Identifying and Quantifying Hydrologic Processes Underlying Recent Wetland Loss in Yellowstone National Park

Derek Schook and David Cooper
Graduate Degree Program in Ecology, Department of Forest, Rangeland and Watershed Stewardship, Colorado State University

Abstract. Wetlands are some of the most biologically productive yet vulnerable ecosystems on Earth. They provide essential habitat for various biota and act as landscape indicators by reflecting the status of catchment-scale processes. The drying and shrinking of wetlands during the past four decades on Yellowstone National Park's Northern Range has recently incited concern among National Park managers and the public at large. Investigation of wetland hydrologic regime is a critical step in building an understanding of these changing ecosystems. My research has the following objectives: (1) Determine the functional types of wetlands in the study area and identify the hydrologic and geomorphic processes supporting them, (2) Determine the patterns and magnitude of water level declines that occurred during the 20th and early 21st centuries and assess whether these fall within the natural range of variation, (3) Create a hydrologic model to provide a mechanistic understanding of the hydrologic regime dictating dramatically receded water levels at a focal study site. In 2009 I established a monitoring network of 25 wetlands within the Northern Range. Each wetland was instrumented with 4 to 6 shallow groundwater well and piezometer nests. Well data was manually collected from each site at one to two week intervals in summers 2009 and 2010. Data analyses indicate that the study sites represent locations of ground water discharge, recharge, and flow-through, as well as sites perched above the regional water table. Additional analyses conducted or in progress include vegetation-hydrology relationships, a soil seed bank study, soil hydraulic conductivity tests, and aerial photo interpretation. In continuing analysis I am working to classify wetland hydrologic patterns and relate these patterns to local environmental and climatic variables. I aim to establish a quantitative understanding of the hydrologic processes responsible for wetland decline and analyze these trends in the context of global climate change.