Geophysical Research Abstracts
Vol. 14, EGU2012-289, 2012
EGU General Assembly 2012

State Transitions in Semiarid Landscapes

J.D. Phillips
University of Kentucky, Geography, Lexington, KY, United States (jdp@uky.edu)

The U.S. Department of Agriculture has developed a large number of state-and-transition models (STM) to predict and interpret changes in vegetation communities in drylands of the southwestern U.S. These are represented as box-and-arrow models indicating potential changes in response to various combinations of management practices and environmental forcings. Analysis of the 320 STMs developed for areas within the state of Texas reveals two important aspects of environmental change in semiarid environments. First, the STMs are highly local—they are specific to very particular combinations of landform, soil, and climate. This is consistent with the perfect landscape concept in geomorphology, which emphasizes the irreducible importance of geographically and historically contingent local factors in addition to universal laws or principles in determining the state or condition of landscapes. Second, analysis of the STMs using algebraic graph theory shows that a majority of them have structures that tend to amplify effects of change and disturbances. In many cases the STMs represent a form of self-organization characterized by the potential of divergent behavior rather than convergence toward a dominant pattern or outcome. These results indicate that geomorphic, hydrologic, and ecological responses to climate and land use change are likely to be highly variable and idiosyncratic, both within and between semiarid landscapes of Texas.