MARKING BY ASHBEL F. HOUGH

Silviculturist
Northeastern Forest Experiment Station
Upper Darby, Pennsylvania

The objective of silvicultural marking in this stand is to improve tree quality and growth-rate and at the same time produce cordwood by thinning, and saw timber and veneer logs for future harvests. This should be done without rotation or with a continuous canopy of the overstory by partial or tree-selection cuttings.

The first step is to build up the growing stock of best quality trees and to improve the stand structure. This can be done by favoring the best trees available, that is the best species, well-formed boles, vigorous crowns, and those of good origin and with least defects. What is needed is a greater proportion of the larger diameter trees. Today we have four hundred and sixty-two trees in the 1- to 7-inch d.b.h. class, seventy trees 8- to 11-inches d.b.h. and only fifty-four trees 12 inches d.b.h. and larger on a per-acre basis, using data from the one-half-acre marking plot.

The silviculturist must take a number of factors into account when considering the management of this secon-growth stand. First, is the danger of severe glaze or ice storms such as those of 1936 and 1950. Next, is damage caused by win storms and lightning which often affect the taller black cherry. Finally, there is damage by animals such as porcupine, deer, and rabbits. Some losses are unavoidable from these or other causes. We can work with nature to keep such losses low by following certain principles in second--growth stands:

1. Make light partial thinnings or harvest cuttings which will not seriously disrupt the forest canopy.
2. Cut from above or at the upper end of the diameter distribution to remove the coarser stems and wide-crowned trees.
3. Remove less than 40 percent, preferably about one-third, of the total basal area or cubic feet volume of trees 4 inches d.b.h and larger at the time of each thinning or harvest cutting.
4. Follow the same principles in harvesting sawlos. By this means the trees cut always have replacements in the smaller diameters growing up to merchantable saw-timber and veneer-log sizes.

By working chiefly with the trees which are above the sizes to be damaged by deer browsing or horn-rubbing, the silviculturist can direct stand development with every confidence of success for many cutting cycles into the future. If clear-cutting practices are used in deer country, the chances of getting desirable regeneration either naturally or artificially are slim unless deer fences are used. We must thihk of established growing stock and use management without rotation to keep forest land continuously productive on heavily populated deer ranges.

My marking is not based on the idea of growing and harvesting a particular product, but on the hard-won knowledge I have of the silvics of the tree species, and the reactions of these species of various size and vigor classes to various degrees of thinning. In this particular stand the silvicultural choice is a light partial cutting or thinning, ranging throughout all diameter classes to improve the quality of trees reserved for future growth, and removal of those of poor vigor or quality.

In considering the species present on the marking plot, I rate the red maple as the best quality trees in the growing stock. They have good form, are mostly dominant or co-dominant and show good crown vigor. The black cherry left by the pulpwood cutting of 1940 have been seriously scarred at the base by porcupine. This type of injury can result in serious rot over a period of 30 or 40 years but the progress of decay is generally slow. I left black cherry with basal wounds for future growth into saw timber and veneer logs on the theory that the growth in volume and quality wood will be greater than losses due to decay over a relatively short time period of 10 to 15 years. Black cherry will put on a lot of diameter growth in 10 or 15 years and callus growth over the basal scars keeps them wind-firm. Remember these trees have been well-pruned in youth and the butt logs will yield veneer logs worth up to $300.00 per thousand board feet.

Considering only living trees of merchantable quality 6 inches d.b.h. and larger the total basal area per acre is 98.2 square feet. The stand thus shows a nice recovery from the heavy cutting of 1940. I marked for removal 40.0 square feet of basal area per acre in pulpwood and a few sawlog trees. This is a cut of 41 percent of the total basal area. A residual basal area of 58 square feet per acre may be expected to grow at the rate of 3.2 square feet per acre per year for the first 10 years following cutting. The 40 square feet of basal area cut would thus be replaced in 12-1/2 years. Growth will be on the best quality trees of the best species and will soon produce some valuable saw-timber sizes. As a rule greater returns will be produced per acre from material to be sold as board feet than as cordwood.

At this age of 59 years and with its present stocking we should not expect an abundance of natural regeneration in the understory. Even the 1940 cutting to an 11-inch diameter limit did not result in much reproduction. A few beech suckers and sugar maple seedlings developed. Use of light partial cuttings in management without rotation will result in a slow invasion of the tolerant species and some stems of these young reproduction classes will survive and grow slowly. Thus a natural understory will become available long before all stems of the present stand are removed in future cuts as mature trees. The regeneration will be of permanent species.

