EIGHT YEARS LATER, DID A WILDFIRE IN SOUTHWESTERN VIRGINIA ACCOMPLISH FIRST-ENTRY PRESCRIBED FIRE TREE REGENERATION OBJECTIVES?

George E. Hahn, T. Adam Coates, W. Michael Aust, Carolyn A. Copenheaver, and Melissa A. Thomas-Van Gundy

Extended abstract—In the early 20th century, fire exclusion policies had unforeseen consequences on the forests of the Appalachian Mountains, including fuel accumulation and a shift in composition to more fire-intolerant species (Nowacki and Abrams 2008, Waldrop and others 2016). The failure to regenerate desirable fire-adapted species, such as oaks (*Quercus* spp.) and Table Mountain pine (*Pinus pungens*), led scientists and managers to consider the use of prescribed burning as a management tool to restore these species (Brose and others 2013).

The application of prescribed burning to promote oak reproduction has led to conflicting results (Brose and others 2013, Keyser and others 2019). Several reasons have been posited as to why differences occur, including differences in burn season or frequency and overall fire behavior (Brose and others 2013). Generally speaking, wildfires are of higher intensity and consume more duff than prescribed fires (Hahn and others 2019). Also, prescribed fires are ignited with management intentions and goals in mind. Objectives are targeted under specific constraints of weather and desired fire behavior (Waldrop and Goodrick 2012). In contrast, wildfires typically result from unplanned natural (in other words, lightning ignitions) or human (for example, arson, carelessness, etc.) causes. The dormant season has been the preferred burn season of choice for prescribed fires in the Southern and Central Appalachian Mountain regions for a host of reasons, including concerns for specific wildlife species and their habitat, avoidance of western United States wildfire seasons when personnel and resources might already be utilized, and potentially hazardous burning conditions (Keyser and others 2019).

Over the past 15 years, the size of wildfires in Virginia and West Virginia has been increasing (National Interagency Fire Council 2019). This has led some forest managers and researchers to consider wildfire-related regeneration dynamics, particularly when compared to those generated by prescribed fires. Black and others (2018) used the Composite Burn Index (CBI) to correlate wildfire burn severity to vegetation effects on the Daniel Boone National Forest in Kentucky. As fire severity increased, so did overstory mortality and oak and pine sapling density and recruitment. Hagan and others (2015) examined vegetation response following two wildfires in the Linville Gorge Wilderness Area, NC, and found that oak and Table Mountain pine seedlings increased post-fire alongside a more diverse herbaceous layer. These studies suggested that fires of higher intensity might be needed to achieve oak and pine regeneration objectives.

During research activities in the summer of 2018, researchers at Virginia Tech visually observed suspected differences in tree regeneration in two adjacent forested areas (fig. 1) of the Fishburn Forest in southwest Virginia. Both of the forested areas were on eastern aspects, but one was affected by a wildfire in November 2010, and the other had not been affected by any type of fire in at least the last 20 years.

To investigate potential regeneration differences, the abundance of tree regeneration was measured in a total of 63 0.02-acre plots. Eighteen plots were located in the wildfire-affected area, and 45 plots were located within a non-burned portion of the Fishburn Forest. Differences in sample size were simply based upon the affected acreage. Within these plots, all stems <2 inches diameter at breast height (d.b.h.) were counted. The species was

Author information: George E. Hahn, Graduate Research Assistant, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; T. Adam Coates, Assistant Professor, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; W. Michael Aust, Professor, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; Carolyn A. Copenheaver, Associate Professor, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; and Melissa A. Thomas-Van Gundy, Research Forester, U.S. Department of Agriculture, Forest Service, Northern Research Station, Parsons, WV 26287.

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recorded, and height class was assigned based upon the following classifications: Class 0 = <1 foot; Class 1 = 1–3 feet, Class 2 = 3.1–4.5 feet; Class 3 = >4.5 feet. Species were placed into two groups: a xeric group, which consisted of chestnut oak (*Quercus montana*), scarlet oak (*Quercus coccinea*), and hickories (*Carya* spp); and a mesic group, which consisted of red maple (*Acer rubrum*), blackgum (*Nyssa sylvatica*), tulip-poplar (*Liriodendron tulipifera*), sourwood (*Oxydendron arboreum*), and sassafras (*Sassafras albidum*).

Preliminary analyses of the data (Wilcoxon test for non-parametric data, $\alpha = 0.05$) suggested:

- Total tree regeneration (all height classes included) was significantly ($p < 0.0001$) greater in the wildfire-affected portion of the Fishburn Forest.
- Regeneration of the xeric group (<1 foot) was significantly ($p < 0.0001$) greater on the wildfire-affected portion of the Fishburn Forest.

Using this data and data collected from additional prescribed fire and wildfire locations in the Appalachian region (Thompson and others 2019), we hope to better understand how long-term forest restoration goals might be accomplished in long-term non-burned forests. Two 2018 Virginia wildfire locations and one 2018 West Virginia wildfire location are being measured similarly to develop a more comprehensive understanding of potential wildfire impacts on tree regeneration.

Figure 1—Comparison of regeneration on the Fishburn Forest, Montgomery County, VA, in non-burned (left) and wildfire-affected (right) areas (Thompson and others 2019).

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