Assessing Fire Moss Effects on Post-Wildfire Soil Properties in Semi-Arid Forests

Henry Grover, Matthew A. Bowker, Peter Z. Fulé

School of Forestry, Northern Arizona University, USA

Semi-arid forests of southwestern North America have shifted from a frequent surface fire regime to rare but severe fires over the past century. Warming climate and encroaching urban development increase the negative effects of uncharacteristically severe wildfires, motivating study of new approaches to rehabilitate burned areas including the possible application of “Fire Mosses”, the cosmopolitan species Ceratodon purpureus, Funaria hygrometrica and Bryum argenteum, that naturally colonize burned landscapes. We assessed post-fire moss colonization on 10 severe fires in Arizona and New Mexico, selecting a range of times since fire, and stratified plots within each wildfire by winter insolation and elevation. At 69 plots we measured fire moss cover and a suite of soil functional characteristics on moss covered and adjacent bare soil including infiltration, shear strength, compressional strength, and soil aggregate stability. Moss cover ranged from 0-72.9% with a mean over all plots of 10.6% and a median of 3.2%. Using random forests, our predictive model of moss cover included 12 covariates and had an R2 of 0.41. The three most important predictors of moss cover were: insolation, geologic map unit, and soil organic carbon. Precipitation and elevation were marginally important predictors and there were seven relatively unimportant predictors. When compared with bare soils, moss covered areas had 50% greater infiltration, 100% greater shear strength, 150% greater compressional strength, and 200% greater aggregate stability. These preliminary results will inform locations where moss could naturally increase post-fire hillslope soil stability, locations for targeting moss restoration efforts, and suggest that Fire Moss could be a valuable tool to mitigate post wildfire erosion. We are currently engaged in studies of greenhouse propagation and experimental inoculation of Fire Moss species.