Cultivating science-policy-practitioner partnerships in wetland restoration

Olivia Schloegel, Lauren Kinsman-Costello, Janice Kerns, Eric Saas, Rachel DeNoewer

Outline:

- Overview and strategies
- Emergent themes and examples

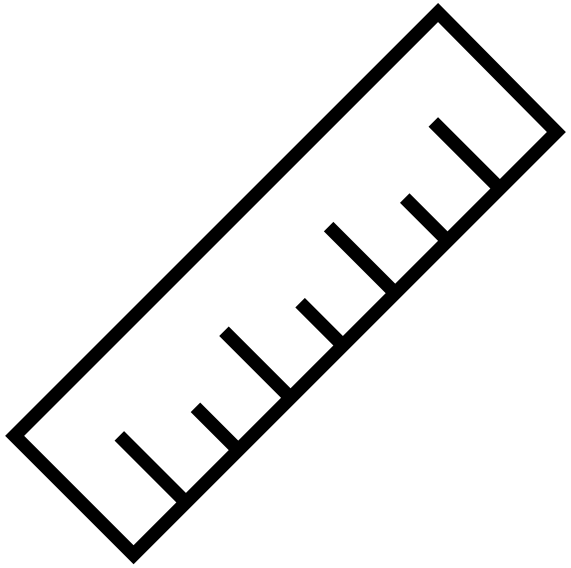
Overview and strategies

Cultivating science-policy-practitioner partnerships in wetland restoration

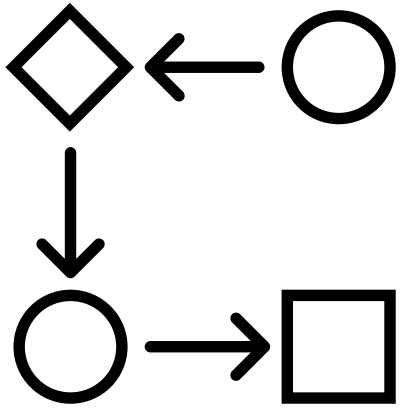
science

(Wetland Monitoring Program Researchers)

