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Post-fire Restoration of Soil Hydrology and Wildland Vegetation using Surfactant Seed Coating Technology

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In semi-arid environments, soil water repellency can contribute to reseeding failure by reducing soil moisture availability. Non-ionic soil surfactants (wetting agents) have been shown to be effective in enhancing infiltration and improving root-zone water reserves in water repellent soils. However, the application of soil surfactants in wildland ecosystems can be logistically and economically prohibitive. In this study we evaluated a potential solution for applying soil surfactants using seed coating technology. Through this technology the seed is used as a carrier for the soil surfactant. After planting, water transfers the surfactant from the seed into soil where it ameliorates the water repellency within the seed's microsite. The objectives of this research were to 1) establish the efficacy of a surfactant seed coating (SSC) in ameliorating soil water repellency, and 2) determine the influence of SSC on seedling emergence and plant survival. To accomplish the first objective, detailed soil column experiments were conducted in the laboratory on water repellent soil obtained from a burned pinyon-juniper woodland. The second objective was met through greenhouse testing of SSC applied to crested wheatgrass and bluebunch wheatgrass seed, using the same soil as used in objective 1. Results indicate that SSC increased soil water infiltration, percolation, and retention. This technology had no influence on seedling emergence for crested wheatgrass, but SSC improved bluebunch wheatgrass emergence threefold. Plant survival was dramatically improved by the SSC. Only 0.75 % of the seedlings that grew from non-coated seed survived to the end of the study, while 37 % of the plants survived in the SSC treatment. Overall, these results indicate that it may be plausible for SSC(s) to improve post-fire restoration efforts by restoring soil hydrologic function and increasing seedling emergence and early seedling development.