

POST-FIRE SEDIMENT RETENTION TO ENHANCE WATERSHED RESILIENCE TO WILDFIRE

LARIMER COUNTY

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PROJECT INTRODUCTION

Colorado and other semi-arid states suffer from recurrent wildfires which affect both human infrastructure and the environment

- As climate change progresses, CO citizens will experience larger and more severe fires at a greater frequency
- Sediment and burned organic matter that enter waterways following wildfire are costly to remove and often involve chemical inputs
- Beavers can drastically change landscapes by creating retention areas, generating marshy complexes in floodplains, and reducing erosion
- Beaver ponds play an important role in sediment retention and may increase watershed resilience and improve water quality following fires



INTERNSHIP GOALS

Project Goals

- Evaluate the effect of beaver ponds on sediment retention by comparing sediment *composition* in burned VS. unburned ponds
- Evaluate the effect of beaver ponds on sediment retention by comparing sediment *volume* in burned VS. unburned ponds
- Evaluate the effect of beaver ponds on sediment retention by comparing sediment *volume/composition* in on VS. off-channel ponds

Personal Goals

- Obtain practical field work skills and experience with a variety of tools, including GPS and ArcGIS
- Explore post-fire landscapes and wetland ecosystems

HOW DOES THIS APPLY TO YOUR EDUCATION



- Ecosystem Science and Sustainability major with a GIS minor
- Hoping to participate in research that provides tangible solution strategies
- This internship provided both useful field experience as well as an introduction to data analysis strategies

WHAT YOU DID

Assess and compare beaver pond sediment volume and composition. Methods include the following:

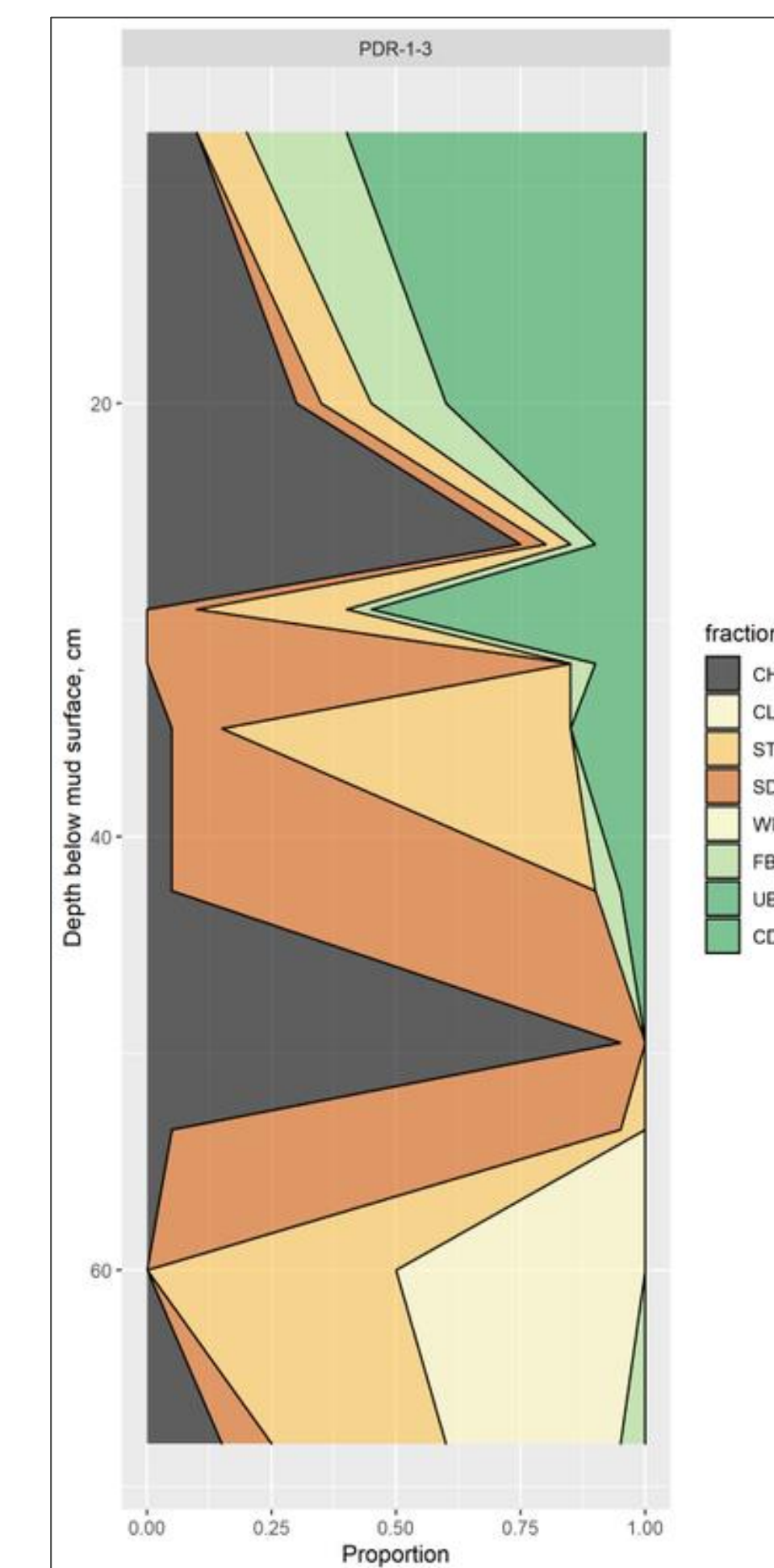
- Choice of ideal sites** through aerial imagery and ArcGIS analysis including
 - Digitization of ponds for surface area
 - Selection based on fire perimeters, burn severity, and elevation
 - Collection of important site information including latitude, longitude, and elevation
- Topographic surveying** of the site using the RTK Topcon for pond edge, inflow/outflow, and dam top/base information
- Cross section surveying** and probing for water height and sediment depth
- Collection of core samples** (2 per pond) for sediment volume and composition
- Core extrusion and processing** including
 - Visual appraisal of composition
 - Microscopic appraisal of relative proportions of sediment type, including charcoal
 - Distinguishing stratigraphic layers
 - Bagging and wrapping cores for archival
- Data digitization and ArcGIS analysis** for visualization of cross sections/points with sediment depths



