METROPOLITAN STATE UNIVERSITY OF DENVER

NATIONAL FISH AND WILDLIFE FOUNDATION NFWF

Five Star & Urban Waters Restoration Program

Investigation of Degraded Sites and Riparian Restoration Design along the South Platte River in the Denver Metro area through Engagement of Underserved Populations

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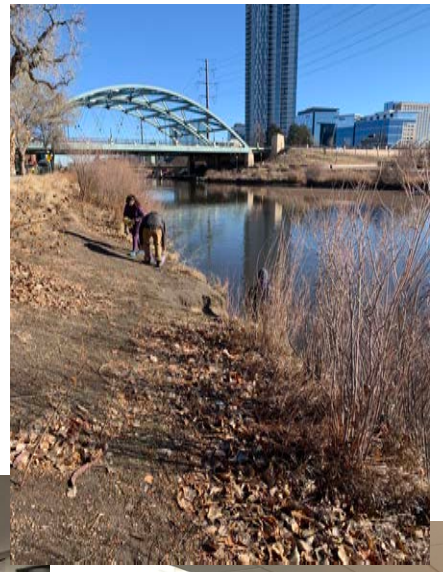
Co-PI: Sarah Schliemann

Thank you to our partners!

Project Goal: To characterize water quality (nutrients, pH, temperature, heavy metals) in the South Platte River through the Denver Metro Area.

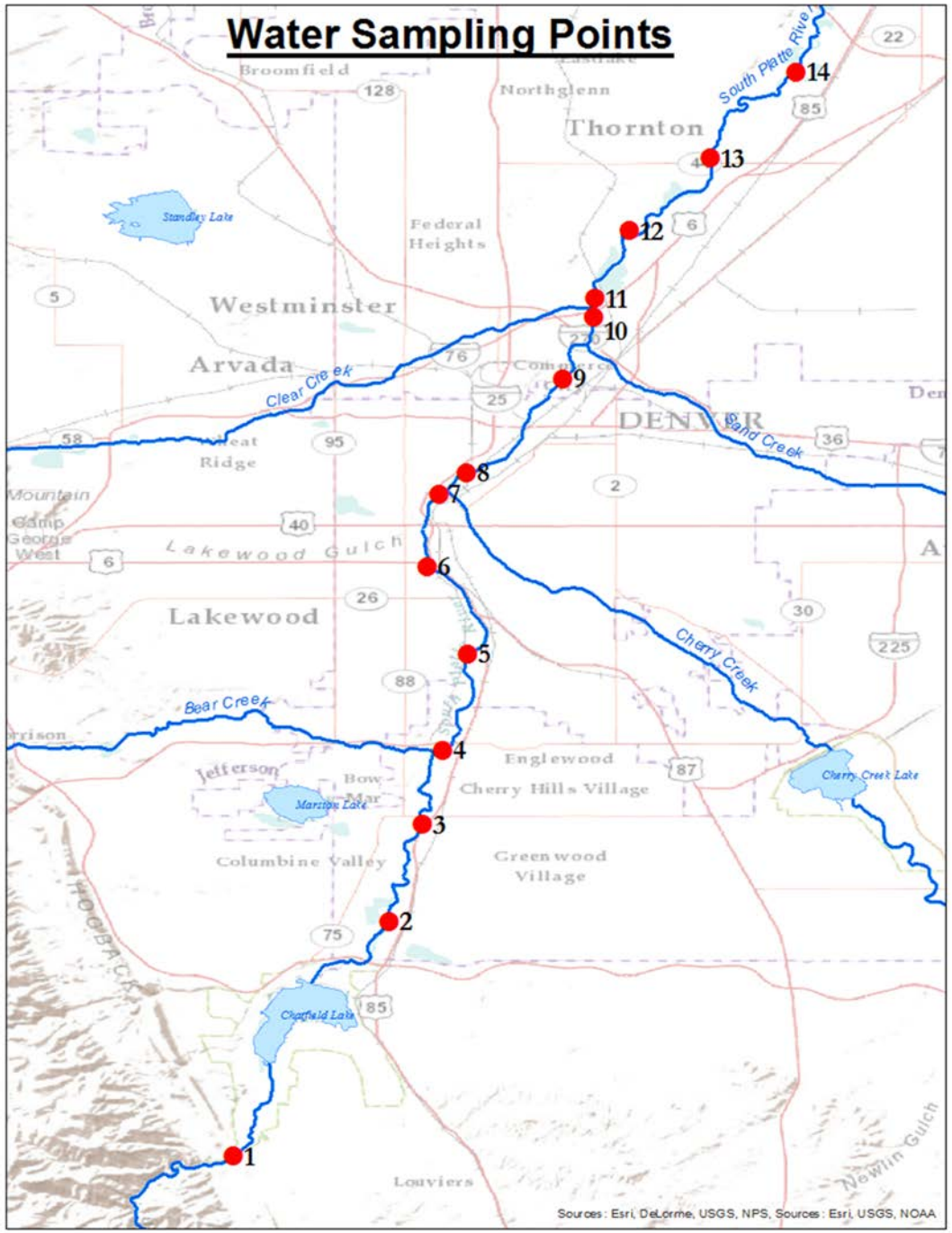
Three Pronged Approach:

