SPECIES AND SITE DIFFERENCES IN STEM-BARK CHAR AFTER PRESCRIBED FIRE IN A SOUTHERN APPALACHIAN HARDWOOD FOREST, KENTUCKY

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Wounding of valuable timber trees during prescribed fires is a primary concern of forest managers, as fire scars often serve as an entryway for decay fungi and insects. Bark-char height and width have been found to be good predictors of mortality and wounding, and thus future wood quality. However stem-bark char and bole damage have not been studied on a landscape scale in closed canopy forests for which fuel loading and fire behavior were also measured. Sixty 10 x 40 m plots were established during the summer of 2002 on three separate study sites on the Cumberland Plateau in the Morehead District of the Daniel Boone National Forest. Within each plot, trees (>2 cm DBH) were tagged and measured, boles and crowns were evaluated for dieback, and litter and fine woody fuels were measured around each tree. Brown's (1974) planar intercept transects and 30 X 30 cm forest floor blocks were used to quantify fuel loads in each plot in January and February 2002. Temperature sensitive paints on aluminum tags were placed at three heights (0, 20, and 40 cm) in each plot to record fire temperatures. Prescribed fires were ignited either by hand or by helicopter, in late March and mid-April, resulting in considerable variability in fire intensity and severity among the three study sites. While temperatures on the Buck Creek and Chestnut Cliffs sites did not differ, the Wolf Pen site had higher temperatures than Buck Creek at 20 cm (230º and 313º C) and 40 cm (165º to 225º C), and higher temperatures than Chestnut Cliffs at 0 cm (574º to 500º C). Immediately after the fires, fuel loads and stem-bark char heights were recorded. Bark-char heights ranged from zero to seven meters in height. A regression model with class variables was used to analyze the bark-char data. Bark-char heights on smooth barked species, such as red maple (*Acer rubrum* L), were lower than on rough barked species, such as yellow poplar (*Liriodendron tulipifera* L.). As anticipated, mean bark-char heights increased with larger DBH size classes. Landscape position was a significant predictor of bark-char height, with higher char in the xeric locations. While accurate estimates of bole damage will not be available until two or three growing seasons after the fire, mortality, bole damage, and crown die-back appear to be greatest in areas of high fire intensity where bark-char heights also tended to be higher, as expected.

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