

MONITORING THE WATER QUALITY IN THE CACHE LA POUFRE RIVER WATERSHED

PROJECT INTRODUCTION

The Cache la Poudre (CLP) River provides roughly 50% of water to the city of Fort Collins as well as for many other front range communities. It provides water for agriculture and industry and provides a source of recreation and culture for many along its pathway. The CLP River Water Quality and River Health Monitoring Network examines water quality and stream health to ensure these needs are met.

The project is overseen by the Radical Open Science Syndicate (ROSSyndicate) at Colorado State University in collaboration with the City of Fort Collins' Watershed Protection Program (WPP) and the U.S. Forest Service's Biogeochemistry Lab at the Rocky Mountain Research Station (RMRS).

The study characterizes changes in the Poudre River watershed's biogeochemistry. The hope is to determine how wildfire, agricultural runoff and other return flows impact the overall health of the river and watershed and assist in long term planning for the river's conservation and restoration.

INTERNSHIP GOALS

The goals of the internship are:

1. Maintain an existing long term water quality grab sample dataset
2. Maintain in-stream water quality sensors to ensure high quality data.
3. Prepare data to be input into stream metabolism and nutrient delivery models.

HOW DOES THIS APPLY TO YOUR EDUCATION

I am studying Water Resource Management and Water Quality with the goal of working in the field of Source Water Monitoring and Protection for a city, county, or state in the near future. The laboratory processing skills, technical field skills, and interactions with professionals directly relate to my education and professional interests.

WHAT YOU DID

Methods used to collect and maintain water quality datasets:

- Daily/weekly in-stream sensor and sonde monitoring and maintenance
- Weekly water sample collection at select sites throughout the watershed (top of Poudre Canyon to Timnath)
- Prepare water samples for chemical analysis in the biogeochemistry lab at RMRS
- QA/QC and data cleaning of water quality data
- Analyze select water quality parameters to assess watershed health

Data Cleaning and QA/QC:

1. Load a specific data set (location and parameter) into R for viewing and analysis
2. Cross-reference site visit logs, calibration logs, similar site data, and similar chemical parameter data to determine if the data is correct.
3. If all data looks correct, approve it.
4. If data looks incorrect, or there are outliers, determine the issue based on cross references. Flag the data appropriately (e.g. sonde burial, sensor malfunction, sonde out of water), decide if it should be excluded, and approve the finalized data set.

