



Hydrologic impacts of soil water repellency following fire in coarse-textured shrub-dominated ecosystems

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Wildfire is a major ecological process and management issue on rangelands throughout the western United States. Fire suppression activities over the past century have disrupted natural fire cycles. Managers are now faced with a choice between rehabilitation of catastrophic wildfires or using proactive management alternatives such as prescribed fire to return ecosystems to their natural fire regimes. Fire can reduce infiltration and increase runoff and erosion causing reduced site productivity and impairing water quality. Few data are available to quantify fire-induced hydrologic impacts on rangelands or to determine how long such impacts persist. Rainfall simulation methodology was used to quantify hydrologic impacts under rangeland wildfire and prescribed fire settings. Plot-scale spatial and temporal variations in fire impacts were compared to unburned conditions. An index of water repellency was derived and used to quantify the influence of water-repellent soil conditions on infiltration. Water drop and wetting front penetration tests were also used to quantify strength and depth of soil water repellency under burned and unburned conditions. Results indicate that the impact of the fire on infiltration and erosion was quite significant under both wild and prescribed fire. The impact of fire on infiltration was localized primarily on coppice microsites directly under shrubs characterized by high surface litter accumulations. Burned coppice microsites exhibited the greatest water repellency and highest interrill erosion rates compared to unburned coppices. Significant water repellency was also observed under unburned conditions when soils were dry. Significant temporal variability in infiltration between years was observed on both burned and unburned areas complicating the interpretation of fire impacts and hydrologic recovery following fire. The influence of soil water repellency on infiltration decreased with time and was insignificant after two growing seasons following both wild and prescribed fire.