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# Vegetation change in dryland environments: understanding changes in fluvial fluxes via changes in hydrological connectivity

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Dryland environments are estimated to cover around 40% of the global land surface (Okin et al, 2009) and are home to approximately 2.5 billion people (Reynolds et al. 2007). Many of these areas have recently experienced extensive land degradation. One such area and the focus of this project is the semi-arid US Southwest, where degradation over the past 150 years has been characterised by the invasion of woody vegetation into grasslands.

The transition from grass to woody vegetation results in a change in ecosystem structure and function (Turnbull et al, 2008). Structural change is typically characterised by an increased heterogeneity of soil and vegetation resources, associated with reduced vegetation coverage. Functional change is characterised by an increased vulnerability to soil erosion and the potential loss of key nutrients to adjacent fluvial systems. Such loss of resources may impact heavily upon the amount of carbon that is sequestered by these environments and the amount of carbon that is lost as the land becomes more degraded. Therefore, understanding these vegetation transitions is significant for sustainable land use and global biogeochemical cycling.

Connectivity is a key concept in understanding the hydrological response to this vegetation change, with reduced vegetation coverage in woody environments being associated with longer and more connected overland flow pathways. This increase in hydrological connectivity results in an accentuated rainfall-runoff response and increased fluvial fluxes of eroded sediment and associated soil organic carbon and other nutrients.

This project uses an ecohydrological approach, characterising ecological structure and monitoring natural rainfall-runoff events over bounded plots with different vegetation covering the transitions from $C_4$ pure-grass (*Bouteloua eriopoda)* to $C_3$ creosote (*Larrea tridentate*) shrubland and $C_3$ piñon-juniper (*Pinus edulis-Juniperus monosperma*) mixed stand woodland. Data collected quantifies fluvial fluxes of sediment and associated soil organic matter and carbon that is lost from across the grass-to-shrub and grass-to-woodland transition (where change in space is taken to indicate a similar change through time). Structural characterisation data along with results collected during the 2010 and 2011 monsoon seasons will be presented; illustrating the usefulness of viewing environmental structure via the concept of connectivity when trying to understand fluxes of water, sediment and associated nutrients.

References

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