- Undergraduate Water Research
- Water Quality Course
- Riparian Restoration Design Showcase

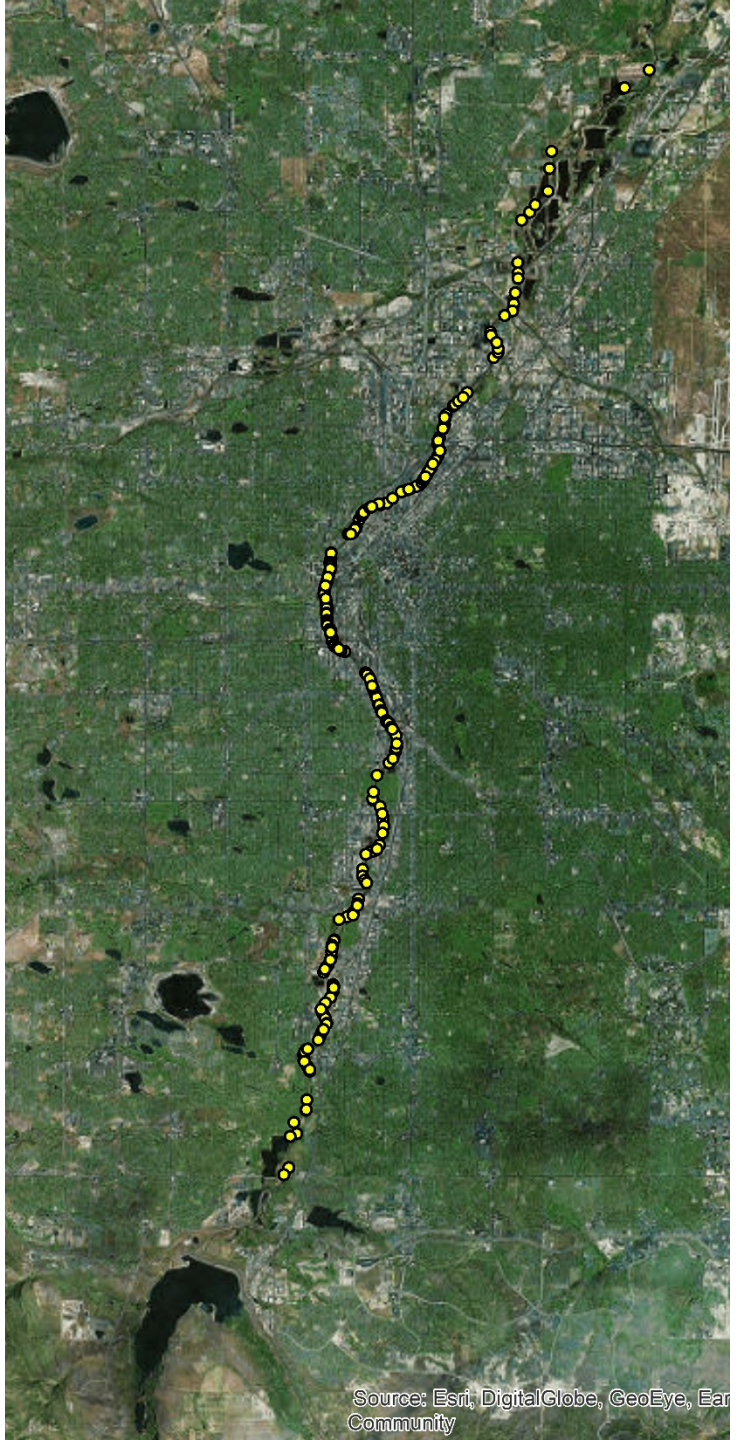


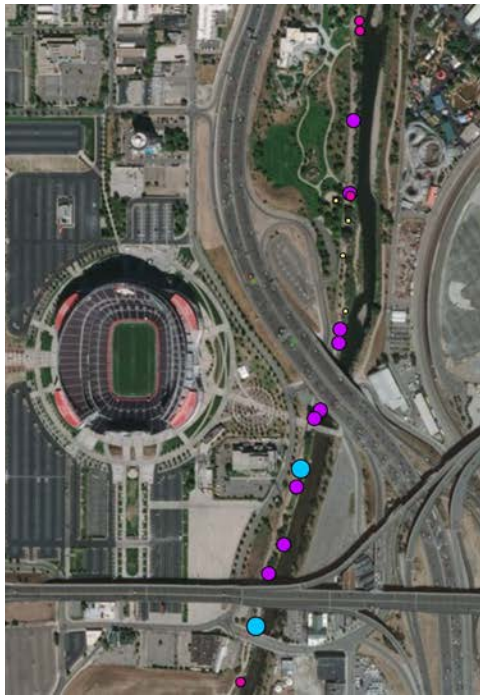
Water Quality Sampling

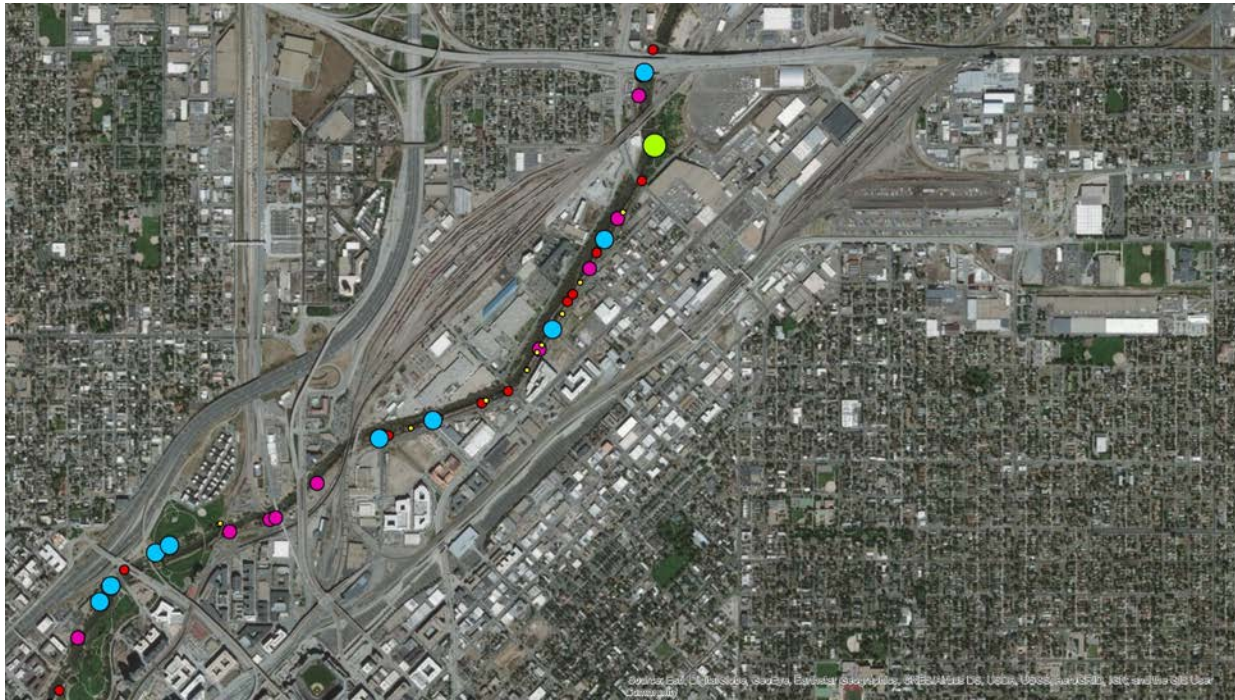
- Sample water every 3 miles through
  the metro area
- Test for
  - Nutrients (PO_4, NH_3, NO_3)
  - pH, DO, Temperature
  - Heavy metals (Pb, Hg, Cd, etc.)
  - Chlorine
  - Biochemical Oxygen Demand



