

STREAM AND WETLAND RESTORATION OPPORTUNITIES: KAWUNEECHE VALLEY GRAND COUNTY, COLORADO

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PROJECT INTRODUCTION

This project is the initial phase of a long-term watershed scale restoration to improve ecological function and water quality throughout the Kawuneeche Valley. Streams and wetlands in the headwaters of the North Fork of the Colorado River have been degraded by land use, ecological stressors, and the East Troublesome Fire. In the early 1900's ranchers cleared willows from large areas of the valley and constructed ditches to drain some wetlands and irrigate others. These alterations changed the patterns of water availability across much of the landscape. Additionally, beavers have been nearly extirpated from the landscape, but evidence of their historical role as ecosystem engineers remains visible in areas of Kawuneeche Valley within Rocky Mountain National Park. The Grand Ditch constructed beginning in the 1880's intercepts water destined for the Colorado River and diverts it east of the continental divide resulting in reduced flows of the upper Colorado River. The Grand Ditch periodically breaches and sends debris flows into the Colorado River creating sedimentation issues. Heavy ungulate browsing has also altered the watershed, converting tall willow ecosystems to short willow ecosystems (Figure 1). The cumulative impacts of these stressors result in sediment and nutrient inputs to Shadow Mountain Reservoir and threaten water supply operations.



Figure 1. Kawuneeche valley in 1995 (left) and the same location in 2018 (center). Looking down the fence line of the Timber Creek enclosure in 2021 (right). Willow decline of this scale has occurred throughout the valley. Left and center photos by David Cooper. Right photo by Collin Shuman.

INTERNSHIP GOALS

My personal goals for the internship were:

1. Use mapping software to create maps of land modifications that may affect hydrology (ArcPro and Avenza)
2. Learn about beaver-related stream restoration
3. Learn to identify common wetland plant species
4. Avoid altercations with moose

EDUCATION CONNECTION

I am currently pursuing a degree in Restoration Ecology at CSU. During my studies I have learned many concepts concerning ecological restoration and my involvement in this project allowed me to put that knowledge to work and play a role in an important restoration project.

WHAT I DID

I worked to identify unnatural ground-surface modifications that potentially affect the hydrology of the Kawuneeche Valley landscape. Modifications of interest included current/relic irrigation features (canals, ditches, headgates), levees, berms, and roadways. I used aerial imagery to identify features and digitized those features in ArcGIS. Maps of modifications that I generated in ArcGIS were exported to Avenza which I then used to locate features in my area of interest and ground verify them. I also collected attribute data such as canal/ditch depth, canal/ditch water flow direction, and road elevation characteristics. Once features were ground verified, I edited my ArcGIS map to reflect the verified modifications. Additionally, I assisted with willow data collection (species, size, and location) around willow enclosures in Rocky Mountain National Park and assisted with water quality sampling of the Colorado River and its tributaries in Kawuneeche Valley (flow volume, nutrient, and sediment sampling).

