S. FOREST SERVICE RESEARCH NOTE NE-53
1966

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EPICORMIC BRANCHING ON EIGHT SPECIES OF APPALACHIAN HARDWOODS

Epicormic branches and associated defects are leading causes of degrade and value loss in lumber sawed from hardwood logs.[1] The degrade may be in the form of small knots, ingrown bark, wood blemishes, and/or rot.

Although only a small amount of research has been done on the comparative tendencies of different species to produce epicormic branches,[2] some species are generally known to be much more apt than others to produce such branches. For example, white oak (*Quercus alba* L.) is well known as a prolific sprouter. White ash (*Fraxinus americana* L.), on the other hand, usually remains relatively free of bole sprouts.

More definite information about species susceptibility to epicormic branching should be of considerable value to forest managers in selecting trees to leave after cutting, and in setting stand density goals. Consequently a study was begun to evaluate bole sprouting of the more important hardwood species found on the Fernow Experimental Forest in West Virginia.

The Study Area

Eighteen clearcut openings, each larger than an acre, were used in the study. All had been cut 3 to 7 years before. Thus sufficient time had elapsed for bole shoots to develop on the border trees, but not a long enough time for reproduction to have seriously shaded the lower shoots.

The openings were all in well-stocked sawlog-size stands of mixed second-growth Appalachian hardwoods about 60 years old. Site indexes

[1] Bryan, W. C. LOSSES FROM DEFECT IN PIEDMONT HARDWOODS. U. S. Forest Serv. SE. Forest Exp. Sta., Sta. Paper 109, 31 pp., illus. 1960.

[2] Jemison, George M., and F. X. Schumacher. EPICORMIC BRANCHING IN OLD-GROWTH APPALACHIAN HARDWOODS. J. Forestry 46: 252-255. 1948.

(for oak)[3] ranged from 60 to well over 70 feet. Most of the sample trees were on the better sites, as shown below:

Oak site index	*Number of sample trees*
60	90
70+	260

Timber volumes ranged from an average of 7,000 board feet per acre on site index 60 to about 17,000 board feet per acre on the higher sites.

Methods

Data on epicormic branching were taken on 350 trees distributed among 8 hardwood species, as tabulated below:

Species	*Number of study trees*
Black cherry (*Prunus serotina* Ehrh.)	63
Chestnut oak (*Quercus prinus* L.)	61
Hickory (*Carya* spp.)	30
Red maple (*Acer rubrum* L.)	21
Red oak (*Q. rubra* L.)	89
Sugar maple (*A. saccharum* Marsh.)	53
White ash (*Fraxinus americana* L.)	15
White oak (*Q. alba* L.)	18
Total	350

It was originally intended to include yellow-poplar (*Liriodendron tulipifera* L.) in the above list, but not enough suitable sample trees were found during this study to provide reliable data for analysis. However, based on observations made in a previous study[4] of epicormic branching, yellow-poplar is included in a susceptibility rating presented later in this note.

Only trees that were growing on the borders of the clearcut openings were taken as sample trees. To qualify, these trees had to be at least 5 inches in diameter at breast height and had to contain at least one 16-foot log above a 1-foot stump. The sample trees were classified in two dominance classes: (1) dominant and codominant, and (2) intermediate and overtopped.

For each sample tree, the number of epicormic branches on the half-circumference of the bole that faced the opening was tallied. On trees that contained two 16-foot logs above a 1-foot stump, the branches were tallied separately for each log.

[3] Schnur, G. Luther. YIELD, STAND AND VOLUME TABLES FOR EVENAGED UPLAND OAK FORESTS. U. S. Dep. Agr. Tech. Bull. 560, 88 pp., illus. 1937.

[4] Smith, H. Clay. EFFECTS OF CLEARCUT OPENINGS ON THE QUALITY OF HARDWOOD BORDER TREES. J. Forestry 63: 933-937, illus. 1965.

Results

A summary (table 1) of the data from the trees on the better sites (site index 70 or higher) indicated the following order of decreasing susceptibility to epicormic branching among the eight species in the study:

A	White oak	C	Hickory, Yellow-poplar, Red maple, Sugar maple
B	Black cherry, Red oak, Chestnut oak	D	White ash

White oak is unquestionably the most susceptible to bole sprouting (fig. 1, A). The groupings indicate species that are susceptible to about the same degree. Thus, black cherry, red oak, and chestnut oak are about equally less susceptible than white oak; the next group of four species represents a still lower degree of susceptibility; and white ash is least susceptible of all (fig. 1, B). Yellow-poplar, as explained earlier, was included in the above rating on the basis of observations in another study.

Bole sprouting (between log positions and tree-dominance classes) was compared within species and for all species (table 1). These two variables appeared in an earlier study[4] to be correlated with sprouting, and the present data substantiate the previous tentative conclusions: that, on the aver-

Figure 1. — Two border trees representing the extremes of susceptibility to epicormic branching. A, an 18-inch, 2-log white oak 7 years after exposure, displaying about 24 epicormic branches on the half-circumference of the bole that faces the stand opening. B, an 18-inch, 3-log white ash 5 years after exposure, entirely free of epicormic branches.

Table 1. — Average numbers of epicormic branches per log[1] by species, tree dominance class, and log position[2]

Species	Dominant and codominant trees				Intermediate and suppressed trees			
	First log		Second log		First log		Second log	
	Logs in sample	Branches per log	Logs in sample	Branches per log	Logs in sample	Branches per log	Logs in sample	Branches per log
White oak	5	7.20	5	9.20	1	12.00	1	14.00
Black cherry	54	4.81	49	6.27	7	17.00	4	12.00
Red oak	51	4.63	51	7.39	15	7.27	12	7.42
Chestnut oak	18	2.00	18	3.39	7	16.14	6	10.50
Hickory	25	1.04	25	3.04	3	5.67	3	9.33
Red maple	5	1.00	5	1.80	6	2.50	4	5.25
Sugar maple	26	1.69	19	1.32	25	1.96	22	2.18
White ash	9	.44	9	.33	3	1.00	3	2.00
All species	193	3.35	181	4.99	67	6.52	55	5.76

[1] Branches per log denotes only the branches on the half-circumference facing the stand opening.
[2] Table covers only the trees growing on sites of index 70 or better.

Table 2. — Epicormic branching by site class[1]

Species	Site index 80		Site index 60	
	Logs in sample	Branches per log[2]	Logs in sample	Branches per log[2]
Chestnut oak	18	3.4	28	7.3
Red oak	39	4.6	20	6.3
White oak	5	9.2	9	13.6

[1] Table covers only the second logs of dominant and codominant trees.
[2] Branches per log denotes only the branches on the half-circumference facing the stand opening.

age, more sprouts develop on second logs than on first logs; and more sprouts develop on intermediate and overtopped trees than on dominant and codominant ones.

In addition, the relationship between site index and bole sprouting was examined. For the species found on both site index 60 and site index 80 — the poorest and the best sites — average bole sprouting was somewhat greater on the poor sites (table 2).

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