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Effect of Logging Wounds on Diameter Growth of Sawlog-Size Applachian Hardwood Crop Trees

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Abstract

In previously thinned, even-aged Appalachian hardwood stands, 5-year diameter growth of 102 wounded and 102 unwounded codominant crop trees were compared. A wounded crop tree was defined as one with at least one exposed sapwood logging wound at least 100 inch^2 in size. An unwounded crop tree of the same species and size was selected near each of the 102 wounded trees. Five-year diameter growth of wounded crop trees averaged 1.34 inches, while unwounded crop trees averaged 1.40 inches. Paired *t*-test showed no significant differences in 5-year diameter growth between wounded and unwounded crop trees.

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Introduction

Intensive management of even-aged Appalachian hardwood stands requires stands to receive one or two commercial thinnings. Cut trees are topped after felling and then skidded tree-length to the deck where they are bucked. Inevitably, some residual trees are wounded during felling and/or skidding. Although these logging wounds are primarily to saplings, some codominant crop trees also are wounded (Miller et al. 1984; Lamson et al. 1984; Lamson and Miller 1983). The most common type of wound to crop trees is exposed sapwood wounds. We are concerned about such wounds for at least two reasons. First, they can be infection courts for various fungi. This can lead to wood discoloration and decay, which reduces the amount of high-quality lumber produced from wounded trees. Second, exposed sapwood wounds partially girdle the stems and may reduce diameter growth. In this paper we examine the effects of exposed sapwood wounds on the diameter growth of crop trees in Appalachian hardwood stands.

Methods

Data were collected from six even-aged stands in northern West Virginia. Three of the stands were 60-year-old cherry-maple stands. Each of these three stands was thinned to a different relative stand density (RSD). The remaining three stands were 80-year-old mixed Appalachian hardwood stands. The deferment cutting practice was applied to these three stands. This is a harvest cut that leaves about 12 to 15 codominant trees per acre with the intent of removing these residuals at the next harvest cut in about 80 years or longer.

Within each stand, 5-year diameter growth data were available for all residual trees. Also, length and width of all exposed sapwood logging wounds were measured immediately after logging. Any codominant tree with at least one exposed sapwood wound over 100 inch^2 in size was considered a wounded crop tree. For every wounded crop tree we randomly selected a nearby codominant crop tree that was free of wounds, of the same species, and had a diameter (d.b.h.) within 1.5 inches. This procedure minimizes differences in species, tree size, and residual stand density. Species were black cherry, red maple, sugar maple, yellow-poplar, red oak, white oak, chestnut oak and cucumbertree. The numbers and average size of trees selected are shown in Table 1.

We tested the differences in 5-year diameter growth using a paired t-test with each wounded crop tree and its unwounded comparison tree as the pair.

Results and Discussion

Five-year diameter growth was not affected by logging wounds (Table 1). Periodic diameter growth ranged from 0.80 to 2.53 inches depending on the stand treatment. The differences in 5-year diameter growth between wounded and unwounded trees ranged from zero to 0.13 inch, but none were significant. Five-year diameter growth for all wounded study trees averaged 1.34 inches compared with 1.40 inches for unwounded comparison trees.

The 5-year diameter growth of crop trees was not decreased by exposed sapwood logging wounds that were at least 100 inch^2 in size. Future diameter growth may not be decreased. Pioneering work by Shigo (1969) showed that internal chemical processes compartmentalize wounded tissues, zoning them off from the rest of the tree. We can safely assume that any rot developing from these wounds will not spread outward and thereby kill more cambium. Although diameter growth was not decreased by logging wounds, large wounds are likely to develop rot (Nyland 1986). Generally, the amount of lumber-value loss in previously wounded trees is not substantial. Ohman (1970) reported a 0.7-percent loss in lumber value traceable to 10-year-old wounds in yellow-birch. For sugar maple, Hesterberg (1957) found a 3.4-percent loss in lumber value in logs wounded 10 and 20 years earlier. Both of these studies

Table 1.—Number, average diameter, and 5-year average diameter growth of wounded and unwounded crop trees

Stand no.	Cover type	Stand treatment	No. sample tree pairs	Average diameter		Ave. 5-year d.b.h. growth	
				Wounded	Unwounded	Wounded	Unwounded
				Inches			
1	Cherry-maple	75% RSD	13	10.6	10.7	0.80	0.80
2	Cherry-maple	60% RSD	19	10.6	10.9	1.12	1.13
3	Cherry-maple	45% RSD	23	11.5	11.6	1.09	1.22
4	Mixed hardwoods	Deferment	12	16.6	16.6	2.53	2.53
5	Mixed hardwoods	Deferment	5	17.8	16.8	1.72	1.64
6	Mixed hardwoods	Deferment	30	15.2	15.1	1.36	1.47
	All stands		102	13.2	13.3	1.34	1.40

reported lumber value for butt logs with wounds. Tree-value loss traceable to logging wounds would be less than that of butt logs.

We do not believe that exposed sapwood logging wounds are serious in even-aged Appalachian hardwood stands. Many of the wounded trees are not crop trees. For example, in cherry-maple stands thinned to 60 percent RSD there were 376 residual trees per acre (1.0+ inch d.b.h). Only 17 (4 percent) trees at least 11.0 inches d.b.h. received exposed sapwood wounds of any size (Lamson et al. 1984). Most of the wounded crop trees are not severely wounded. Miller et al. (1984) reported that in mixed Appalachian hardwood stands thinned to 60 percent RSD, only 7 of 67 residual codominant trees per acre (10 percent) received exposed sapwood wounds of any size. Only three of these trees (4 percent) had exposed sapwood wounds larger than 100 inch^2.

Recommendations

Although exposed sapwood logging wounds did not influence 5-year growth of sawlog-size crop trees, some rot can be expected to develop from some of the larger wounds, but lumber value losses can be minimized by removing previously wounded trees during subsequent thinnings (Ohman 1970). There are some practical recommendations to reduce such logging wounds when thinning even-aged hardwood stands. Carefully lay out skid roads so that the amount of load turning is reduced. Curves in skid roads are the site of many exposed sapwood wounds because of the wide radius needed to maneuver tree-length material. Most exposed sapwood logging wounds occur along skid trails. Leave fender trees along the skid roads. These trees help keep the load in the skid road. Mark the residual trees instead of the trees to be cut. Aho (1983) showed that this marking technique can reduce logging wounds because attention is drawn to the crop trees, making operators more conscious of them. Leave some small pole trees near valuable crop trees. These poles can serve as bumper trees to protect the crop trees from skidding wounds.

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