**Project Summary**
**Rocky Mountains Cooperative Ecosystem Studies Unit**

**Project Title:** Grand Ditch Restoration Adaptive Management Monitoring, Rocky Mountain National Park

**Discipline:** Natural
**Type of Project:** Technical Assistance/Research
**Funding Agency:** National Park Service
**Other Partners/Cooperators:** Colorado State University
**Student Involvement:** Yes, Graduate Research Assistant
**Effective Dates:** 7/10/2017 – 12/31/2019
**Funding Amount:** $42,466

**Investigators and Agency Representative:**
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**Project Abstract:** The Grand Ditch breach in 2003 sent tens of thousands of cubic yards of sediment into Lulu Creek and the Colorado River, and a portion of this sediment was eventually deposited in the Lulu City wetland. Impacts from the breach and the need for restoration are documented in the Final EIS. Restoration is planned to begin during the summer of 2017, with heavy machinery operations lasting two years. This proposal outlines the monitoring needs for during and after the restoration process.

The final restoration design (Sueltenfuss and Cooper, 2017) is meant to restore the Colorado River's historic meander through Lulu City wetland and the tall willow riparian community supported by this landscape. The deposition of material from the 2003 breach, and earlier debris flows, formed a large alluvial fan at the head of Lulu City Wetland and diverted the river from its historic path through the center of the valley to its current path along the western edge of the valley. The debris directing water toward the west edge of the valley, onto topographically high terrain, results in a sheet flow of surface water southeast across the entire meadow toward the historic Colorado River channel, providing continual saturation of the meadow all summer. This permanently saturated regime has altered the vegetation of the historic floodplain from a highly diverse tall willow community conducive to beaver populations to an herbaceous wet meadow dominated by just a few herbaceous species (Carex utriculata, Calamagrostis canadensis and Carex aquatilis).

The final restoration design reconnects the portion of the river upstream of Lulu City Wetland to its historic meander in the center of the valley, and proposes to excavate some of the debris flow material from the wetland to create hydrologic conditions suitable for tall willow habitat. These two activities are supported by the findings from the Phase I channel construction, where the reconnection of the Colorado River Channel led to decreases in the water table elevation throughout the wetland. Water tables in some areas went down by only a few inches, calling for a more robust channel than what was created in 2015. Water tables in other areas went down significantly, necessitating excavation in these areas to create hydrologic conditions suitable for willow growth. Water tables in the riparian wetlands adjacent to the created channel should peak in snow melt runoff with the river, but should be below the ground surface when the Colorado River is flowing at base flow in the late summer.

Because a key goal of the Lulu City wetland restoration is the return of the meandering Colorado River channel with a hydrologically connected riparian zone that will support a complex of tall willow communities, each of these components must be monitored during and following restoration activities. The National Park Service Record of Decision states:

"Changes in stream and groundwater hydrology, channel morphology, water quality, and vegetative recovery will be monitored and evaluated against state standards, where applicable, in the restoration area to measure restoration effectiveness. Monitoring will also evaluate mitigation measures and best management practices for effectiveness in reducing adverse effects on resources."

Monitoring of various attributes is thus required during restoration to identify opportunities for mitigation of adverse effects as well as to identify opportunities and needs for adaptive management. Water table depths are one primary attribute needing constant monitoring throughout the process to identify the most appropriate amount of debris needing to be removed for successful willow growth and recruitment.

The proposed activities for this CESU include the two years of restoration implementation, and the associated monitoring for adaptive management opportunities.