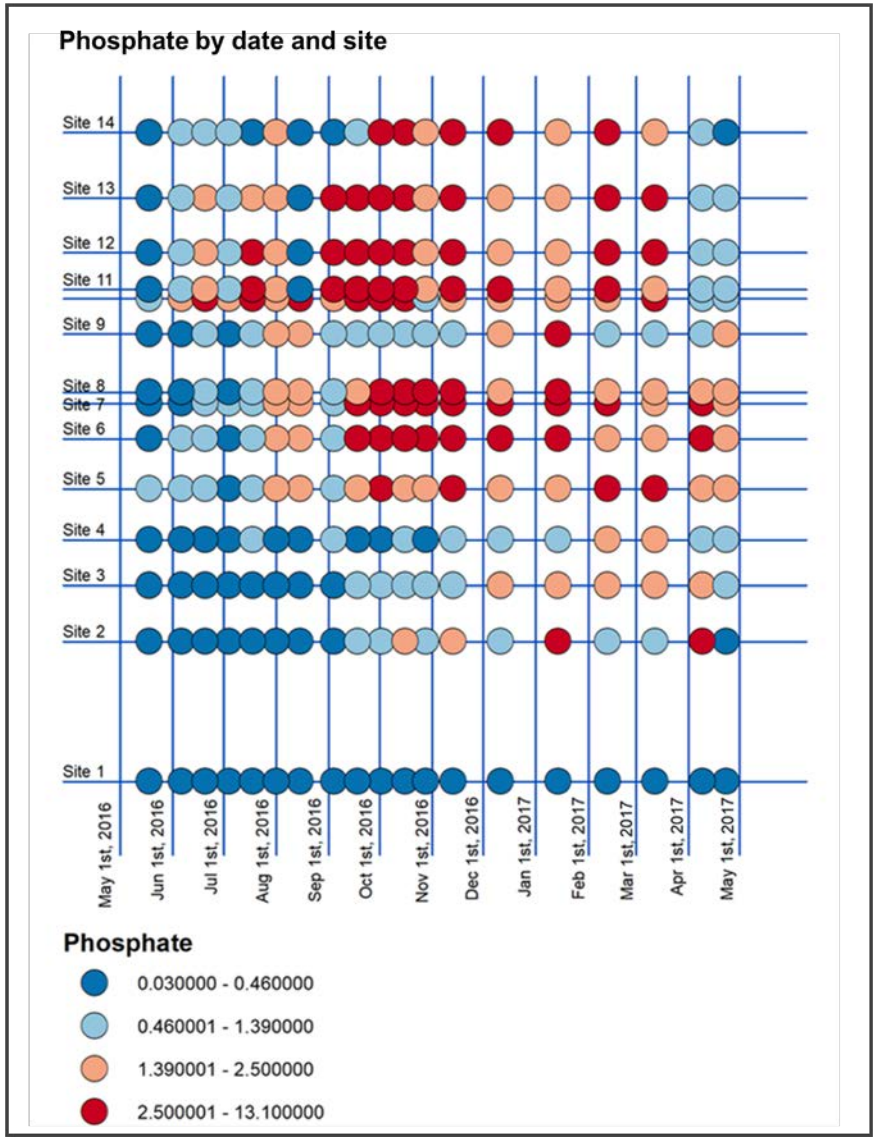
Spatial Mapping: Point Source Discharges

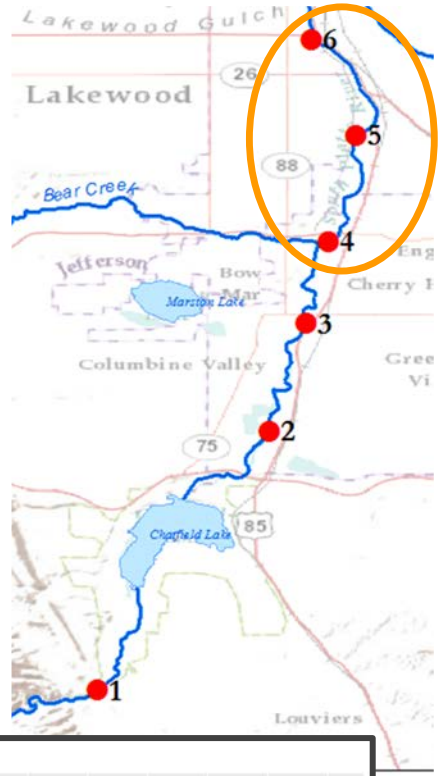


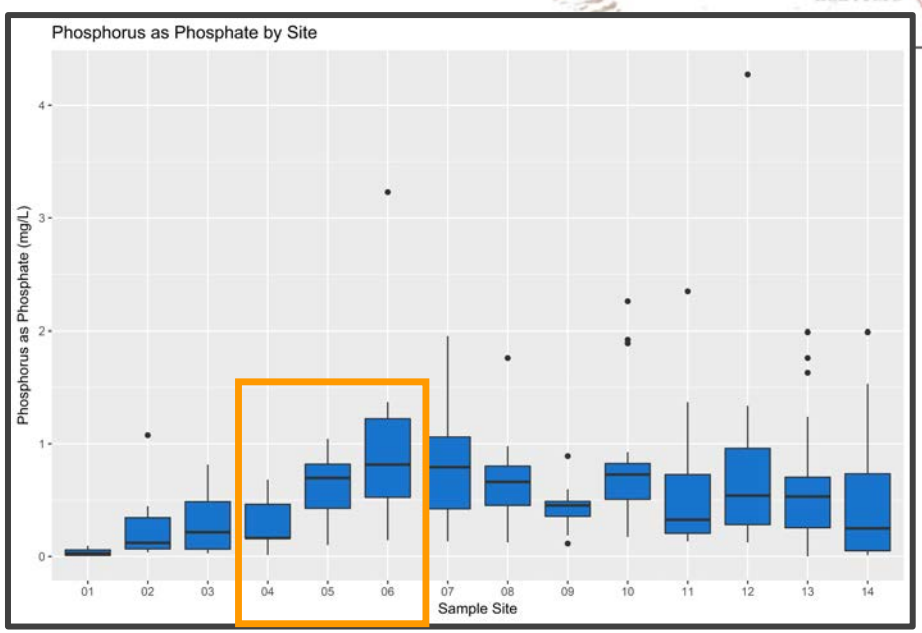




Data Analysis – Regression Modeling and Geospatial Analysis “Hot Spot 1”