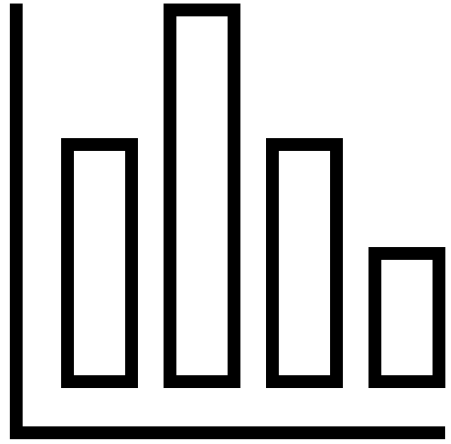
Collect data



Process data



Use data



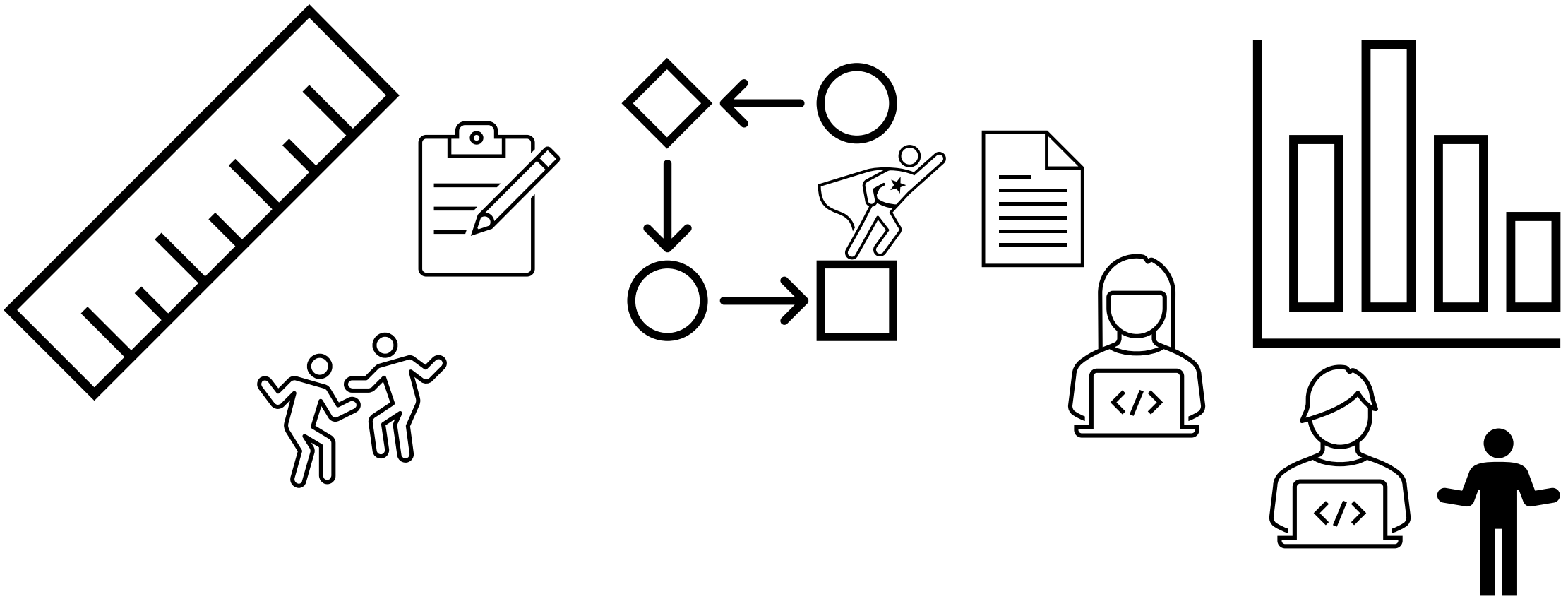
science

(Wetland Monitoring Program Researchers)

Collect data

Process data

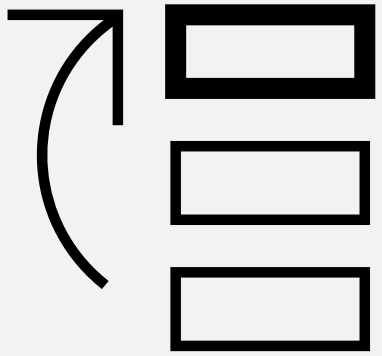
Use data



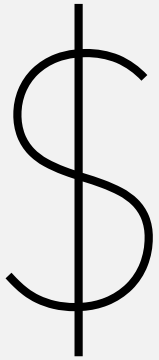
policy

(Ohio Department of Natural Resources)

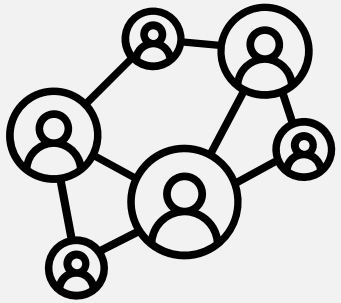
Prioritize restoration



Fund restoration



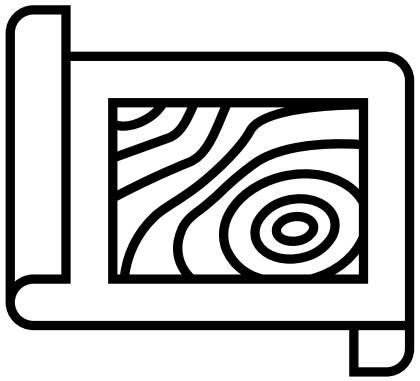
Connect restoration to public good



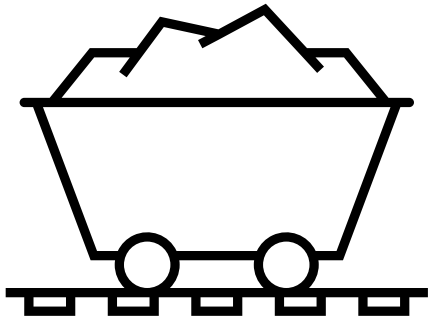
practitioner

(Project Partners)

