

Range Management 2009

Project: **609 Mechanistic Foundations of State and Transition Models: Linking Application and Theory**

Leader: *Katharine Nash Suding, Assistant Professor, University of California at Irvine, Department of Ecology and Evolutionary*
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Objective: We propose to test the generalities and predictability of grazing intensity, widely thought to drive transitions between rangeland states, and its impact on ecosystem processes. In addition, we will investigate how vegetation change initiated by grazing intensity may promote positive plant-soil feedbacks involving microbes and important limiting resources such as water and nitrogen, increasing the resilience of rangeland vegetation states. We focus on ecosystem states of management concern in California rangelands: perennial native grasslands dominated by species such as Needlegrass (*Nassella pulchra*), annual exotic grassland state dominated by acceptable forage species such as annual rye (*Lolium multiflorum*) and wild oats (*Avena fatua*), and annual exotic grassland dominated by noxious weeds such as Medusahead (*Taeniatherum caput-medusae*).

Project: **804 Scale and management effects on soil and vegetation properties in the Sierra Nevada foothill annual rangeland**

Leader: *Kenneth W. Tate, Specialist, One Shields Ave, Plant Sciences, University of California*
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Objective: State and transition models have been widely utilized to catalog ecological information and assess management risks and benefits in rangeland ecosystems. In the oak woodland-annual grassland foothills of the Sierra Nevada, most research to date has focused on vegetation dynamics, with little integration of soil properties. Additionally, there has been little guidance regarding appropriate scales at which vegetation and soil properties can be integrated for development of state and transition models. Our objectives are to: 1) define the optimal spatial scale(s) at which to jointly investigate vegetative and soil properties; and 2) determine how soil-plant properties respond to mechanisms of transition such as fire, livestock grazing intensity, and oak tree thinning/removal. Our approach will utilize hierarchically nested sample units (for investigating scale effects) within variously managed units (e.g., livestock exclusion, low stocking rate, high stocking rate). This observational study will capitalize upon an existing chronosequence of management units already in place (e.g., 40+ years livestock exclusion, 20 years livestock exclusion), which will provide the opportunity to examine temporal scales important to our second objective.

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Project: **804 Scale and management effects on soil and vegetation properties in the Sierra Nevada foothill annual rangeland – Continued**

This study will be of value because it will examine ecologically important spatial scales for state and transition modeling, identify dynamic soil properties that serve as sentinels of soil change, and assess management impacts on soil-plant properties.

Project: **901 Soil Microbial Biogeography in California Grasslands**

Leader: *Mary Firestone, Professor, Dept. ESPM, UC Berkeley*
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Objective: Since microorganisms mediate many soil biogeochemical cycles, the patterns of soil microbial communities across landscapes are important for the functioning and health of grassland ecosystems. We propose to study how edaphic characteristics shape the bacterial and archaeal communities in California annual grassland ecosystems, specifically the communities associated with a common annual grass, *Avena barbata*.