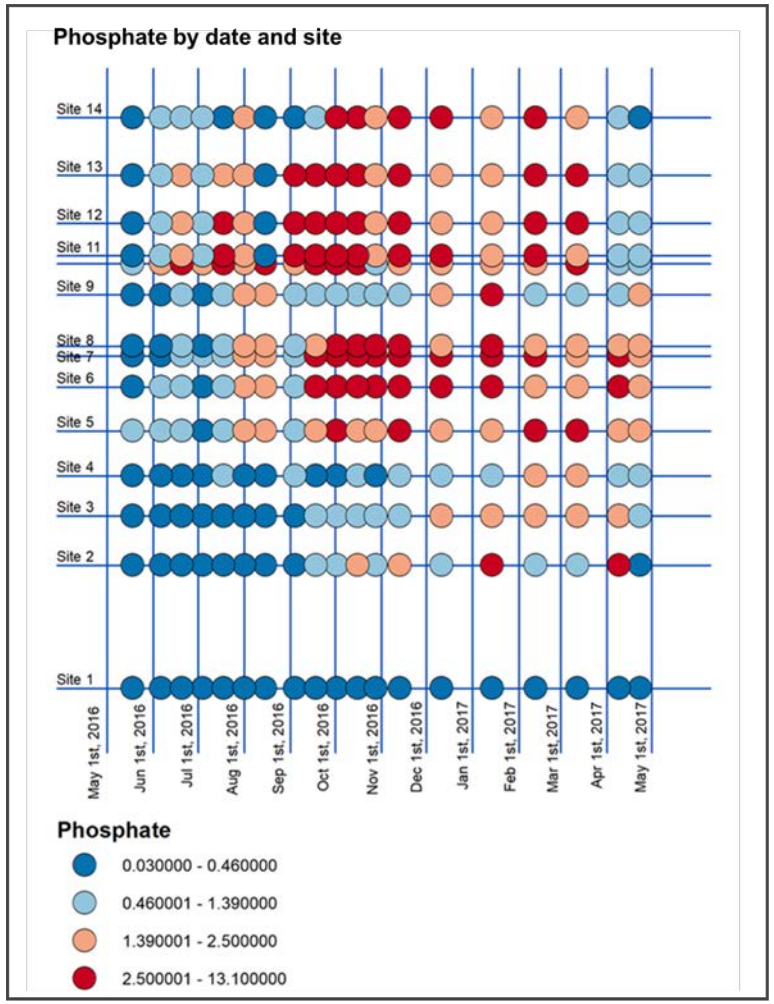


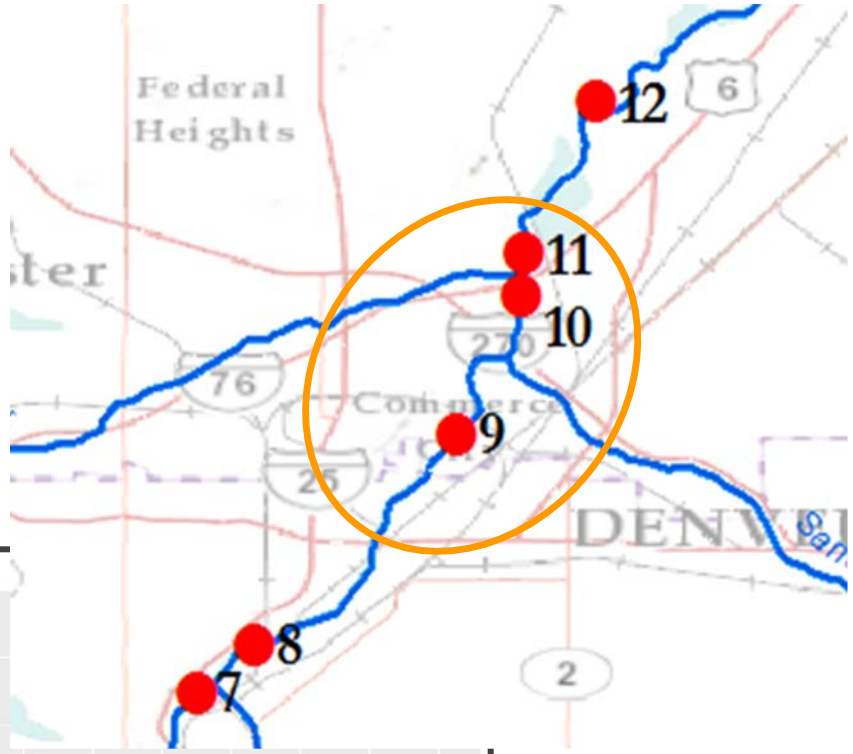


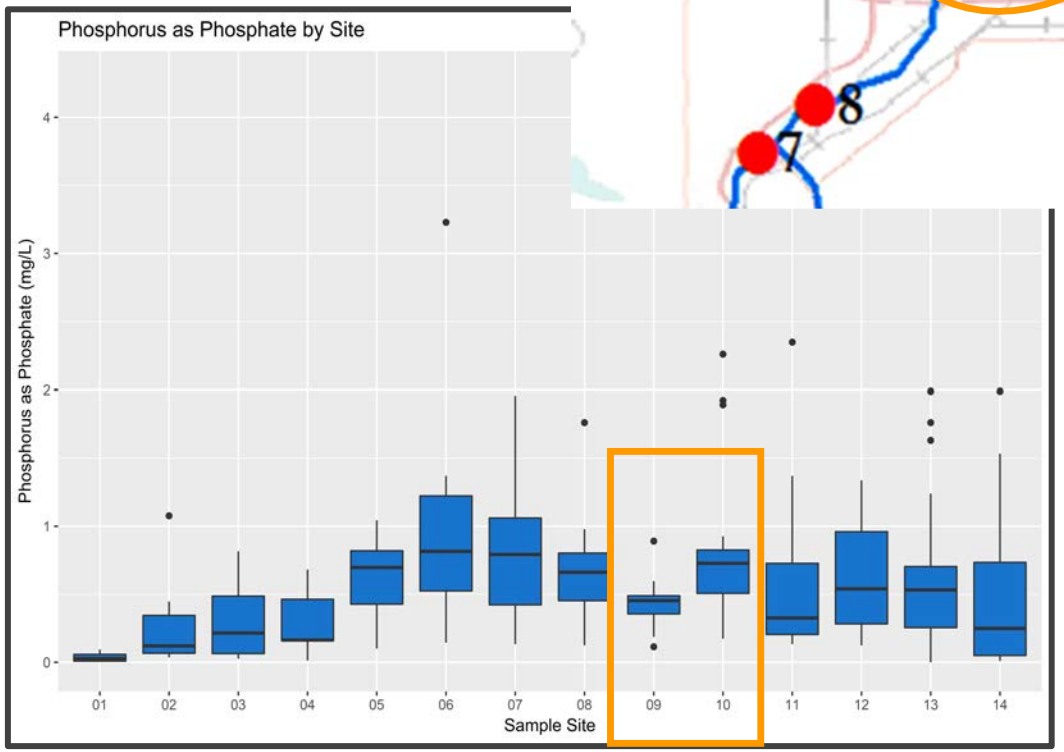


Data Analysis – Land Use Impacts of "Hot Spot 1"

Data Analysis – Regression Modeling and Geospatial Analysis "Hot Spot 2"



