

Subject: 3 PhD positions - Resilience, Fire, Invasions

Resilience & Vulnerability driven by Fire-Invasion-Human Interactions Multiple PhD research assistantships (exceptional MS students will also be considered) are available to focus on closely related projects involving contemporary changes in fire regimes, woody plant invasions into grasslands and vulnerability of alternative state transitions. Students will be joining an interdisciplinary program and study in the labs of Dirac Twidwell (Institute of Agriculture and Natural Resources) and Craig R Allen (Nebraska Cooperative Fish and Wildlife Research Unit) at the University of Nebraska-Lincoln. Students will be expected to lead one of the following project themes:

Ph.D. 1: Spatial vulnerability of future woody invasions and restoration potential The goal of this project is to develop a broad-scale assessment for understanding future vulnerability to woody invasions and their potential relative reversibility following alternative state change to an invaded-dominated state. The assessment will include spatially explicit and probabilistic predictions using exposure risk and sensitivity of current communities. It is expected that the output from this project will be used to prioritize natural resource agency invasion control efforts, given current geospatial information on current invasive woody plant distribution and abundance.

Ph.D. 2: Threshold analysis and spatial fire modeling, with implications for new approaches to prescribed fire management Funding for this project supports a student to use spatial fire modeling programs and threshold analysis to understand the role of fire in changing the spatial boundaries of alternative grassland and woodland states in complex landscapes. Spatial fire models will expand on our lab's current expertise of fire intensity – woody mortality thresholds and explore the spatial and temporal dimensions of fire needed to prevent juniper woodland expansion or facilitate its reduction. The student will also have opportunities to quantify potential scaling mismatches of current prescribed fire applications relative to historical contexts, which provides the basis for assessing new, broader-scale fire management designs.

Ph.D. 3: Social-ecological traps and human constraints on fire regimes Social-ecological traps are conditions that result from mutually reinforcing social and ecological feedbacks acting to push a system toward an undesirable state. Invasion of juniper, and the resulting transformation of grasslands to juniper woodlands throughout the Great Plains, is a consequence of social feedbacks that promote juniper invasions being more dominant than others meant to prevent invasions. In such an instance, it has proven difficult for agency investments to restore ecological feedbacks needed to push the system toward a more desired state (e.g. grassland). This project will explore data from multiple case studies where agency investments have attempted to escape social- ecological traps limiting contemporary use of fire.

Additional project information:

These research projects offer highly motivated students the unique opportunity to bridge science directly with land managers from multiple conversation agencies and private landowner special interest groups. In 2014, the Conservation Roundtable, a panel consisting of state, federal and private conservation groups, identified *Juniperus virginiana* invasions as the biggest threat to conservation and ecosystem services in Nebraska. Those groups are anticipating the findings from this research project will shape future conservation actions and provide innovative solutions that reprioritize existing programs.

The successful candidates will therefore be expected to build relationships with a diverse group of agency personnel and communicate results in a manner that enhances learning and adaptive management in this landscape. Successful candidates will be joining a collaborative group of graduate students conducting unique experiments throughout the Great Plains. Students are given opportunities for cross-project collaborations and to use existing data to explore additional areas of interest.

Contact and application information:

Students interested in this position should send a statement of interest with research qualifications and career goals, GPA and GRE scores, your most recent transcript (unofficial is fine) and a CV that includes contact information for three references (email preferred). Please send applications to Dirac Twidwell (dirac.twidwell@unl.edu). Start date is flexible but anticipated to be between May 2016- January 2017. Full funding is available for 4 years. The stipend rate for 2016 is \$25,200. Full tuition waiver and graduate student health benefits are provided. Review of applications will begin March 10, 2016, and continue until qualified candidates are identified.