THE KNOWLEDGE NETWORK FOR BIOCOMPLEXITY

Second collaborative meeting Community Dynamics in South African Savannas
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The Knowledge Network for Biocomplexity (KNB), a research collaboration between the National Center for Ecological Analysis and Synthesis (NCEAS; www.nceas.ucsb.edu), the Long-Term Ecological Research Network Office (www.lternet.edu), the San Diego Supercomputer Center (www.sdsc.edu), and Texas Tech University, is developing software tools to advance ecological understanding through remote discovery, access, retrieval and management of ecological and environmental data (http://knb.ecoinformatics.org).Ê New tools alone are insufficient to meet current and future knowledge integration challenges in the environmental sciences. Therefore, to facilitate a transformation in the culture and conduct of environmental science, the KNB is training a cadre of investigators in new techniques for management and analysis of ecological information, with particular emphasis on multi-scale integration, synthesis and analysis. Our approach involves scientists (graduate and postdoctoral students and faculty and other senior scientists) at multiple institutions collaborating remotely using KNB software tools to investigate questions related to the importance of spatial and temporal scale in understanding the relationship between biodiversity and ecosystem function. In addition, participants in the project also collaborate directly during working groups.

To date, a total of 105 participants, including 83 graduate students, 2 undergraduate students, 6 postdoctoral researchers and 14 faculties from 9 US universities have participated in the KNB's educational activities. Participants gain a broad understanding of the scientific question being addressed (the productivity/diversity relationship), participate in synthetic research to address this overarching question, develop collaboration skills, and become familiar with tools and methods to facilitate integration of heterogeneous data and metadata and analysis of heterogeneous data sets.ÊIn addition, participants provide important input to the design and evolution of the KNB software tools.

KNB - South Africa Collaboration

To expand the geographic scope of the KNB and associated distributed seminar model, as well as to diversify participation by the ecological community in KNB research and education activities, and software development, we are initiating a collaboration between the KNB, Kruger National Park Scientific Services, ARC-Range and Forage Institute, and graduate students, postdoctoral researchers and faculties from several universities in the US and South Africa.
This international research and education collaboration will examine relationships between biodiversity, community structure and ecosystem function, and how key drivers influence these relationships in savannas and grasslands. South African and US participants will synthesize and analyze data

from multiple spatial and temporal scales, relating to: 1) patterns and dynamics of biodiversity and community structure; 2) the drivers of these patterns and dynamics; and 3) the consequences of and interactions between these patterns and dynamics and key drivers for ecosystem functioning and management of natural systems.

The collaboration will use long-term datasets from Kruger National Park and adjacent game reserves (Range and Forge Institute), as well as from a variety grassland sites in North America, and from long-term fire experiments in both North America and South Africa. We will synthesize and analyze empirical data from a range of spatial and temporal scales for several sites arrayed along similar environmental gradients in North America and South Africa. Our goal is to understand how patterns of species diversity and community dynamics respond to similar drivers (fire, grazing, and climatic variability) and the consequences of these dynamics for productivity, a key ecosystem process in grasslands and savannas. In additional to analysis of empirical data from multiple sites, we will synthesize and analyze data from long-term (>10 years) controlled burn experiments in North America and South Africa to understand how the timing, frequency and intensity of fire, and their interaction with other biotic and abiotic drivers, affect biodiversity at multiple spatial scales.

Under the framework above, the specific questions we are interested in are:

Long-Term Patterns of Community Change: change in different components of community structure, such as species richness, composition, abundance and turnover of dominant and subordinate species, IN SPACE and over time.

Drivers of Biodiversity: how fire (frequency, scale, intensity and timing), large herbivores, climatic variability and potentially other drivers (e.g., soils) interact to influence changes in plant community composition IN SPACE and over time.

Consequences of Community Dynamics for Ecosystem Functioning: the relationship between fire, species diversity, community dynamics, large herbivores, and climatic variability, and how these interact with and influence above-ground plant productivity (biomass), a key ecosystem process in grasslands, over time.

Grasslands and savannas are ideal systems for examining these patterns and processes because they are highly variable in space and time and are subject to multiple disturbances, such as periodic drought, fire, and intense periods of herbivory by ungulates, invertebrates and numerous species of small mammals. Spatially discrete soil disturbances (e.g., burrows, wallows and termite mounds) are also important. Together these disturbances interact to create spatial heterogeneity and temporal variation in resource availability, community structure and ecosystem processes.

Although the impacts of fire, grazing and climate on community and ecosystem structure and function have been well-studied for particular sites, comparative analyses of data from a range of sites is required to understand whether the patterns and causes of species dynamics observed at individual sites or within individual plant communities are general among grassland and savanna systems.

Understanding the causes and consequences of long-term patterns and dynamics of biodiversity and community structure is needed to help increase our ability to predict responses of communities to natural and anthropogenic change. This understanding is critical for informing management decisions. Furthermore, this knowledge will help elucidate the controversial relationship between biodiversity and the functioning and stability of ecosystems.

Participants:
US: Sandy Andelman (NCEAS), Scott Collins (University of New Mexico), Katherine Gross (Michigan State University), Melinda Smith (NCEAS), Alan Knpaa (Colorado State), Mike Willig (Texas University).
Kruger National Park: Harry Biggs, Judith Kruger, Nick Zambatis.
ARC-Range and Forage Institute: Mike Peel
University of Fort Hare: Winston Trollope