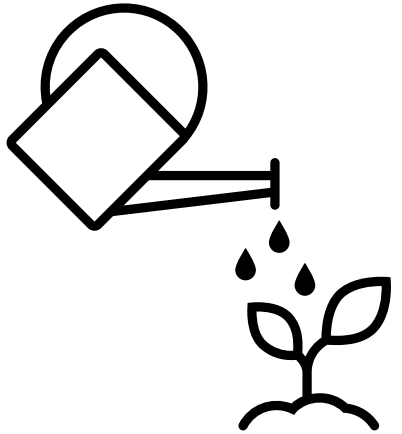
Design restoration

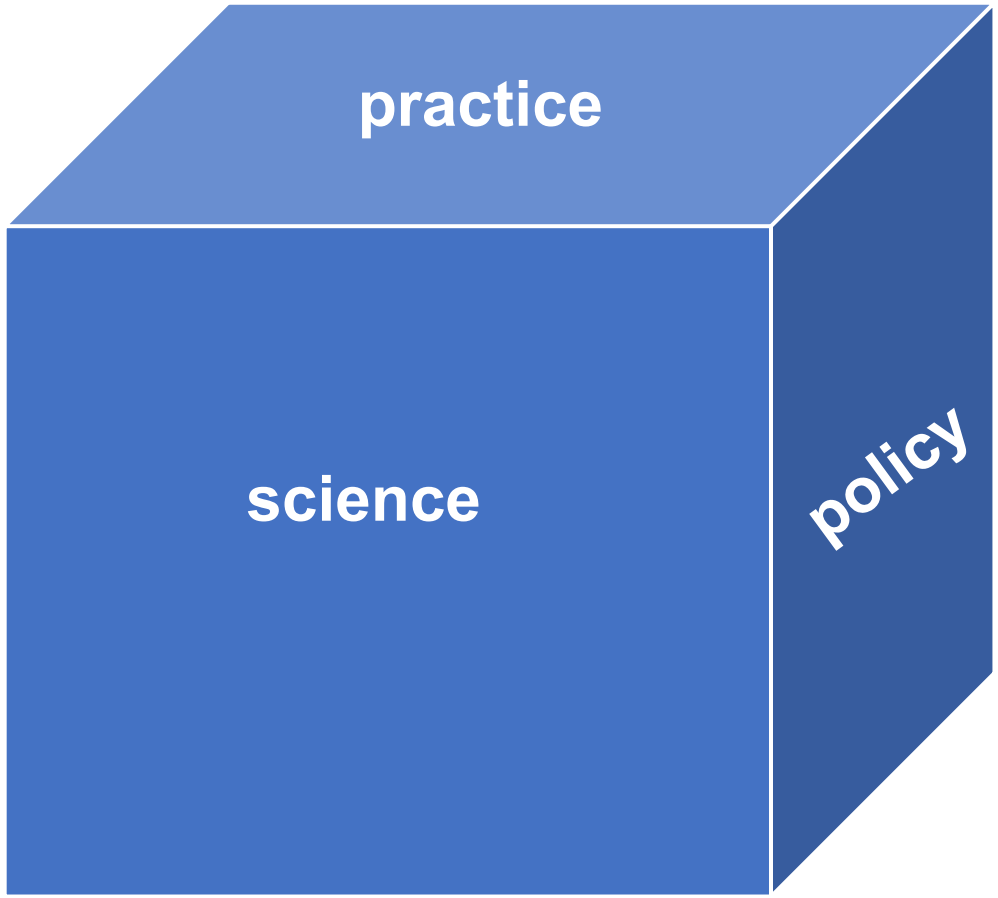


Implement restoration



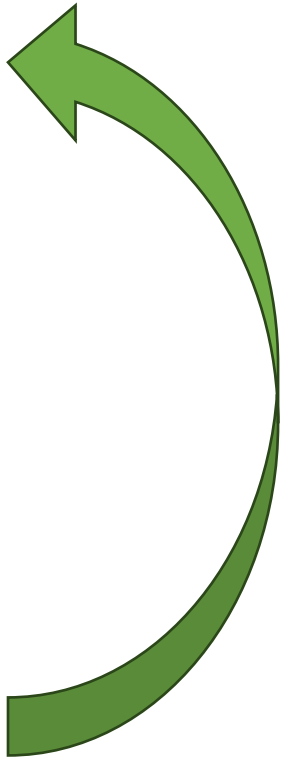
Manage restoration




practice
science
policy

Information Exchange

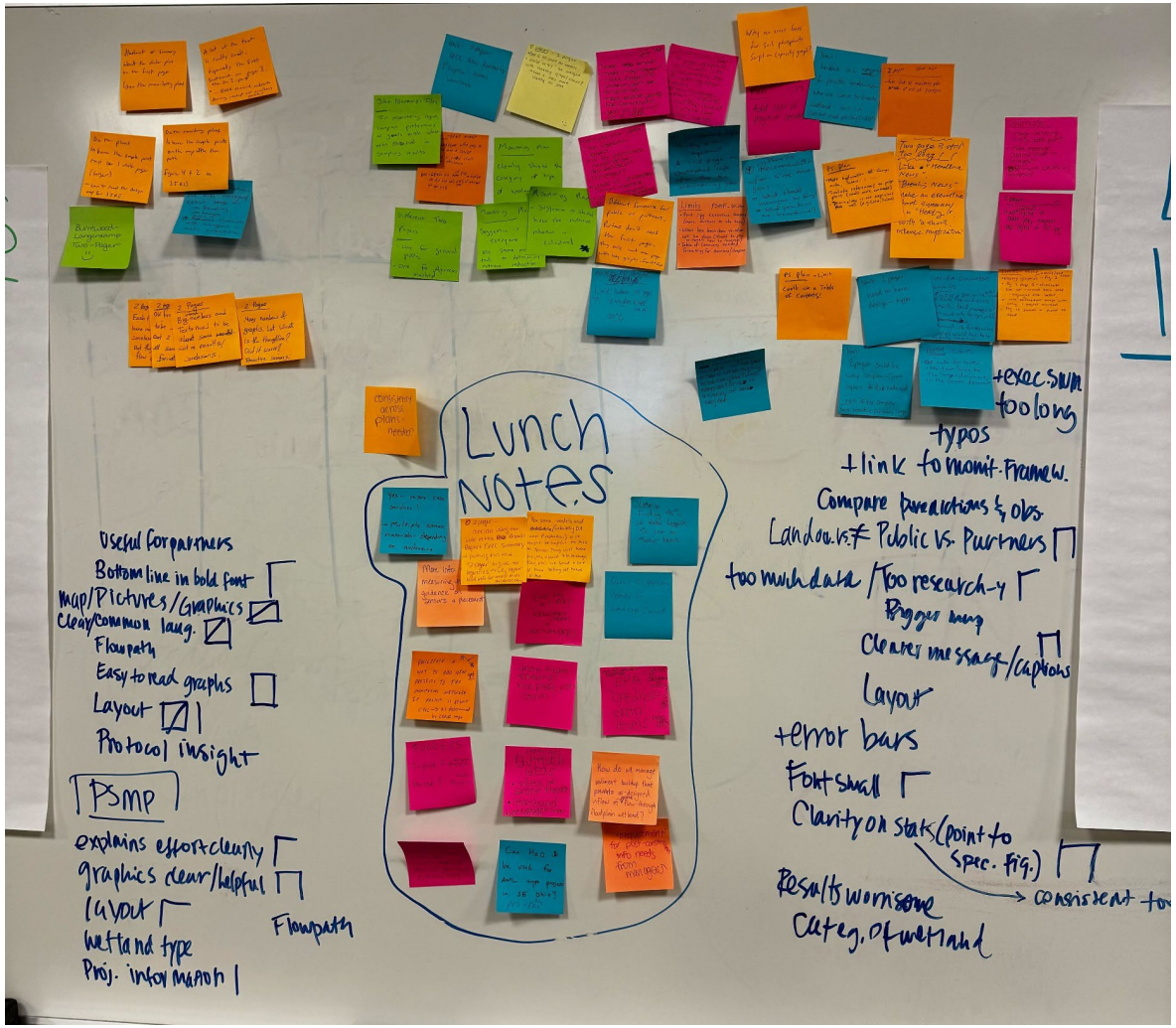
- From Ohio Department of Natural Resources (ODNR) to Wetland Monitoring Program (WMP) when **new project under contract**
- Between ODNR, WMP, and Project Partners about **design & engineering, restoration approach** (ecological, logistical)
- From WMP to ODNR and Project Partners about **monitoring results** (data, information)