Stump measurements converted to d.b h, show that 13 black cherry, 4 beech, and 1 red maple, 11 to 15 inches d.b.h., were cut from the one-half acre marking plot in 1940. These were the dominant trees 11 inches d.b.h and larger in the stand which was then 43 years of age. The removal of these trees totals 28.5 square feet of basal area, 720 cubic feet of volume, and 2,336 board feet of volume, per acre. In terms of basal area the cut was relatively light but since it was entirely among the largest, most rapid-growing trees, it has delayed the time at which saw timber can be produced. This is a serious loss when black cherry of veneer-log quality were nearing the stage of exploitation.

In summary: the objective of marking is to improve the representation of the better quality trees, maintain growth-rate and produce both cordwood and log products by thinnings now and in the future. A light partial cutting of not over 40 percent of the basal area is the method of choice. The stand should be managed as a continuous forest without rotation to circumvent deer damage to young growth. Red maple is the best species present but black cherry with basal scars can be held for 10 to 15 years until it reaches veneer-log size. Natural reproduction of tolerant species will slowly develop as an understory following a series of partial cuttings for cordwood and logs. Greater returns to the landowner are to be expected from raising some high quality saw-timber products than from cordwood alone.

Discussion

Chisman Best trees. Is this best on stem form alone or was crown development taken into consideration?

Hough I consider bothin classifying trees for leaving as growing stock or for cutting out. The crown vigor depends on the size of the crown, its diameter and length, density and size of foliage. Crown vigor constitutes a separate character from quality. Stem quality is the form of the stem and any defects in it.

Wardell Doesn't value come in?

Hough Naturally there must be a relationship between these tree classifications and the value of the tree even if you can't put it in dollars and cents.

Bramble Will soft maple reach a large size without being defective?

Hough Yes, I am sure soft maple will reach a good age, an adequate size of 26 or 30 inches, without serious defect.

Stotz On one saw-timber chance we had, the soft maple had up to three 16-foot logs in some perfect trees. The heartwood was extremely light in color, no black heart, and very small for the total diameter of the log. In fact, in the winter time when we were scaling and stamping frozen logs, the frozen wood reacted like hard maple to the stamping hammer and the general appearance of the wood and the bark was quite similar to hard maple. Positive identification was made by looking at the buds. So we do grow some good soft maple of large size.Incidentally, these nice trees were growing in the rocks on a steep hillside on a north exposure.

Bacon I was interested in your statement, Ash, regarding the natural regeneration of tolerant species that you expect will enter these second-growth stands managed on a partial-cutting or tree--selection basis.

Hough Regeneration of the tolerant species will come in after each partial cutting opens the canopy. Black cherry cannot be expected to succeed unless a heavy cutting and fencing treatment is made, such as was done on the crop-tree plot below here. To favor black cherry one must also release the young growth as was done on some of these 5- and 8-inch diameter limit cutting plots in this vicinity. I think we are licked on cherry regeneration until further studies are made, but you will get regeneration after partial cuttings. It will be of the tolerant species.

Raup What are the tolerant species?

Hough Beech, hemlock, hard maple. Even cherry is fairly tolerant in youth. Cherry seedlings will last for 10 years with the slightest bit of light let in by thinning.

Raup What are the intolerant species?

Hough Ash, cherry, at older ages. I think the birch is somewhat intolerant toward the south and west of its range. Tulip poplar and red maple are sort of in-between.

Raup Both Svend and Hough, would there be any point in reducing the understory in this stand? In other words, cutting out the small stuff.

Heiberg My answer is that it is really the smaller trees that are the better trees. For that reason I have not cut very heavily; as a matter of fact very little. Are you thinking that it would add anything to the growth of the bigger trees?

Raup That is right, I am wondering about root competition.

Heiberg Some, but very little.

Hough A large number of the 1-inch and 2-inch seedling trees have been removed. Even so the understory you see here actually wouldn't amount to much. I do not think it would be economic to remove them.

Raup I am not thinking you could use them, just knock them down. I am wondering whether it would be of interest.

Heiberg Your interesting experiment on the Harvard Forest may answer it.