

Landscape Dynamics and Climate Variability in the Okavango-Kwando-Zambezi Catchment of Southern Africa

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Southern Africa is one of the most uncertain regions in the world with respect to projections of climate change and the response of land-use/land-cover dynamics. How vegetation phenology, structure, and composition will change with increased variability, more or less rainfall, or changes in temperature is compounded by the land-use decisions for agriculture, ranching, and settlement. Before competing and interacting drivers of climate and land use may be disentangled, effects of water availability must be accounted for in landscape change as it is considered to be the most limiting factor in a savanna environment.

Savanna environments are characterized by a strong seasonal response to wet and dry seasons making quantification of initial water input, rainfall, the first step to understanding the influence of water in the system. Changes in rainfall will affect system drivers, such as soil moisture or fuel load, in turn influencing the vegetation cover ratios in semi-arid dry land ecosystems. My dissertation project focuses on spatial and temporal patterns of precipitation in part of southern Africa and the seasonal and long-term response of vegetation. The research uses geospatial analyses and field measurements to examine the response of vegetation productivity to rainfall variability at a regional catchment scale and to better understand long-term change in woody and grass land covers for a local protected area in Caprivi, Namibia.

The local study area in Caprivi, Namibia is located along the woody end of the tree-grass continuum with the predominant woodland land cover resting upon a relatively homogenous substrate of Kalahari sand. Characteristic of rainfall in dry land systems, this region has experienced great fluctuations over the past century and statements collected from environmental history interviews correspond to a description of southern African rainfall variability described by Nicholson (2001).

In addition to these environmental history interviews, research during the 2007 and 2008 field seasons also included focus group discussions on land-use perceptions and ground data collection for use with satellite imagery. The 2009 field season focused on validating land-cover datasets for both



the local, Caprivi area but also for areas in the larger Okavango-Kwando-Zambezi catchment. Several rainfall and satellite image products were compared to land cover along a precipitation gradient stretching from the western side of Caprivi up to Mongu, the capital of the Western Province in Zambia located on the edge of the Barotse floodplain. Key informant interviews were conducted with select people to identify what types of development and growth have occurred over the past 20 years in the rural western Zambian region. In addition, training sample data and tree cores were systematically collected to inform analyses of land-use and land-cover changes in the regional catchment.

All field seasons have included collaborative efforts amongst faculty and graduate students at the University of Florida as well as partners at African universities and within local communities. The overall objective of this research is to contribute to the broader knowledge of how dynamics of human and environmental factors interact in dry land socio-ecological systems by accounting for precipitation-vegetation relationships in the Okavango-Kwando-Zambezi catchment. This study will contribute an applied understanding to historical environmental change necessary to look at future projections of climate change and variability and its effect on semi-arid dry land vegetation both at the local and regional scale.

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