FUEL AND FIRE DYNAMICS IN EASTERN MIXED-OAK FORESTS

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In eastern mixed-oak forests, prescribed fire and thinning are being used as tools for a variety of management goals, including altering fuel loads. However, the specific effects of these treatments on fuel dynamics in hardwood forests are relatively unknown, as are the specific patterns of fire behavior based on fuel loading and moisture content. We conducted two experiments to address these deficiencies. First, we conducted a study to examine fuel dynamics 3 years after thinning, prescribed fire, and a combined treatment as a part of the Ohio Hills site of the Fire and Fire Surrogate program. Measurements techniques followed the Brown planar-intersect method to determine litter, duff, 1-hr (0 to 6 mm diameter), 10-hr (6 to 25 mm), 100-hr (25 to 75 mm), and sound (1,000S) or rotten (1,000R) 1,000-hr (75+ mm) fuel mass. Coarse woody debris (CWD) was evaluated for species, length, large- and small-end diameters, and decay class. Three years after treatments, thinning increased 100-hr, 1,000S, CWD, and litter, but reduced 1-hr fuels; burning increased 1,000S but reduced 1,000R; thinning followed by burning increased 100-hr, 1,000S, and CWD but reduced 1-hr, 10-hr, and duff. Changes in the larger, sound fuels (100-hr, 1000S, and CWD) appear to persist over time following treatments, while changes in finer fuels (litter, duff, 1-hr, and 10-hr) or less-sound fuels (1,000R) appear to be more ephemeral, recovering or shifting direction within 3 years after treatment. In the second experiment, we manipulated moisture and fuel-load levels (litter, 1-hr, and 10-hr) in a common garden, trial burn experiment using fuel load estimates covering the range estimated in the first portion of the study. As predicted, fires burned hotter and consumed more fuel with elevated fuel loads or lower fuel moistures. The results of this experiment can be used by managers to predict fire behavior based on fuel conditions, and can be linked to other research to predict stem mortality based on fire temperature. Collectively, our experiments can be used to evaluate the effects of silvicultural treatments on future prescribed fires. As such, they provide a realistic baseline for fuel loading and fire behavior in models of eastern mixed-oak forests.

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