

Project Summary

Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Persistence of Willows on the Northern Range of Yellowstone National Park, Wyoming
Type of Project: Research
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Effective Dates: June 1, 2004 - July 1, 2005
Funding Amount: \$11,703
<p>Investigators and Agency Representative: NPS KEY OFFICIAL: Roy Renkin, Yellowstone Center for Resources, P.O. Box 168, Yellowstone NP, WY 82190, (307) 344-2161, roy_renkin@nps.gov</p> <p>PRINCIPAL INVESTIGATOR: Dr. David J. Cooper, Department of Forest, Rangeland and Watershed Stewardship, Colorado State University, Fort Collins, CO 80523, (303) 499-6441</p>
<p>Project Abstract: This project is a continuation of a collaboration by Yellowstone NP and CSU to analyze willow growth, water stress, and the quantification of water sources used by willows along Elk, East Blacktail and West Blacktail Creeks. At these sites, we implemented a 2x2 factorial field experiment in 2000/2001 to allow us to evaluate the influence of elk browsing on willows in unexclosed vs. exclosed plots, and plots with the pre-existing deep water tables vs. those with higher water tables as influenced by our constructed simulated beaver dams/ponds. This is the fourth year of measurements of willows in these plots. Supplemental funding is requested to allow for a complete analysis of the water sources used by willows in different browsing and water table depth situations, and for plants of different age, height, and condition. Our hypothesis is that willows in sites with deeper water tables, or shorter more browsed or stunted willows will access primarily soil water, and have higher drought stress and lower growth rates. However, the presence of a simulated beaver dam and higher water tables allows willows to access more ground water, and have higher growth rates and lower water stress. This analysis would use natural stable isotope ratios of oxygen. Ground water and soil water, due to different water inputs, and different evaporation rates have different ¹⁶O/¹⁸O ratios. We would use these stable isotope ratios of soil and ground water, and willow sap, to identify the likely water sources used by willows during the early, middle and late summer of 2004. We are requesting funds to collect and analyze samples for stable isotope ratios.</p> <p>The second task is the historical analysis of willow establishment, and floodplain sediment accumulation along Elk, East Blacktail, West Blacktail, and Lost Creeks. The analysis of soil texture from beaver ponds and alluvial reaches, and stratigraphic analysis of cut banks along these streams are incorporated into a CSU Master's thesis. However, only have two dates were identified within the stratigraphic columns, and there is a need for additional radiocarbon (¹⁴C) dates to accurately age the timing of alluvial sediment accumulation. These ages will allow us to identify the periods when beavers were present along small streams in our study area, and the age of alluvial landforms. To perform this work, a CSU graduate student will spend 7 days in Yellowstone analyzing stratigraphic sections, collecting samples for analysis, and preparing the samples for analysis by Beta Analytical Lab. The additional ages will be added to our body of work for publication.</p>
<p>Outcomes with completion dates: Final report for the 2004 field season due April 1, 2005. End date of project, July 1, 2005</p>
<p>Keywords: willow growth, water stress, willow establishment, floodplain sediment accumulation, Elk Creek, East Blacktail Creek, West Blacktail Creek, Yellowstone National Park, Colorado State University</p>
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