

# USING WESTERN CONIFERS TO PREDICT TREE MORTALITY IN SOUTHERN PINES: RECOMMENDATIONS FOR FIRE EFFECTS MODELING SYSTEMS

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## ABSTRACT

The future of prescribed fire use in the southern United States depends on resulting fire effects meeting management goals. Prior to burn implementation, freeware fire models such as BEHAVE Plus and FOFEM are often used to predict these effects, given user-specified weather and fuels conditions. Such predictions of fire behavior and impacts can help managers implement prescribed burning when objectives can best be met. The retention of mature overstory trees is commonly included in fire prescriptions for pine-dominated southern ecotypes. However, typical model systems use equations derived only from western conifers to predict fire-induced overstory tree mortality. We hypothesize that the modeling systems' dependence on western conifer-based allometric relationships between bole diameter and bark thickness, as well as resilience following crown scorch, may significantly over- or underpredict tree mortality in southern pines. Here, we use > 1,000 individual sample trees to assess post-fire mortality predictors for a fire-dependent ecosystem dominated by sand pine (*Pinus clausa*) in the Ocala National Forest of Florida. Our logistic regression models show that diameter is not an important inherent tree characteristic in relation to post-fire mortality, and that sand pine is resilient to high levels of crown scorch. We also show that fire in sand pine scrub is not uniformly stand-replacing across the landscape, with only 18% of our study area classified as having high-severity or stand-replacing fire. Our results suggest that the FOFEM-BEHAVE Plus system does not accurately predict tree mortality for this species, and that basic assumptions about tree response to fire injuries should also be revisited for some other southern pine species.

*Keywords:* BEHAVE, fire effects, FOFEM, logistic regression, sand pine scrub, tree mortality.

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