Forest Health Research Program Grantee Webinar:

Plume Dynamics of Three Prescribed Fires in Western States

Stephen Drake, PhD, University of Nevada, Reno

Tuesday, October 24, 2023

3:00 pm – 4:00 pm

Register here

Abstract: The intensity of a prescribed fire depends on many variables such as the burn application strategy, forest structure, fuel moisture content and meteorology, among others. Fire managers must weigh the long-term benefits of prescribed fire against near-term risks. Dispersion of the smoke plume generated by a prescribed fire is an increasingly important consideration. Low intensity fire has the upside of facilitating containment but fumigates fire personnel and nearby communities and may lack sufficient intensity to meet the prescription goals. High intensity fire lifts the plume benefiting near-field air quality but presents a containment risk and may yield an overly aggressive treatment. Improved understanding of plume dynamics is needed to tilt the cost/benefit calculation in favor of fire managers. Towards this goal, we present plume dynamics analyses from three prescribed fires – one at Sagehen Experimental Station in the Tahoe National Forest and two in conifer stands at Sycan Marsh Preserve, Oregon. The three prescribed fires shared characteristics having upright plumes generated by medium to heavy fuels but varied in intensity, footprint size and soot loading. Near-surface turbulence and meteorological characteristics were measured with 3D sonic anemometers, thermohygrometers and pressure sensors. Backscatter data from a lidar located beyond the fire perimeter yielded wind and relative soot load information. For each case study the evolution of the wind field and plume behavior is examined.

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Dr Drake has been a Research Scientist at the University of Nevada, Reno since 2018. He specializes in field-based assessment of microphysical phenomenon in the layer of air near the earth's surface. Studies include turbulent enhancement of latent heat flux over snow, the effect of wind dynamics on subcanopy moisture loss and methods of discriminating near-field flux variability with eddy covariance measurements. More recently, Dr. Drake has been applying eddy covariance methods to examine plume dynamics of prescribed fires.

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