



Woody Plant Encroachment: Rainfall, Soil Moisture and Patterns of Plant Water Use

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Woody plant encroachment can affect the ecohydrology of arid and semi-arid ecosystems due to physiological differences in water use between functional types such as grasses and shrubs and due to species specific differences within functional types. Semi-arid and arid regions of the United States are often characterized by pulses of rainfall during the summer growing season and intervening dry periods that frequently are severe enough to limit biotic activity. Additionally, the amount of winter precipitation varies in these rangeland ecosystems. Changes in the seasonality, frequency and size of rainfall events can produce differential patterns in the depth and duration of soil wetting, which will affect plant water use, and the resulting carbon and water fluxes. These differences in water use and changes in community composition also interact with variable soil physical properties to create differences in how rainfall is partitioned into soil moisture, evaporation and transpiration. Furthermore, woody plant processes such as hydraulic lift and nighttime transpirational water loss potentially have important implications for water and nutrient cycling. Results from experimental studies in field environments will be used to identify ecohydrological interactions for a variety of woody species that occur in rangeland, dune, and riparian systems. Examples from mesquite, creosote, greasewood, and salt cedar will be used to illustrate the mechanisms that affect processes that may warrant inclusion in state and transition models for water-limited systems with increasing densities of woody plants.

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