[Extended Abstract]

RED OAK TIMBER PRODUCT VALUE LOSS DUE TO FIRE DAMAGE

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Fire is increasingly applied as a land management tool toward achieving multiple objectives in eastern North American oak (*Quercus*) communities. Prescribed fire treatments are applied for natural community restoration, hazardous fuel reduction, and multiple silvicultural objectives (Arthur and others 2012, Brose and others 2013, Brose and Van Lear 1998, Burton and others 2011, Dey and Hartman 2005, Pyne and others 1996). In southern Missouri, prescribed fire is used to restore glades, savannas, and woodlands by decreasing the number of woody stems, consuming litter, and creating forest canopy openings, thus promoting fire-tolerant tree and shade-intolerant herbaceous species (Nelson 2005). As land management agencies increasingly move toward landscape-level management processes (e.g., burn units > 1,000 acres), prescribed fire will burn across ecological boundaries more frequently, including into stands of merchantable timber. Currently there is much debate as to whether prescribed fire management for forest community restoration and managing for timber products are mutually exclusive practices. There is a need for improved understanding regarding how prescribed fire affects timber product values in areas containing merchantable sized trees.

We measured the economic loss due to fire-caused injuries (i.e., fire scars) in terms of volume and value in the butt logs of 88 red oak (*Quercus velutina, Q. rubra,* and *Q. coccinea*) trees harvested from prescribed fire units in southern Missouri. Trees with varying degrees of external fire damage, time since fire, and diameter were harvested and milled into dimensional lumber. Fire scar dimensions and tree size (diameter at breast height (DBH)) were measured prior to tree harvest. Lumber grade changes and volume losses due to fire-related injuries were tracked on individual boards (n=1298, 7754 board feet). Lumber values were assigned using rough, green lumber values reported by the Hardwood Market Report (Southern Hardwoods Category, April 16, 2011).

Overall, value and volume losses were surprisingly low. Volume loss per fire-scarred log averaged 3.9 percent, and the average value loss was 10.3 percent. A large amount of fire-caused defect was removed incidentally during the milling process (fig.1). Statistically significant models ($p < 0.001$) were developed to predict log value loss considering tree size, fire scar size, and fire scar residence time (time between fire damage occurrence and tree harvest). Trees that were mid-sized (i.e., pole size) when injured were most likely to experience higher value loss, while trees that were small or large in diameter at time of injury typically experienced little or no value loss. If fire damage is less than 20 inches in height and/or 20 percent basal circumference injured, then little value loss should occur over 14 years. If these thresholds are exceeded, value loss is likely. Value loss may be very low if trees are harvested within five years after fire damage, regardless of scar size. These findings are applicable for red oak trees which are at least 8 inches DBH at time of fire damage and with fire-scar residence times not greater than 14 years.

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Figure 1—Fire scarred tree pre- and post-harvest. Tree DBH=19.7 inches, fire scar height=27.0 inches, fire scar depth=5.0 inches. The dotted circle on the base of the log depicts (to scale) the log's small end diameter; the solid square represents the portion of the round log that is utilized when manufacturing rectangular dimensional lumber. Though this tree appeared heavily defected while standing, it only experienced 8.0 percent value loss and 2.8 percent volume loss, with much of the fire-caused defect removed during the milling process.