

Validation of Fuel Consumption Models for Smoke Management Planning in the Eastern Regions of the United States

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Summary

We measured fuel loading and fuel consumption on 18 prescribed fires in southern pine forest and sand pine scrub fuelbed types in the Southeastern United States, and in 11 mixed hardwoods and pitch pine fuelbed types in Northeast and North Central states. The data from the 29 units have been compiled and placed in the SEMIP repository as a data set that can be used to evaluate fuel consumption and other fire models. Additionally, pre-fire and post fire fuel consumption data from other studies occurring in the eastern and western United States was compiled and added to it more usable as a validation data set.

The data collected from the 29 units were used to test Consume and the First Order Fire Effects Models (FOFEM), two currently available fuel consumption prediction systems. The study suggests that, with the exception of fine woody fuels, there are no discernible differences between model results (how they predicted consumption) on the 18 pine sites and 11 mixed hardwood sites. Overall, both systems perform well in predicting shrub and herbaceous consumption, but did a poor job in predicting 1-hr, 10-hr, litter, and duff fuel consumption. More work is needed to develop reliable models of small woody fuels, litter, and duff consumption for the eastern fuel types.

Airborne infrared mapping and associated ground measurements were performed with the Wildfire Airborne Sensor Platform (WASP) on eight fires for this project. Two fires were monitored in both Ohio (Tar Hollow State Forest) and Kentucky (Mammoth Cave National Park). An additional four units were monitored in Florida (Eglin Air Force Base). Ground measurements (N = 19) consisted of nadir-viewing, dual-band radiometer measurements of total ground-leaving fire power and fire video. Airborne and ground data from this project are combined with data from other projects to provide >20 airborne datasets and >60 ground measurement points. A new calibration approach allows us to use data from a single bandpass infrared detector to estimate total fire power. This calibration method provides a check and alternative to ground calibration of airborne fire mapping data and is expected to be widely applicable. With the new calibration, we will map fire heat release and fuel consumption for comparison with Consume and FOFEM.