MARKING BY J. E. IBBERSON

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In marking the timber for removal on this plot. I had the assistance of Ralph Wible, Ash Hough, and Ray Bower.

The policy of the Pennsylvania Department of Forests and Waters in marking timber under management plans recently completed for 1,800,000 acres of state forests was followed in marking this plot. The objectives of these plans are as follows:

1. Produce the greatest possible sustained supply of timber products.
2. Improve species composition and quality of existing stands and provide for adequate residual growing stock as well as reduce the damage caused by insects and diseases.
3. Regulate the cutting of timber so that the supply and flow of products from the forest will be constant and adequate. This will tend to stabilize wood-using industries and the activities of employees and communities dependent upon them.
4. Develop and preserve the recreational values of the forests.
5. Protect the watersheds from erosion and obtain from them the maximum yields of usable water.
6. Harvest timber in such a way that an adequate, uniform supply of food and cover for wildlife is produced.

As you will note, the above objectives strongly indicate multiple use. Such a policy is positively dictated and must be followe when managing public forests. In formulating the plans and the policy much assistance was given by the Pennsylvania State University, U. S. Forest Service, neighboring states, wood-using industries, and wildlife authorities.

The economics involved in harvesting the timber crop were considered. Consideration was given to the fact that 1,500 board feet per acre is the min imum cut that can generally be made from the economic standpoint. In marking cordwood, it is well known that timber below 8 inches d.b.h. is expensive to harvest. For example to make a standard cord requires 36 trees 6 inches d.b.h. but only 13 trees 8 inches d.b.h. The number of bolts to a cord, 4-inch top diameter, is 109 while 64 bolts with an 8-inch top diameter will make a cord. The conversion time to prepare a 52-inch cord is 15.5 man hours for trees in the 5.0- to 7.9-inch d.b.h. group, while only 9.6 hours are required to convert a 52-inch cord from trees in the 8- to 10.9-inch d.b.h. group. The cost to chemical-girdle a 52-inch cord of trees averaging 7.3 inches d.b.h. is $1.90 but only $0.80 for trees averaging 9.2 inches d.b.h. Then, too, the cost of marking must be considered. The cost to the Department to mark and sell a standard cord from trees 6 inches d.b.h is $1.49 while the cost for a cord from trees 10 inches d.b.h. is only $0.33.

The following considerations by d.b.h. classes were given as the timber was being marked. Trees 6 to 8 inches d.b.h. were marked only when they had absolutely no future. This would include trees of dangerously low vigor or exceptionally high defect. Trees 8 to 12 inches d.b.h. that did not have good prospects of growing to be good saw-timber specimens were marked for cutting. Vigor, quality and species were the main considerations. If it was necessary to relieve competition, trees from this 8- to 12-inch d.b.h. class were se lected for removal. Trees over 12 inches d.b.h. were marked for removal if they were of poor quality, or growing slowly and were poor risks because of low vigor.

Since the Department is obligated to get the highest reasonable stumpage returns for the public, the timber was marked and recorded wit h the intent that a combination cordwood and saw-timber sale would be consumated. Trees 12 inches d.b.h. and up that were of saw-timber quality were recorded as saw timber. All other trees were recorded as cordwood. The volume of cull trees was not considered.

In making value calculations the following prevailing stumpage prces in the northern hardwood region of Pennsylvania were used:

$ 1.50 per cord containing 100 cu. ft. of solid wood
250.00 per M bd. ft. for cherry veneer logs
90.00 per M bd. ft. for cherry sawlogs
20.00 per M.bd. ft. for soft maple sawlogs
20.00 per M bd. ft. for yellow birch sawlogs
10.00 per M bd. ft. for hemlock sawlogs

While the plot was only one-half acre in size,all data are given on a per acre basis. In computing volumes, cubic foot volumes were taken from a table recently made for this area by the Northeastern Experiment Station and the Armstrong Forest Company. Board foot volumes were taken from tables re-cently made by the Department of Forests and Waters for the northern hardwood region of northcentral Pennsylvania.

Of the 202 trees 6 inches d.b.h. and up, 9 (including 12 cull trees) were marked for cutting. This is 42 percent of the stems, including 1,136 cubic feet or 44 percent of the present volume of 2,546 cubic feet (exclusive of 12 cull trees). If the timber marked is all sold for cordwood at $1.50 per cord the stumpage returns will be $17.04. The 10 trees suitable for saw-timber constitute 1,944 board feet and the remaining marked trees include 839 cubic feet. The value of the combination sale then is

8.39 cords at $1.50	$ 12.58
576 bd. ft. cherry at $90/M	51.84
346 bd. ft. soft maple at $20/M	6.92
1,022 bd. ft. hemlock at $10/M	10.22
Total value of combination sale	$ 81.56

The net gain of the combination sale over the cordwood sale is therefore $64.52 per acre.