Figure 2-3. Unnatural modifications: Kawuneeche Valley

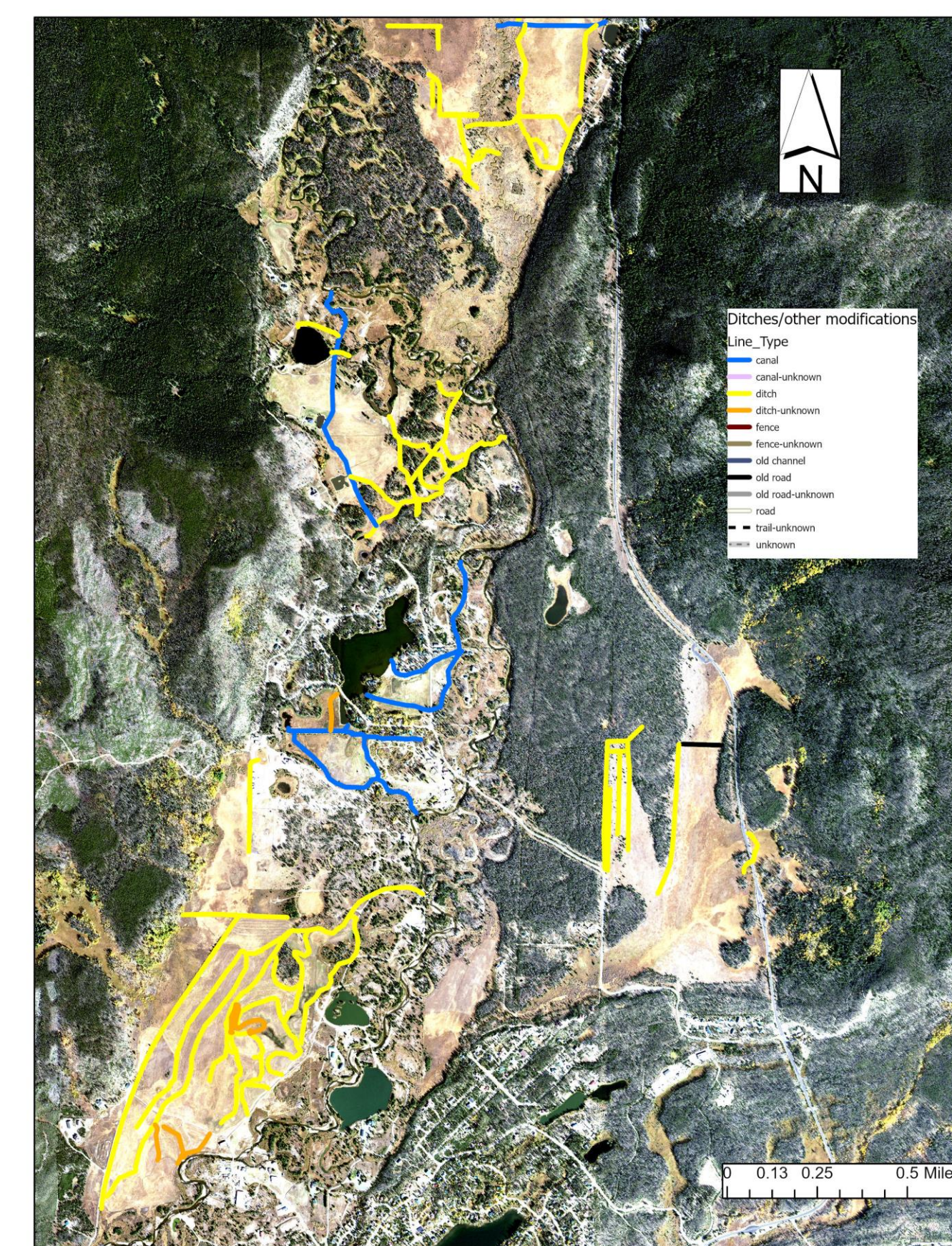


Figure 2. Unnatural modifications north of Grand Lake, Colorado. Maps created by Collin Shuman.

