several successive seed crops may be required for acceptable regeneration.

(3) Poor survival of established seedlings. This problem is particularly acute during seedlings' first year.

(4) Slow seedling growth. During the familiar grass-stage, which may last from 3 to more than 10 years, land is essentially out of production. Slow growth primarily results from competition and the brown-spot needle blight.

Yet despite all these obstacles, millions of acres of second-growth longleaf pine sprang up when old-growth timber was cut. Whatever nature can accomplish so well by chance, surely the forester can improve on by design. Observations of longleaf regeneration in nature led to the hypothesis that some form of the shelterwood system of natural regeneration might be most suited to the requirements of this species (Croker 1956). More than 20 years of the follow-up research on longleaf regeneration ecology has demonstrated that a shelterwood system can regenerate existing longleaf stands at low cost and with a.high degree of reliability. With modification, it is applicable to a wide range of site conditions and management goals. Areas regenerated in this manner have ranged from large blocks to patches as small as g-acre. The research has led to published guidelines on the application of the shelterwood system (Croker and Boyer 1975).

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Perhaps the most important consideration for successful natural regeneration is the proper prescription and careful timing of the necessary operations and cultural treatments. Given a longleaf pine stand approaching harvest age, regeneration by the shelterwood system would typically be applied as follows.

(1) Preparatory cut.--This cut, the first in a three-cut shelterwood regeneration system, is primarily an improvement cut leaving 60-70 sq. ft. of basal area per acre of the best dominant-codominant trees. It will promote development of larger crowns on residuals. A hardwood understory, if present, is removed or deadened, and periodic prescribed fires keep sprouts and shrubs under control. A well-managed pine stand, however, should not need a preparatory cut.

(2) Seed cut.--This cut, made about 5 years ahead of the planned harvest date, further reduces stand density to about 30 sq. ft. of the highest quality trees and creates the shelterwood stand, which will provide the seeds for the next generation. Maximum per acre seed production is reached under this density, and in good seed years will produce almost 3 times as many seed as a stand with 10 seed trees per acre. The regeneration area is not out of production during the wait for a seed crop. Although the seed cut may halve stand density, per acre volume growth is reduced by only about one-third, and all this growth is on premium trees. Increased seed production stimulated by release will show up 3 years after the cut. Another advantage of the shelterwood stand is that it produces enough needle litter to support hot prescribed fires for brush control and seedbed preparation.

(3) Monitor seed crops.--Within each area, mark 40 to 50 representative sample trees for annual springtime binocular counts of both flowers (which predict next year's crop) and conelets (which predict this year's crop). Make the counts just before female flowers are obscured by new foliage. Conelet counts can reliably predict not only seed production, but also number of established seedlings, provided the area has had a seedbed burn. Flower counts are of marginal value in predicting the size of fair to good seed crops, but they invariably reveal seed crop failures.

(4) Seedbed burn.--Apply this burn within a year of a good seed crop. The burn removes surface litter and exposes mineral soil.

(5) Regeneration surveys.--Schedule annual winter seedling stocking surveys. The usual criterion for regeneration success is 6,000 or more seedlings at least 1 year old. This number will absorb logging mortality of up to half the stand and still provide enough survivors so that the superior 10 to 20 percent of the seedling stand will provide at least 500 crop trees per acre. First,-year seedling survival is too uncertain to base success on newly established seedlings. The proportion of ¼-milacre sample plots stocked with one or more seedlings will indicate the number of seedlings per acre (Boyer 1977). A ¼-milacre stocking percent of 63 is equivalent to 6,000 seedlings per acre.

(6) Overstory removal.--When an adequate seedling stand is established, the overstory can be harvested. Timing of the cut usually is not critical,, as long as it is done before crop seedlings begin height growth. Seedlings can tolerate

overstory competition for a long time if they are protected from fire while small (0.3-inch or less in root-collar diameter). If you have a choice, however, removing the overstory at seedling age 1 or 2 should have the least impact on the new stand (Maple 1977).

(7) Post-harvest treatments.--Two or more years after overstory removal, the seedling stand may need to be burned for control of hardwood brush or the brown-spot needle blight. The need for brown-spot burns should be based on infection surveys of crop seedlings (Croker 1967). The disease condition of the extra seedlings has no importance to management. Normally, about 10 to 20 percent of a seedling stand will be resistant to brown-spot.

Natural regeneration should be considered a viable alternative when planning the harvest and regeneration of an existing longleaf pine stand. This approach should be particularly attractive to landowners who, because of financial considerations or management goals, do not want to make the heavy capital investment now required by site preparation and planting.

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