RMHRC 2024 Scholarship Final Report

Recipient: Connor Mertz

Project Title: RESTORATION PRIORITIZATION OF UPPER COLORADO TRIBUTARIES IN THE KAWUNEECHE VALLEY, ROCKY MOUNTAIN NATIONAL PARK, CO

Abstract:

Collapse of tall willow habitat along the Upper Colorado River, Rocky Mountain National Park, CO has led to the loss of beaver and channel morphologic change. A diverse stakeholder group is pursuing restoration on Upper Colorado tributaries to improve willow habitat and downstream water quality. Utilizing field data, remote sensing, and flow inundation modeling, I investigate the processes driving channel morphology, levels of floodplain connectivity, and the extent of historical beaver activity. I develop and apply a ranking framework of geomorphic condition for restoration based on channel, floodplain, and catchment characteristics of three study sites: Upper Baker Creek, Lower Baker Creek, and Onahu Creek. Channel assessments indicate that Onahu Creek has the steepest gradient, coarsest bed material, and exhibited the greatest in-channel beaver dam density in 1990. Bankfull cross-sectional areas differ significantly between sites ($p < 0.001$), a product of varying channel widths. Flow inundation modeling indicates that Upper Baker has the highest degree of floodplain connectivity with a 10.3x increase in surface water extent between observed base and peak flows, relative to a 5.2x increase at Lower Baker, and a 1.9x increase at Onahu. Based on my findings, process-based restoration is a suitable technique to reconnect the channel and floodplain and promote willow growth, but the degree of restoration effort required at each site varies. Onahu Creek has the poorest relative geomorphic condition with the greatest potential for floodplain reconnection through restoration. Upper and Lower Baker Creeks have good geomorphic condition which may benefit from less intervention to achieve the greatest river ecosystem benefit.

Scholarship use and key accomplishments:

I primarily used this scholarship to support my field efforts for the 2024 season. A large part of my geomorphic ranking relied on field-based observations of channel, floodplain, and catchment characteristics. This involved weekly overnight trips to Rocky Mountain National Park with a field assistant from June-August 2024. While I was fortunate enough to have funding support to pay a field assistant, those funds were limited to small monthly stipend. RMHRC funds were used to cover meals for the two of us as well as other travel-related expenses, including travel reimbursement for my field assistant. I am deeply grateful for funding support from the Rocky Mountain Hydrologic Research Center as it allowed me to conduct a more robust field campaign for my research and fairly compensate a hard-working undergraduate field assistant.

I successfully defensed my thesis on May 14th, 2025 and am currently revising my thesis based on committee feedback for final submission. Revisions for publication will be conducted this summer. Through this research, I developed a geomorphic-based prioritization for restoration prioritization of three tributary reaches of the Upper Colorado River: Upper Baker, Lower Baker, and Onahu Creeks. I found that the channel, floodplain, and catchment-scale geomorphic conditions differed between the three sites, which has implications for the type and level of restoration intervention required to meet project goals. Overall, Upper Baker Creek exhibited the best contemporary geomorphic condition to promote tall willow recovery, followed by Lower Baker and Onahu Creeks. In the context of restoration, Upper Baker and Lower Baker Creeks require a lower degree of restoration work to create conditions for tall willow recovery. Ungulate exclosure fencing is potentially a suitable restoration approach. Under contemporary conditions, implementation of more involved restoration work (low-tech structures) at Onahu Creek is recommended to increase channel-floodplain connectivity and raise groundwater levels to promote tall willow growth. These findings can be incorporated into the KVRC's restoration goals and project resources to inform long-term recovery of tall-willow communities in the Kawuneeche Valley. Implementing the results of this research through restoration will help to expose visitors to a more diverse, complex river ecosystem that reflects historical ecologic conditions in RMNP and help fill a gap in the channel restoration literature that prioritizes geomorphic potential.

Thanks again for the funding support!

Successful defense on May 14th, 2025