National Park Service Fire Monitoring Plots are used to Better Understand Hardwood Stem Mortality after Prescribed Fire

In the research article published in the *International Journal of Wildland Fire*, authors Tara Keyser, Virginia McDaniel, Robert Klein, Dan Drees, Jesse Burton, and Melissa Forder look at how well tree diameter (DBH) and fire intensity, estimated by the height of bark char, can predict stem mortality in eastern hardwoods. The data for this study were collected on 210 fire monitoring plots before and after single prescribed fires. The plots were in 13 different National Park Service (NPS) lands, stretching across the southern Central Hardwoods from Shenandoah National Park, VA in the east to Pea Ridge National Military Park, AR, in the west. For more than 4,000 trees of 10 different species, DBH was measured before prescribed fire, and the height of bark char was measured immediately after the fire. Then 2 years post-burn field crews recorded whether the tree stem was alive or dead, regardless of whether it resprouted. The most abundant species in the study were chestnut oak, white oak, red maple, scarlet oak, and black oak; another common Appalachian species, blackgum, was also well-represented.

Study Methods:

More than 80% of the prescribed fires were conducted in the winter and spring dormant season and into to the early spring growing season, January through April. Overall, fires were low to moderate intensity, as bark char height was most often 0 to 1.5 feet. Bark chars >3' height also occurred but were not common.

Key Findings:

- Across all diameters, white oak and chestnut oak had the lowest percentage of stem death, both less than 10%. Species considered fire-sensitive, such as red maple and blackgum, had higher stem mortality (20-30%). H
- Size differences between species were important: most of the stem death in red maple and blackgum occurred in trees 10" DBH was extremely low – similar to the oaks.
- For all species, DBH and bark char height together were excellent predictors of stem mortality in the statistical models: stem death became more probable as stems became smaller and bark char height increased.
- The authors conclude by noting that this wide-ranging study of stem mortality in eastern hardwoods could be used to improve on the FOFEM (First Order Fire Effects Model) computer program, which predicts tree mortality after fire, but has not been well calibrated for eastern tree species.

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