The volume remaining is 610 Cubic feet in trees 6 to 11 inches d.b.h., and 4,810 board feet in trees 12 inches d.b.h. and up.

The sage value of the remaining timber (trees 6 to 11 inches d.b.h. computed as cordwood, those 12 inches d.b.h. and up computed as saw timber) is as follows:

6.10 cords at $1.50	$ 9.15
2,796 bd. ft. cherry at $90/M	260.64
2,014 bd. ft. soft maple at $20/M	40.28
Stumpage value of remaining stand	$ 310.07

While gathering the basic data necessary to formulate management plans for the 1,800,000 acres of Pennsylvania state forests, many thousands of increment cores were taken from the northern hardwoods. It was found that cherry of the sizes found on this plot grows nearly two inches in diameter in 10 years, while the other species found on this plot generally average from 1.0 to 1.5 inches d.b.h. growth in 10 years. The table below shows the diameter growth referred to:

10-Year d.b.h. Growth - Inches

D.B.H.	Red Maple	Sugar Maple	Black Cherry	Beech
6	1.1	1.3	1.4	0.9
7	1.1	1.3	1.5	1.0
8	1.2	1.4	1.5	1.0
9	1.2	1.4	1.6	1.0
10	1.3	1.4	1.7	1.0
11	1.4	1.4	1.7	1.0
12	1.4	1.4	1.8	1.0
13	1.5	1.4	1.8	1.0
14	1.5	1.4	1.8	1.1
15	1.6	1.4	1.8	1.1
16	1.6	1.5	1.8	1.1
17	1.5	1.5	1.8	1.1
18	1.5	1.6	1.9	1.1
19	1.4	1.5	1.9	1.1
20	1.3	1.5	1.9	1.1
21		1.5	1.9	1.1
22		1.5	1.9	1.1
23		1.5		1.1
24		1.5		1.1

in projecting the growth and volumes of this plot 20 years hence, the conservative 20-year d.b.h. growth-rates of only 3 inches for cherry and 2 inches for the other species were used. Considering 15 inches inside bark diameter at the small end to be the minimum for veneer logs, 4 cherry trees per acre will qualify. Forty percent of the volume of these trees, or the butt log, is classed as veneer volume. The value of the timber on this plot 20 years hence then becomes:

9.16 cds. at $1.50	$ 13.74
551 Bd. ft. cherry veneer logs at $250/M	137.75
4,159 bd. ft. cherry sawlogs at $90/M	374.31
4,340 bd. ft. soft maple sawlogs at $20/M	86.80
286 bd. ft. yellow birch sawlogs at $20/M	5.72
Stand value 20 years hence	$ 618.32
Present value of residual stand	310.07
Increase in value	$ 308.25
Per acre per year value of growth -	$15.41

One might be inclined to think that the projection above is over-optimistic from the financial and growth standpoint. As stated previously the prevailing stumpage prices of the region were used. The diameter growth-rates for the 20-year projection period were somewhat less than those that could be expected for northern hardwoods growing on an average site. That the diameter growth-rates were conservative is reflected in the per acre per year growth-rates during the projection period. During the 20 years the volume per acre is computed to increase from 4,810 board feet to 9,336 board feet with an increase of 4,526 board feet. Taken from reliable growth data of recent origin, the growth rates per acre per year should be 412 board feet or 8,240 board feet. This is nearly double that arrived at by using the conservative 20-year d.b.h. growth rates.

The growth data used and referred to above was the average taken on hundreds of growth-study plots throughout the northern hardwood type in connection with formulating management plans on state forests. On each of the one-fifth-acre plots an increment core was taken from every tree 6 inches d.b.h. and up. The volume of each plot ten years ago was determined and the present volume of each plot was also determined. This data was then curved and growth prediction tables of the type shown below were extracted from the curves.

Northern Hardwood Type - Site I

Beginning Volume Bd. ft./acre	Annual Growth Bd. ft./acre	Beginning Volume Bd. ft./acre	Annual Growth Bd. ft./acre
2-3,000	340	12-13,000	464
3-4,000	356	13-14,000	470
4-5,000	371	14-15,000	475
5-6,000	386	15-16,000	479
6-7,000	400	16-17,000	480
7-8,000	412	16-18,000	480
8-9,000	427	18-19,000	479
9-10,000	438	19-20,000	477
10-11,000	448	20-21,000	470
11-12,000	457		

Discussion

Fifteen to 20 minutes were allotted to each of the nine markings. There was no time left for discussion of Mr. Ibberson's marking. - Ed.