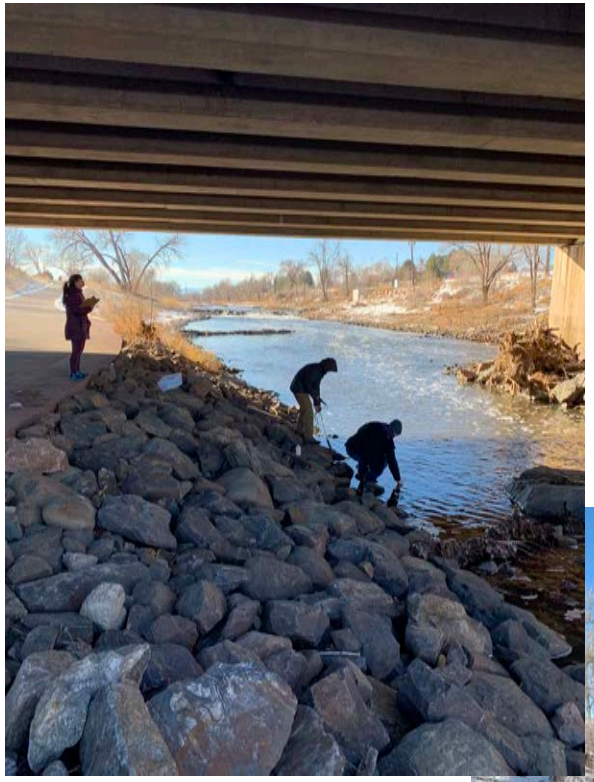


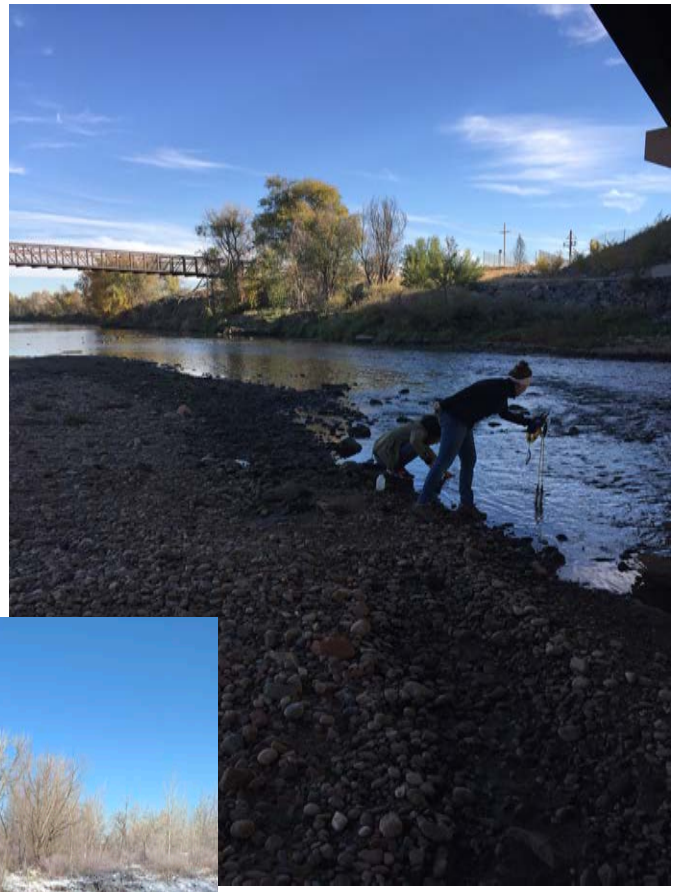


Data Analysis – Regression Modeling and Geospatial Analysis “Hot Spot 2”

Student Impact

- 3 Years (Summer 2016 – Summer 2019)
- 25+ Student Researchers
- 4 Parallel Studies
- 2500+ Student Research Hours





Water Course: GEG 1910 – Global Water Concerns

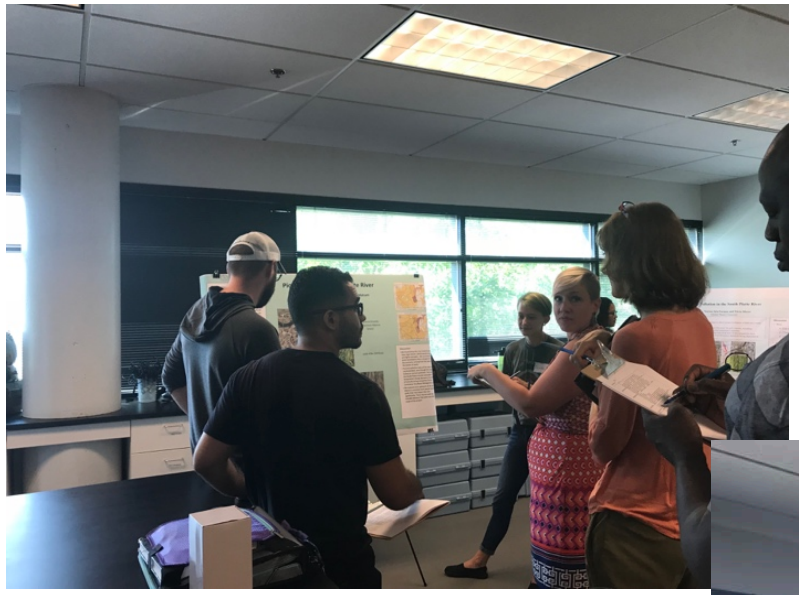
- 9 Student Scholarships (6 High School, 1 CCD, 2 MSU Denver)
- 20 Students Total
- General Studies Credit
- 4 Field Trips
- 2 Guest Speakers
- Riparian Restoration Design Showcase