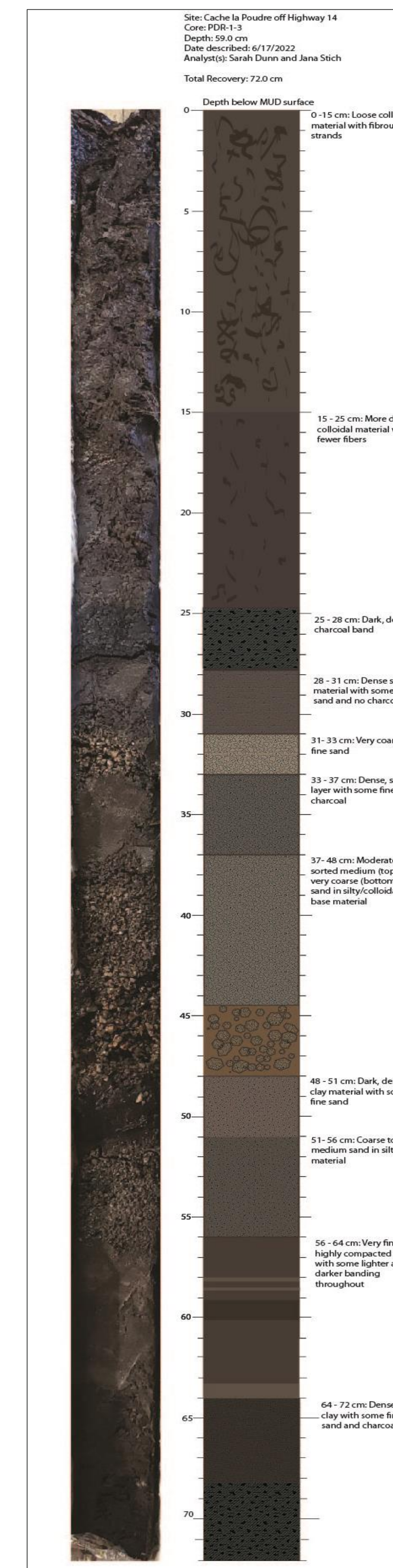
Core sample taken from a large, active beaver pond off Highway 14



Probing for sediment depth at Swamp Creek



(Above, left) Graphed representation of the proportion of sediment components in a core sample
(Above, right) Illustrated representation of a core sample



WHAT YOU LEARNED

Beaver ponds have shown a potential to increase sediment storage capacity by

- Directly preventing sediments from moving downstream and
- Raising the water table and flooding nearby areas which also can function as sediment storage (these areas would otherwise not be immersed except in rare high flows)

Preliminary Project Results

- Sediment volume is greater in burned ponds than in unburned ponds
- Samples from unburned ponds tend to have greater concentrations of colloidal and intact organic material (plant fibers, grass, etc.)
- Some burned ponds have higher concentrations of incinerated materials (wood chunks in particular) relative to unburned ponds

Discussion

- Beaver ponds may have the capacity to store large amounts of burned material, keeping sediment, carbon, and nitrates from moving downstream and negatively affecting water infrastructure and ecosystems
- Results from this study may indicate that Simulated Beaver Structures (SBSs) could play a valuable role in fire and carbon management practices
- SBSs may potentially lessen the environmental impacts of wildfires and reduce water sanitation costs.

NEXT STEPS

Next steps

- Full analysis of data collected in the 2022 summer
- Incorporate streamflow and discharge rates as well as pond age to determine approximate deposition rates

Future directions

- Determine the effect of beaver dams on sediment retention in other natural disasters