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Ecohydrologic Implications and Management of Post-fire Soil Water Repellency in Burned Pinon-Juniper Woodlands

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Erosion and weed dominance often limit the recovery of piñon-juniper woodlands of western North America after high intensity wildfires. Soil water repellency (SWR) is one factor that may promote overland flow and impede seedling establishment. In spite of these effects, the influence of post-fire SWR on site recovery is poorly understood. Our presentation summarizes data collected within studies on burned piñon-juniper woodlands that provide new insight on: 1) the spatial distribution and severity of SWR, 2) influence of SWR on soil hydrology, nitrogen cycling, and site revegetation, and 3) the suitability of soil surfactants as a post-fire restoration tool. We demonstrate how patterns of SWR are highly correlated to pre-fire woodland canopy structure. At sites where SWR is present, infiltration, soil water content, and plant establishment is significantly less than at non-hydrophobic sites. We show how newly developed soil surfactants can significantly improve ecohydrologic properties required for plant growth by overcoming SWR; thus, increasing the amount and duration of available water for seed germination and plant growth. However, the application of soil surfactants in wildfire-affected ecosystems has been limited due to logistical and economic constraints associated with the standard practice of using large quantities of irrigation water as the surfactant carrier. We have developed a potential solution to this problem by using seed coating technology to use the seed as the carrier for the delivery of soil surfactant. Through this approach, precipitation leaches the surfactant from the seed into the soil where it absorbs onto the soil particles and ameliorates water repellency within the seeds microsite. We present findings from laboratory and field evaluations of surfactant seed coatings, which provide evidence that it may be plausible for the technology to improve post-fire seeding efforts by restoring soil hydrologic function and increasing seedling emergence and early seedling development.