



Multiscale Variability of Soil Aggregate Stability: Implications for Rangeland Hydrology and Erosion

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Conservation of soil and water resources in rangelands is a crucial step in stopping desertification processes. The formation of water-stable soil aggregates reduces soil erodibility and can increase infiltration capacity in many soils. Soil aggregate stability is highly variable at scales ranging from individual aggregates to bioclimatic regions due to complex interactions of soil texture, soil organic matter, soil organisms, vegetation and surface disturbance. Variability in soil aggregate stability at all scales has important implications for rangeland hydrology and erosion. We conducted field soil aggregate stability tests at multiple scales (plot, landscape, and regional) throughout the western United States and in areas with varying degrees of vehicle-related disturbances. Additionally, small plot scale rainfall simulation experiments were conducted in conjunction with soil stability measures. Results demonstrate the scale-dependent nature of variability in soil aggregate stability, particularly within a disturbance gradient. The implications of this variability for hydrology and erosion are explored by contrasting variability in soil stability among scales, disturbance types and regions. Other site properties related to hydrology and erosion, including soil texture, vegetation, and cover and distribution bareground, are used to highlight possible mechanisms. In rangeland monitoring and assessment activities, the application of average soil stability values over large areas can be appropriate. Soil degradation at small scales, however, can result in disproportionately large increases in soil erosion and run-off. Results from our studies and related literature indicate that large variability occurring at relatively small scales should be considered for multi-scale estimates of changes in rangeland hydrology and erosion.

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