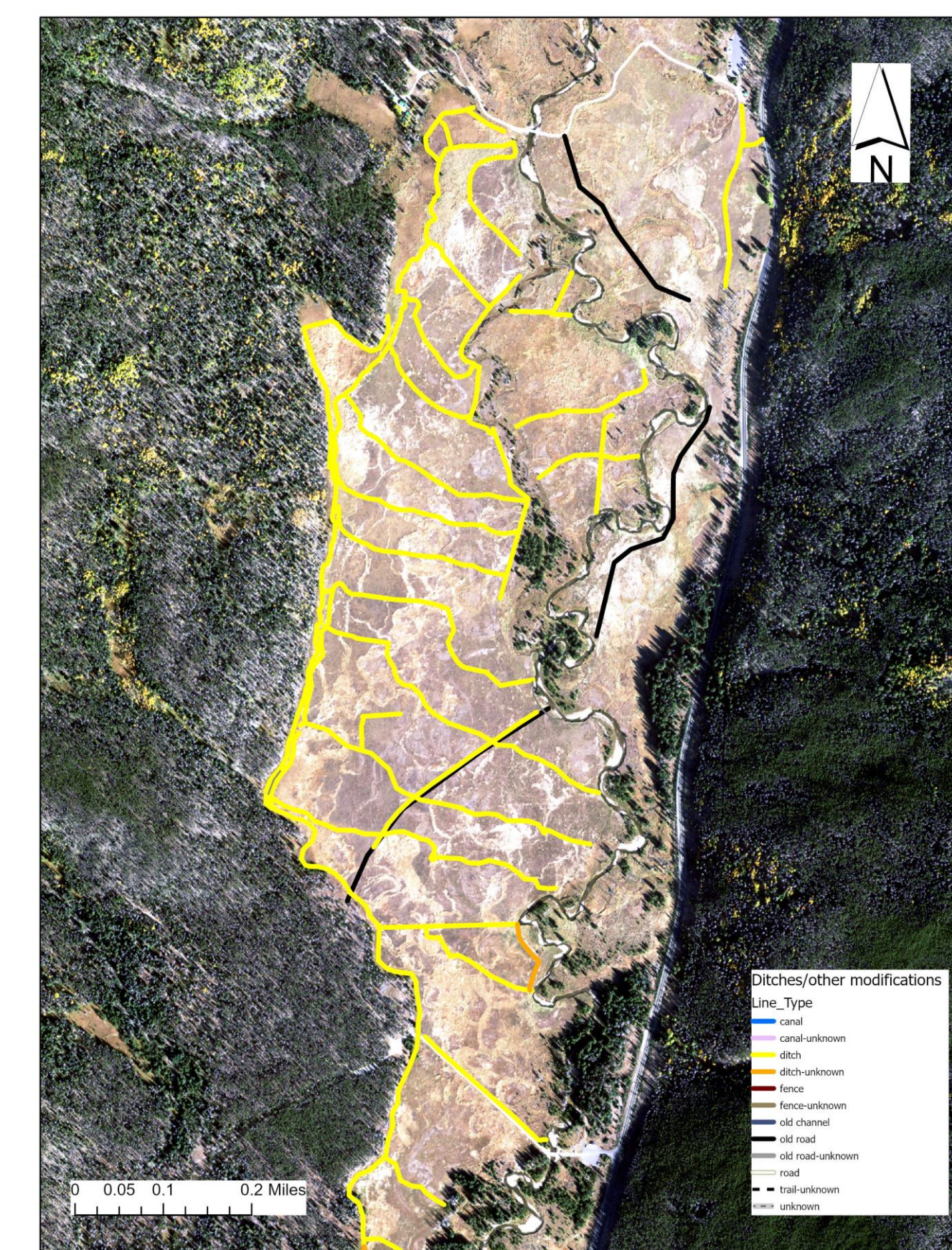
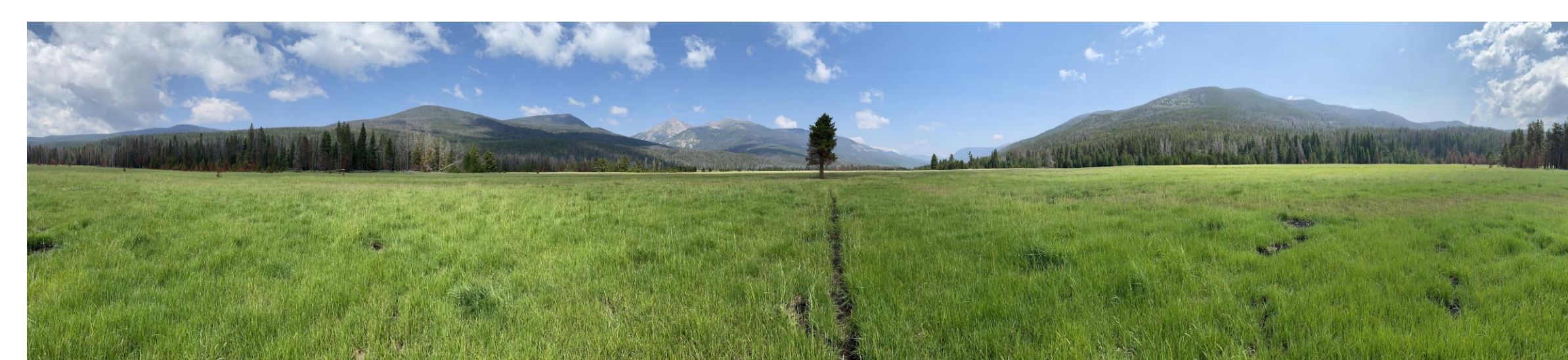


Figure 3. Unnatural modifications at the Holzwarth Historic Site, Rocky Mountain National Park, Colorado.

