Project Summary
Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: 2016 Electrical Resistivity Imaging for Phase I Effectiveness Monitoring: Upper Colorado River, Rocky Mountain National Park

Discipline: Natural Resources
Type of Project: Technical Assistance
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Students Involvement: Yes
Effective Dates: 9/1/2016 – 12/31/2017
Funding Amount: $2,401

Investigators and Agency Representative:
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Project Abstract: A breach in Grand Ditch in May 2003 initiated a debris flow that caused extensive damage to the Upper Colorado River and its tributaries in Rocky Mountain National Park (RMNP). The approximately 36,000 m3 of sediment mobilized by the debris flow heavily impacted channel, riparian, and wetland areas. In order to begin restoring hydrologic processes, ecologic function and wilderness character of the impacted zones, specific goals stated in the Final Environmental Impact Statement, a Phase I Restoration project is planned that will redirect the flow of the Colorado River into its historic channel through the center of the Lulu City wetland. The Phase I channel restoration was completed by field crews using hand tools in September 2015. A pre-restoration electrical resistivity (ER) survey and stream tracer analysis was conducted in fall 2015. The pre-restoration data expand the spatial resolution of hydrologic information collected at existing surface water gages and groundwater wells within the wetland as additional Phase I effectiveness monitoring. This proposal describes the post-restoration ER survey and stream tracer test planned for fall 2016, to replicate the pre-restoration analysis. In addition, flow stage, velocity and morphologic changes will be quantified in the restored channel, and groundwater levels in wells adjacent to the restoration site will be measured throughout snowmelt 2016.

Electrical resistivity (ER) imaging is a geophysical technique that has been used to characterize subsurface hydrologic conditions (Rubin and Hubbard, 2006; Robinson et al., 2008). More recently, ER imaging has been applied to sensitive groundwater-dependent ecosystems such as wetlands (Chambers et al., 2014) to achieve noninvasive, high resolution, large spatial coverage of sites to address the complex pattern of groundwater-surface water interactions. Wetland hydrology can be especially difficult to characterize given the subsurface heterogeneity associated with complex fluvial stratigraphy and buried peat layers (Holden et al., 2002; Holden and Burt, 2003). ER imaging coupled with an electrically conductive stream tracer (salt dissolved in water) has been used to successfully identify temporal changes in hyporheic exchange (Ward et al., 2010).

Keywords: Electrical Resistivity Imaging, Upper Colorado River, Grand Ditch, Rocky Mountain National Park, Colorado State University