As-built design review, site walk-throughs

Logistical access, local connections

Partner day at annual workshop



Research days at annual workshop

Emergent themes and examples

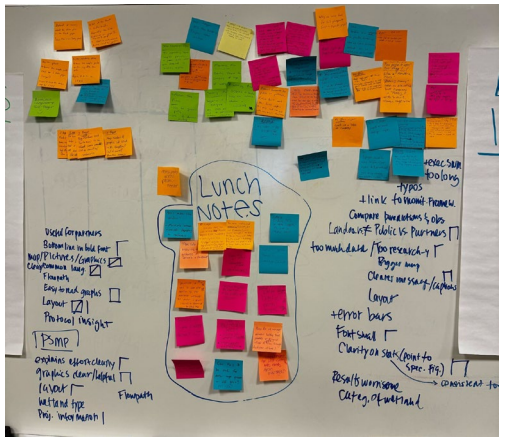
Documentation and dialogue

Communicating uncertainty

Fiscal year versus water year

Documentation and Dialogue

- Prioritize resources and energy toward different level of detail/refinement for different documents
  - i.e., internal communication tool, external-facing product, and in-between
- Well-facilitated space together
  - Balance of structured and unstructured space
  - Use existing documents in new ways, as subject for dialogue



Example from Project Specific Monitoring Plan

Detailed 2023 Monitoring Plan: St. Joseph's River Restoration

Surface Water Sampling

Ambient Surface Water Sampling

Locations: 22 across wetland pools, tile drain outlets, ditch, and river (Figure 4, Table 1).
Frequency: Every 2-4 weeks or post 0.5-in rain event with a maximum of 30 visits per year, and at least once per month.

Event-Based Surface Water Sampling

For rain event sampling, a Base Crew team member will monitor rainfall at this site via the Ubidots dashboard which displays data from the SJRE weather station. When there is rainfall equivalent or greater than 0.5-in, the site will be visited within 24-48 hours, unless antecedent low moisture conditions would preclude a meaningful hydrologic response and/or sufficient events had already been monitored during that time period.

