



Research Brief for Resource Managers

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Effects of Fire and Invasive Plants on Desert Soils

Allen, E.B., R. J. Steers, and S.J. Dickens. 2011. Impacts of fire and invasive species on desert soil ecology. *Rangeland Ecology and Management* 64:450-462. <http://www.srmjournals.org/doi/abs/10.2111/REM-D-09-00159.1>

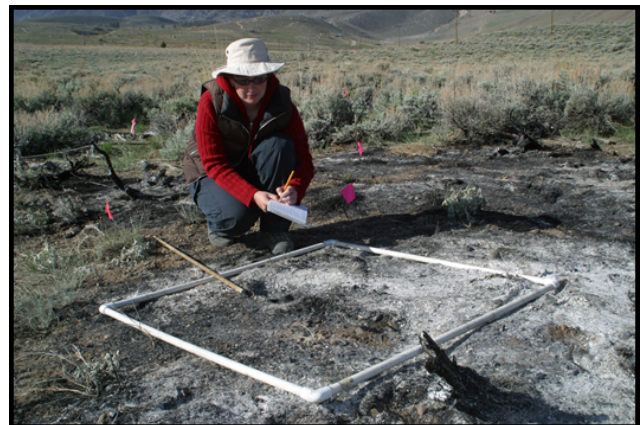
Fire and invasive species may cause changes in biological, chemical, and physical properties of desert soils. Although soil may recover from the impacts of fire during succession, these changes are permanent under persistent invasive species. The most severe effects of fire occur under high temperatures with high fuel buildup and soil moisture that conducts heat downward.

Deserts typically have low fuel loads and low soil moisture, both conditions that would contribute to lower impacts of fire than in mesic soils. Soil is a good insulator, so soil microorganisms will survive a few centimeters deep even in hot surface fires. Immediately postfire there is often an increase in mineral nitrogen (N) and a decrease in soil carbon (C) and organic N, but these changes are often minimal in desert soils, except under fertile shrub islands that have higher fuel loads and fire temperature. Both hot and cold deserts have experienced slow recovery of native shrubs and increased growth of invasive grasses following fire.

Invasive species may either increase or decrease soil N and C depending on fire temperature and site and species characteristics. Mineralization and fixation of N are often high enough after fire that subsequent productivity balances N losses. The elimination of islands of fertility coupled with postfire erosion may be a major impact after fire in grass-invaded shrub lands.

Management Implications

- In the long term, the interaction of fire and invasive species may result in more frequent fires that eliminate fertile islands of shrubs and reduce the productivity of deserts.
- Fire may be used as part of strategy to control some invasive plant species without the concern that N will be irrevocably lost, but this must be done judiciously to avoid eliminating shrubs and further increasing invasive species dominance.



Soil surface immediately after a fire in sagebrush steppe. Photo: M. Brooks