INFLUENCE OF PRESCRIBED FIRE ON STEM GIRDLING AND MORTALITY

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This study examined the response of individual stems to prescribed fire in the eastern oak (*Quercus* spp.) forest. Following seven prescribed fires in Connecticut, all stems at least 4.5 feet tall were tallied within thirty 45- by 45-foot plots. To increase the sample of stems with diameters of at least 2.5 inches, trees that were within 45 feet of each plot center but outside of the interior plots, also were measured. Diameters were measured to the nearest 0.04 inches for all stems with diameters of at least 0.4 inch. Heights were measured to the nearest 0.4 inch to a maximum of 80 inches. The fraction of each stem girdled by fire was recorded in increments of 10 percent. Trees with dead tops (topkilled) were recorded as 100-percent girdled. In all, 3,476 stems were examined. Temperatures were recorded during the fires with thermocouples at each plot corner and at plot center. Average maximum temperatures within plots was 360°F (range: 142 to 696°F). Average stem girdling was 95 percent or more for seedlings (< 0.4 inch diameter) regardless of species. Average stem girdling decreased by approximately 5 percent per 1 inch increase in diameter for larger stems. Less girdling was noted for oaks than for other species in the poletimber size class (4.5 to 10.5 inches diameter). Some sawtimber trees (> 10.5 inches diameter) also were injured by prescribed fire. Twenty percent of sawtimber oaks had at least 25-percent girdling compared with 28 percent for non-oak sawtimber. A similar pattern was noted for stems that were topkilled. There was no difference among species in the proportion of saplings (0.4 to 4.5 inches diameter) that were topkilled. Fewer poletimber and sawtimber oaks were topkilled than non-oak species. Topkilled oaks sprouted more frequently than non-oaks, 68 vs. 44 percent, respectively. However, nonoak sprouts were more numerous and taller. For all species, both girdling and topkill increased as the average maximum temperature of the prescribed fire increased. For example, 45 percent of trees in the 4-inch diameter class were topkilled when exposed to temperatures > 300°F compared with only 5 percent for stems exposed to temperatures < 300°F.

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