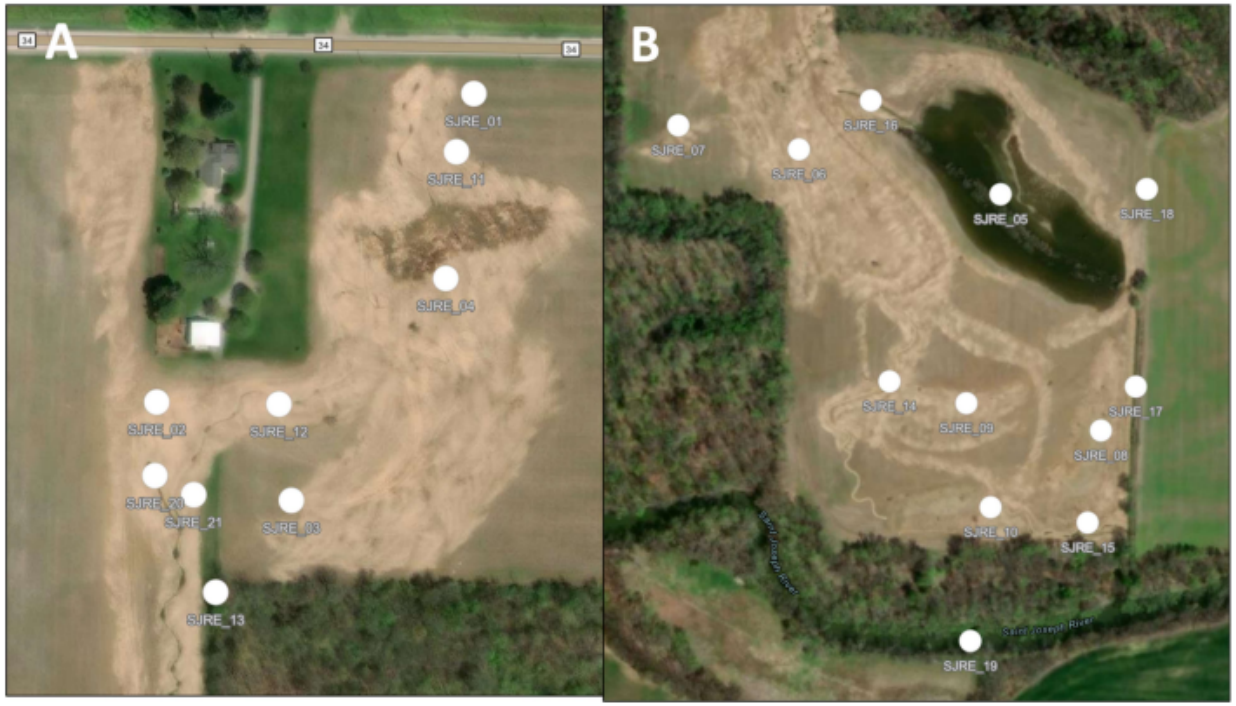
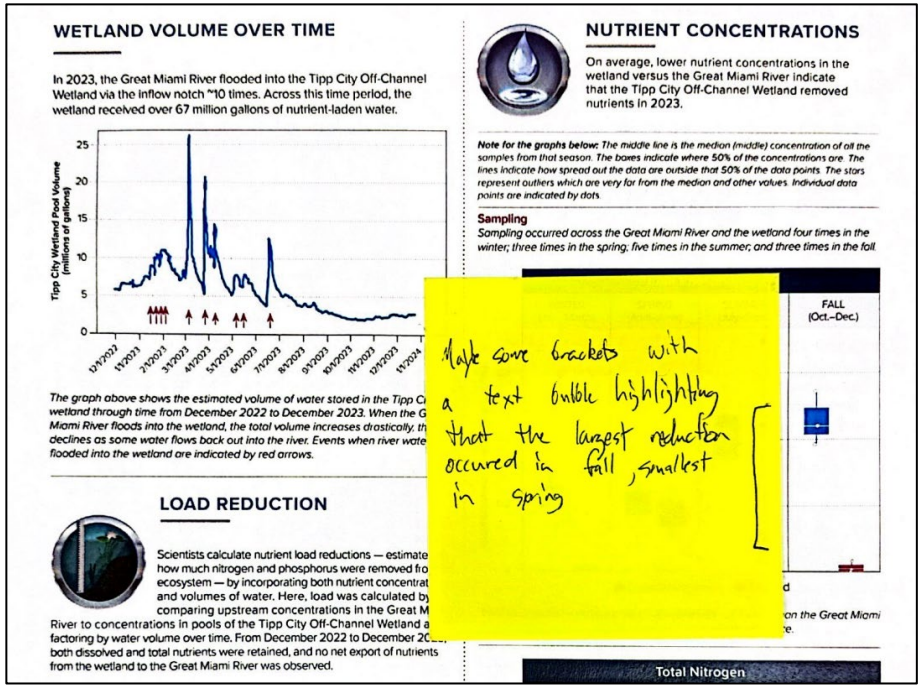