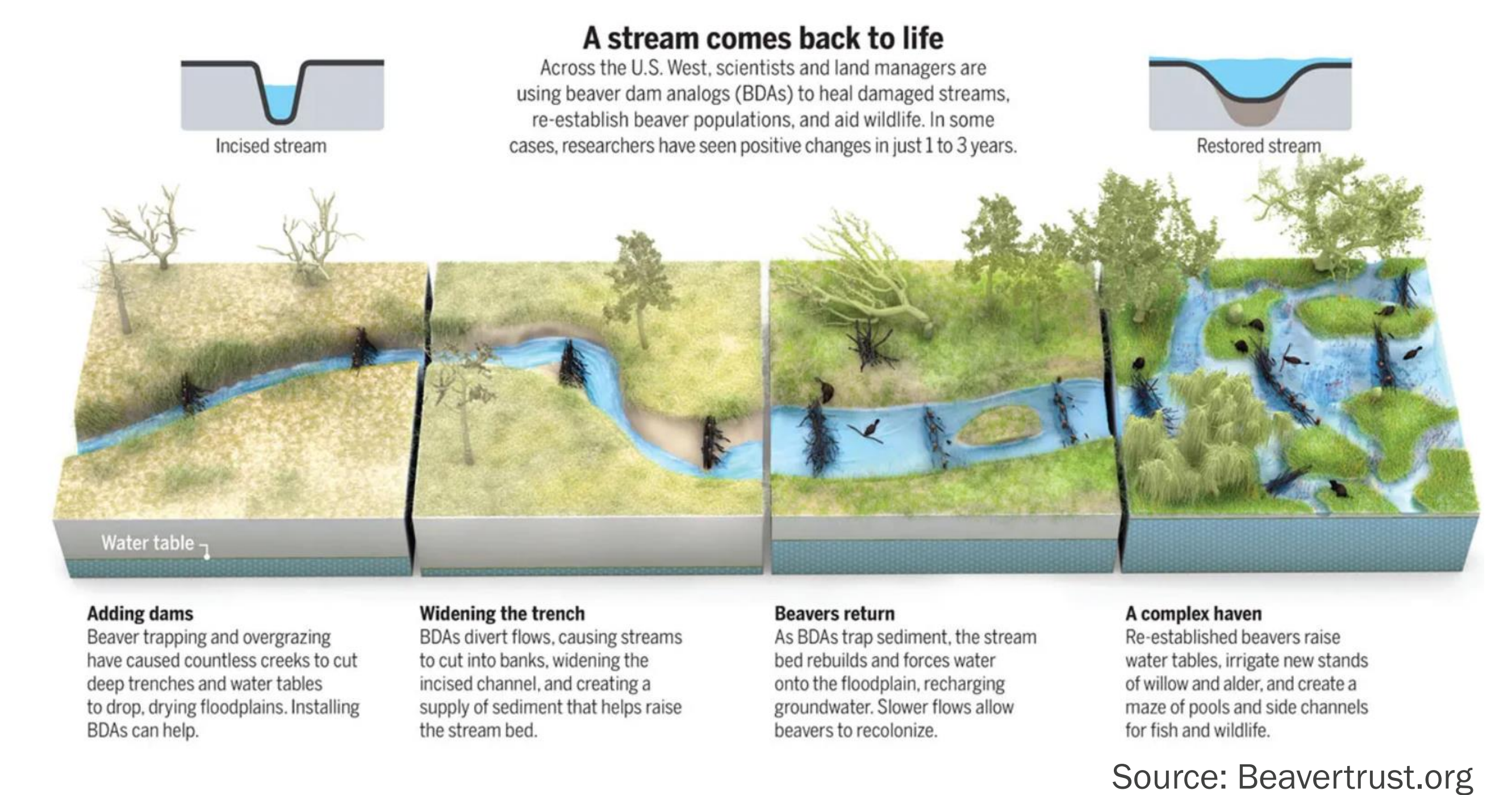


Looking north in Kawuneeche Valley near Coyote Valley trail. Photo by Collin Shuman

WHAT I LEARNED

- I learned about beaver-related stream restoration (Figure 4). If we can get beavers back on the landscape, they will do most of the restoration work. But to sustain beavers in the valley there must be adequate willows present for food and dam/lodge building material. To encourage willows recovery, we need to address the lowered water table and intense herbivory pressure. Raising the water table can be achieved by adding beaver dam analogs (BDAs) to the affected streams. Mitigating herbivory is the major challenge due to the lack of apex predators in the valley. Adding additional exclosures to protect willows from ungulates is an option but is not always feasible due to cost and negative effect on aesthetics.
- I learned to identify seven willow species commonly found in Kawuneeche Valley.
- I gained experience working with various stakeholders including Northern Water and private landowners.
- I further developed my abilities to use mapping software (ArcGIS and Avenza).
- I had the opportunity to connect with current graduate students and learn about their research as well as their various paths to graduate school.

Figure 4. Beaver Dam Analog (BDAs) for stream restoration



NEXT STEPS

The next phase of this project is to evaluate information collected during the assessment phase. It's possible that installation of beaver dam analogs could occur next summer. Monitoring plots would be installed to track the vegetation response to the elevated water table. Continuous assessment of water quality on the Colorado River and its tributaries is necessary to identify additional areas of opportunity to improve ecological function that affects water quality.