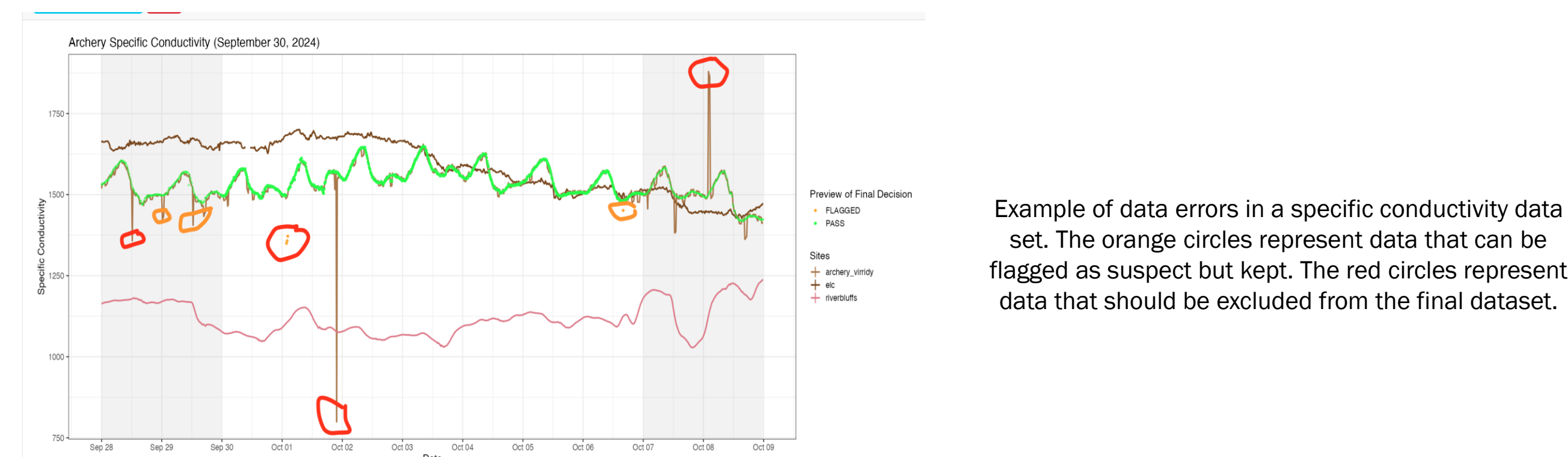
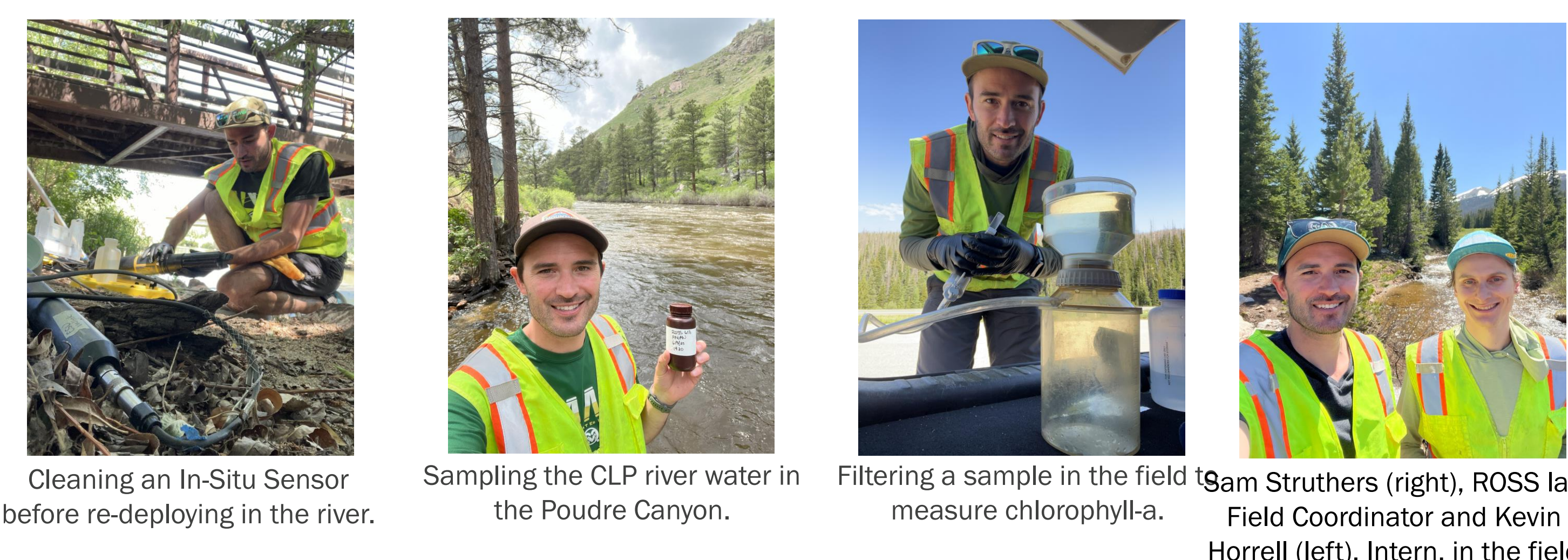


Figure 1. Images performing field work.



WHAT YOU LEARNED

1. Collaboration

The City of Fort Collins works with multiple entities to ensure high quality water and watershed resilience for the future. This could not be accomplished without collaboration with other cities (Greely, Loveland, etc.), conservation groups, ditch companies, and CSU. The ROSSyndicate plays a vital role in that we provide trusted, high-quality data for the city. This data is not only available, but we provide context and analysis of the data. In other words, the ROSSyndicate has built solid trust with managers at the city and provide them with water quality data and what it means. In addition, we have provided prototype data viewing tools and forecasting tools which are invaluable to the city's water treatment efforts and water management decision-making.

2. Importance of Data QA/QC

Raw data must be confirmed before it can be utilized and input into forecasting tools and viewing platforms. Data issues or errors need to be evaluated, given context, and potentially extracted from cleaned and finalized data sets. A buried sensor will not return useful data and therefore needs to be "cleaned". A finalized dataset is trusted by multiple end users for different purposes. These users trust us to provide this data for their own management needs and model-building needs.

3. Importance of Networking

Environmental Science is multidisciplinary and requires collaboration to tackle the most pressing challenges such as climate change and water supply. Building relationships across multiple agencies and disciplines connects me with professionals with different expertise, policymakers, community leaders creating opportunities for collaboration and funding. These connections can lead to career opportunities, mentorship, and access to data and other resources.

4. Importance of having Purpose and Vision in Work

Passion for my work has provided me with motivation and direction in a field where progress can be slow and challenges overwhelming. Purpose gives me the ability to prioritize, make decisions, and communicate my goals to others. Purpose also gives me the fortitude to persist through setbacks and maintain enthusiasm for work. Finally, purpose helps me ensure my contributions are lasting rather than just advancing my career.

NEXT STEPS

1. Create a public facing dashboard of real-time water quality indicators to inform residents and visitors of the CLP.
2. Use the real-time data to inform the treatment of the CLP river water.
3. Develop a to estimate in-stream organic carbon using live sensor data.
4. Expand the real-time data collection to include additional parameters of interest to utility operators and community members.