Figure 4. Surface water routine monitoring sampling points in the (A) northern and (B) southern portion of the St. Joseph's River Restoration Project.

Examples from two-pager case study



WETLAND VOLUME OVER TIME

In 2023, the Great Miami River flooded into the Tipp City Off-Channel Wetland via the inflow notch ~10 times. Across this time period, the wetland received over 67 million gallons of nutrient-laden water.

The graph above shows the estimated volume of water stored in the Tipp C wetland through time from December 2022 to December 2023. When the G Miami River floods into the wetland, the total volume increases drastically, th declines as some water flows back out into the river. Events when river wate flooded into the wetland are indicated by red arrows.

LOAD REDUCTION

Scientists calculate nutrient load reductions — estimate how much nitrogen and phosphorus were removed fro ecosystem — by incorporating both nutrient concentrat and volumes of water. Here, load was calculated by comparing upstream concentrations in the Great M River to concentrations in pools of the Tipp City Off-Channel Wetland a factoring by water volume over time. From December 2022 to December 20 both dissolved and total nutrients were retained, and no net export of nutrients from the wetland to the Great Miami River was observed.

NUTRIENT CONCENTRATIONS

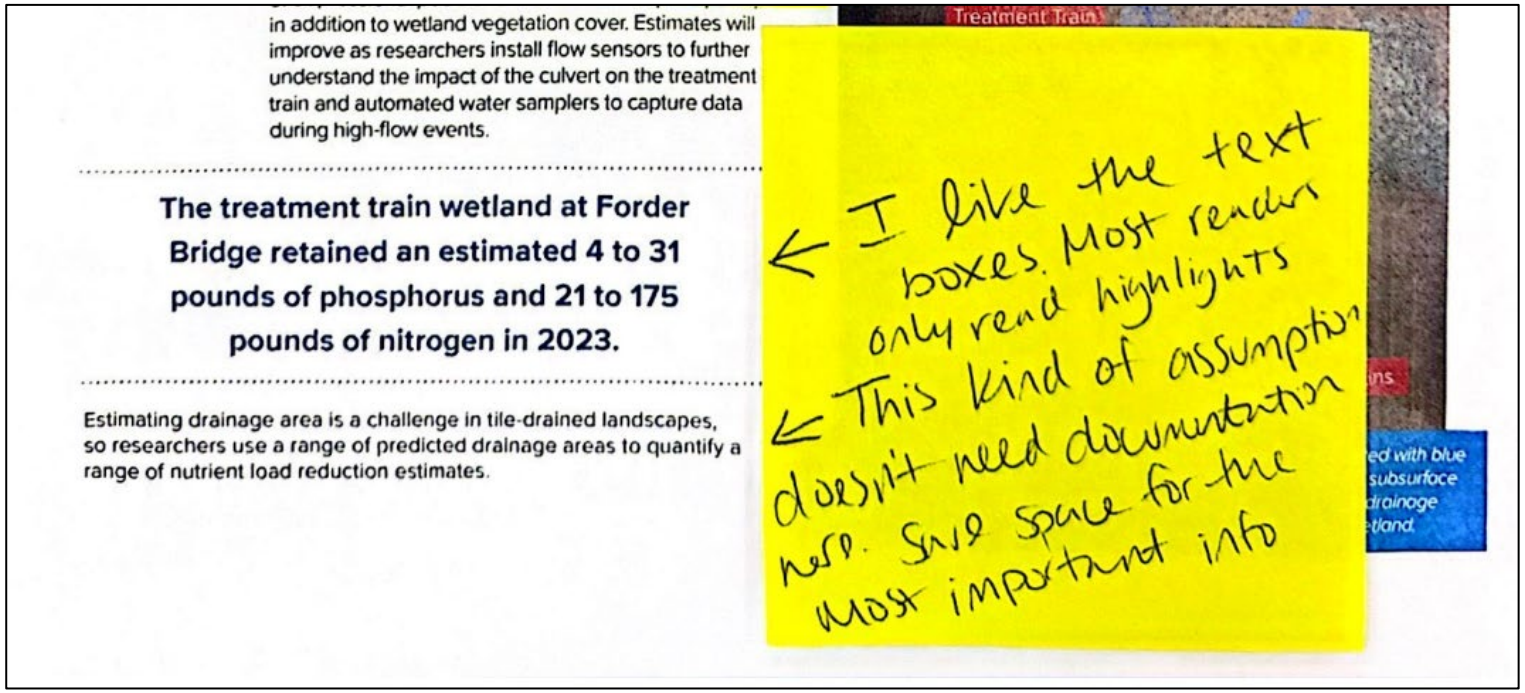
On average, lower nutrient concentrations in the wetland versus the Great Miami River indicate that the Tipp City Off-Channel Wetland removed nutrients in 2023.