Day	Date	Topic	Reading	Activity
T	5-Jun	Syllabus and Course Overview; Water Budget	Ch. 1 and 2	
R	7-Jun	Water Distribution and History	Ch. 1 and 2	Global water history in groups
T	12-Jun	The Hydrologic Cycle, Climate, and Weather	Ch. 3	Global flooding events/ clean-up efforts
R	14-Jun	Water Quality/ Platte River Water Quality	Ch. 4	Cherry Creek Water Quality
T	19-Jun	FIELD TRIP: Bear Creek Park (5650 W Hamilton Place)	Begin reading Ch. 7, 8 and 9	
R	21-Jun	Guest Speaker: CDPHE		Global Project: How have other countries dealt with water pollution and clean-up?
T	26-Jun	FIELD TRIP: Carson Nature Center		
R	28-Jun	Lakes, Rivers, and Wetlands; MIDTERM (11-12:15)	Ch. 7, 8, and 9	
T	3-Jul	Dams and Reservoirs	Ch. 10	Global Water Project: Dams and Impacts
R	5-Jul	FIELD TRIP: Denver Botanic Gardens		
T	10-Jul	Tom Cech - Guest Speaker		Wetland Investigation (Tivoli)
R	12-Jul	Design Showcase Work Day		Design Showcase Prep Time
T	17-Jul	Drinking Water and Wastewater Treatment		Design Showcase Prep Time
R	19-Jul	FIELD TRIP: Klein Water Treatment Facility		
T	24-Jul	Design Showcase		
R	26-Jul	Final Exam		

Field Trips

- Denver Botanic Gardens
- Bear Creek Park
- Carson Nature Center
- South Adams – Klein Water Treatment Plant

Riparian Restoration Design Showcase



South Platte River Design Solutions

By Paul McNally, Dante Miles, Jesse Parker, Meagan Rountree

Background/Site Info

Our team reviewed the South Site area which runs from Hampden Avenue to Florida Avenue. We identified several areas of potential pollution. There are multiple parks and a large golf course that run along this portion of the Platte. In addition to these parks, there are two tributaries that run into the Platte and bring their own pollutants. The tributaries are Bear Creek and West Harvard Gulch. Our team would like to suggest design solutions for both of these potential areas of pollution to decrease nitrates and phosphates.

Constructed wetlands named Minghu Wetland (China)

Design Solutions

1. Implement more riparian wetlands, along with wetlands in the middle of Bear Creek and Harvard Gulch, to help filter water prior to entering the Platte. This will decrease non-point source pollutants coming from surrounding areas, neighborhoods.
2. Build an irrigation canal along the golf courses which will catch the sheet run-off from the golf courses which contains the potential pollutants and divert this to an urban wetland north of the golf courses. This wetland will filter the run-off prior to it draining back into the Platte.
3. Create wetland buffers along Ruby Hill park to mitigate potential pollutants from draining into the Platte.

Example of constructed/ urban wetland.

Fact

Wetlands can remove 20-60% of metal from water and trap 80-90% of sediment from runoff. Additionally, they can eliminate 70-90% of nitrogen running off. (Ecological Society of America, n.d.)

Legend

The **BLUE** lines are the Bear Creek and West Harvard Gulch

The **GREEN** lines indicate the area where the canals will be built to divert water from the golf courses and park to wetlands

The **BROWN** areas are will the wetlands will be built to filter the water in the canals

Idea design for the canals along the golf courses.

Pollution Sources

When examining this section of the Platte, we identify several potential pollution sources.

Bear Creek and West Harvard Gulch bring the following possible residential run-off pollutants:

- animal waste
- pesticides
- fertilizers
- potential septic systems leaking into the groundwater
- Parking lot and road storm water pollutants

The golf courses, the largest being Overland and Broken Tee golf course. Across the Platte from the Overland Golf Course is Ruby Hill Park. Potential pollutants from these sites include:

- fertilizers
- animal waste
- urban run-off

Potential Plants in the Wetlands

- Several types of grasses
- Reeds
- Sedges
- Cattails
- Willows
- Cottonwood trees

Fact

Constructed wetlands can copy some of the filtration capabilities of a regular wetland. They can be cost effective for small communities however cannot replace true wetlands. (Ecological Society of America, n.d.)

Discussion

(1) Funding for this project could come from the following sources:

- Private sector (the golf courses themselves)
- Sponsorship and volunteer support (similar to adopt a highway)
- State and federal tax dollars/incentives for the private sector to create the canals and wetlands

(2) Community outreach may be needed to gain support for this project, and push-back on the installation of wetlands is anticipated.

(3) Maintenance is expected once the plants in the wetlands reach biomass, and are no longer able to extract nutrients from the wetlands. These plants will need to be cleared and re-planted. Along with plants reaching biomass, there may be invasive plants that need to be pulled. We would seek support from the private sector and volunteers to help with these efforts.

Resources

Gallery of Minghu Wetland Park / Turenscape. (2013, January 21). Retrieved July 17, 2018, from https://www.archdaily.com/196061/minghu-wetland-park-turenscape?ad_medium=gallery

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Thank you to our community partners!
Questions??????