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Recent emissions research in southwestern shrub and grassland fuels

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Abstract:

While it is currently challenging to use prescribed burning in chaparral and other southwestern shrub fuel types due to many constraints, any such activities require smoke management planning. Information on fuels and emissions from chaparral were limited and based on older sampling systems. The DoD SERDP program funded a project to measure fuels and smoke emissions in the laboratory and field. In February 2009, 49 dry, compact fuel beds from six chaparral fuel types, two Emory oak fuel types, and masticated mesquite were burned at the Missoula Fire Sciences Lab and smoke emissions were sampled. Emission factors for CO, CO_2, NO_x, PM, and for many previously unmeasured gaseous and particulate emissions were derived. Emission factors of some compounds differed between fuel types (Burling et al. 2010; Hosseini et al. 2010, 2013). Several other research groups performed measurements on the laboratory fires as well (Roberts et al. 2010, 2011; Veres et al. 2010; Warneke et al. 2011). We also successfully measured fuels and sampled emissions from the ground and an aircraft on two prescribed burns in chaparral and one in Emory oak woodland (Burling et al. 2011; Johnson et al. 2013). Smoke emissions were measured on three additional chaparral fires including one in which we followed the plume nearly 32 km downwind from an airborne platform. Concentrations of many compounds increased in the plume as the smoke aged and chemical reactions continued (Akagi et al. 2012). While the laboratory and field fuel beds were markedly different in terms of moisture content and bulk density, many of the laboratory-derived emission factors correlated well with field-derived emission factors (Miller 2013; Yokelson et al. 2013). The aircraft data were then compared to smoke transport-dispersion predictions using the current air quality tools (CMAQ, BlueSky, and SMARTFIRE). While it was not possible to perform statistical comparison given the sample size, of the three air quality tools examined, BlueSky produced predictions which compared favorably with observed data (Miller 2013). Emission factors derived in this study and in a companion study (RC-1649, Johnson et al. 2013) as well as emission factors previously published in a variety of refereed and gray literature have been

compiled into the Wildland Fire Emission Factors Database which is available from the Forest Service National Data Archive (Lincoln et al. 2013).

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