Project Summary
Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Active restoration of Riparian Willows after Fire in Rocky Mountain National Park, Colorado

Discipline: Natural
Type of Project: Research/Technical Assistance
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Effective Dates: 7/15/2013 – 5/31/2017
Funding Amount: $103,622 [FY14: $29,367; FY13: $74,255]

Investigators and Agency Representative:
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Project Abstract: We initiated research in the summer of 2013, following the Fern Lake Fire, to determine the effects of fire on willows in MP and to develop methods for establishing willows. Fire had a dramatic effect on willows, with 91% of the 1408 randomly sampled individuals exhibiting 100% canopy loss. Forty five percent of sampled willows resprouted from the base. Willow stakes planted by volunteers in 2011 burned in the fire also exhibited approximately 45% resprouting rates. However, resprouting willows had high intensity browsing in both summer and winter. Burned and resprouting willows inside exclosures will have a greater chance of survival. The fire also affected willow seed production in Moraine Park and resulted in extremely low seed rain density. Active management is needed to restore the post-fire willow community in Moraine Park. The goal of this project is to reestablish willows throughout Moraine Park in areas burned by the Fern Lake Fire, based on our research on willow restoration techniques.

Seeding for New Willow Establishment:

A number of coincident biotic and environmental processes are required for successful willow seed germination and seedling establishment. First, the dispersal of viable seeds is essential. Fenced willows should produce sufficient seed, however due to the Fern Lake fire there was extremely low seed rain the first summer post-fire. The establishment of a large exclosure in the western end of Moraine Park will allow resprouting willows to eventually produce seed, in the interim, active seeding of willows in exclosures throughout Moraine Park is a viable option.

We had success in the summer of 2013 dispersing seed that germinated and produced seedlings on a small scale, utilizing bare soil created by the Fern Lake Fire. Soil moisture was an important factor in the success of willow seed germination and seedling initial survival, therefore we will identity suitable locations inside exclosures along the Big Thompson River. If suitable bare sites are not located, we will manually disturb ground. Manual disturbance will include turning the soil to depth of 10 cm and raking the soil surface. Mature catkins of *S. monticola*, *S. planifolia*, and *S. geyeriana* will be collected from Endo Valley and Hallowell Park in late May/early June 2015 and seeds will be pressed into wet soil. We will water the seeds at the onset of planting and monitor their success throughout the growing season.

Willow Staking for New Willow Establishment:

Willow stakes of four species were experimentally planted along hydrologic gradients in Moraine Park in summer 2013. Survival data collected in 2013 and 2014 will be used to inform broader scale planting of stakes inside exclosures in Moraine Park in 2015. We will monitor the survival of planted willow stakes through the growing season of 2015 and in summer 2016.

Groundwater Monitoring:

The depth to groundwater throughout the growing season is an important factor in the success of willow stakes. We will measure depth to groundwater biweekly during the growing season at locations near willow staking and seeding plots and sites. We will use existing groundwater monitoring wells in MP.

Outcomes with Completion Dates:
Final Report Due – April 15, 2017

Keywords: riparian willow, restoration, Rocky Mountain National Park, Colorado State University