Fire Behavioral Changes as a Result of Sudden Oak Death in Coastal California Forests[1]

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Abstract

Field observations and anecdotal evidence suggest that sudden oak death (SOD), a disease caused by the pathogen *Phytophthora ramorum*, may alter fuel loading in affected forests. Though it is reasonable to assume that a disease resulting in leaf blight, dead branches, and tree mortality would increase forest fuels, little work has been done to support or quantify this important issue. We compared fuel loading in *P. ramorum*-infested Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco)-tanoak (*Notholithocarpus densiflorus* (Hook. & Arn.) Manos, Cannon & S.H. Oh) forests of northwestern California to 1) assess whether the continued presence of this pathogen alters surface fuel loading, 2) model potential fire behavior in affected stands, and 3) evaluate potential impacts on firefighting response in infested areas.

Recognizing that *P. ramorum* has not been present in California long enough for us to fully capture its effect on fuels, we supplemented sampling of pathogen-killed stands with those killed by herbicides. Herbicide treatments included in the study selectively targeted tanoak, one of the most vulnerable hosts of *P. ramorum* and the species of interest in this study; the lethal effects of both herbicide and *P. ramorum* on tanoak rendered the two treatments comparable.

Fuel loadings were greater in diseased than in non-diseased stands, yet great variability was observed and differences were not significant. However, fuel loads observed in herbicide-treated stands were significantly greater than in control stands ($P < 0.001$); total weight of downed woody debris (all size classes) approximately doubled with the herbicide treatment ($\bar{x}$ = 106.3 Mg ha^{-1}) over the control condition ($\bar{x}$ = 58.1 Mg ha^{-1}). The increasing trends in herbicide and diseased plots were similar, suggesting that fuel loading in diseased plots may continue to increase relative to control plots over a longer time horizon than observed.

Fuel models based on the observed surface fuel accumulations in herbicide-treated and diseased plots predict that for some early-to-mid-phase (2 to 8 years) herbicide-treated forests, and for late-phase (8 years plus) diseased forests, rates of spread, flame lengths, and fireline intensities could increase significantly over the baseline, challenging effective firefighter response and requiring alternative approaches to fire suppression. These results, in addition to the relatively high background surface fuels observed in the control stands, highlight the need for fuels treatments and effective disease management strategies in infested stands and as sudden oak death expands throughout a broader region.

For the full paper, please see Valachovic, Y.S.; Lee, C.A.; Scanlon, H.; Varner, J.M.; Glebocki, R.; Graham, B.D.; Rizzo, D.M. 2011. Sudden oak death-caused changes to surface fuel loading and potential fire behavior in Douglas-fir-tanoak forests. Forest Ecology and Management. 261: 1973–1986.

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