Note for the graphs below: *The middle line is the median (middle) concentration of all the samples from that season. The boxes indicate where 50% of the concentrations are. The lines indicate how spread out the data are outside that 50% of the data points. The stars represent outliers which are very far from the median and other values. Individual data points are indicated by dots.*

Sampling

Sampling occurred across the Great Miami River and the wetland four times in the winter; three times in the spring; five times in the summer; and three times in the fall.

Make some brackets with a text bubble highlighting that the largest reduction occured in fall, smallest in spring



in addition to wetland vegetation cover. Estimates will improve as researchers install flow sensors to further understand the impact of the culvert on the treatment train and automated water samplers to capture data during high-flow events.

The treatment train wetland at Forder Bridge retained an estimated 4 to 31 pounds of phosphorus and 21 to 175 pounds of nitrogen in 2023.

Estimating drainage area is a challenge in tile-drained landscapes, so researchers use a range of predicted drainage areas to quantify a range of nutrient load reduction estimates.

Treatment Train

I like the text boxes. Most readers only read highlights

This kind of assumption doesn't need documentation here. Save space for the most important info

Communicating Uncertainty

- Science-based monitoring of human-managed systems
- Meeting in the middle
  - Intermediate products provided by scientists, including communication of constraints and assumptions, followed by initial feedback from practitioners
  - Deepened appreciation/agreement of the scope (time, space) of a given “conclusion”

Example from Annual Report

Nutrient Load Reduction Assessment

Monitoring in 2023 indicates the Forder Bridge Floodplain Reconnection Project (hereafter Forder Bridge Project) retained an estimated 4–45 lbs. P of total phosphorus (TP) and 22–290 lbs. N of total nitrogen (TN). Newly established plants in the system stored an estimated total of 274 lbs. of P and 1050 lbs. of N. Soils throughout the Project have capacity to sorb phosphate, except for samples from a single location on the banks of the Maumee River. Some soil collected from the wetland retained dissolved reactive phosphorus (DRP) from surface waters, while others released DRP into surface waters. Sediments either had no net effect on nitrate+nitrite (NOx) or retained NOx, and either had minimal effect on surface water total ammonia (NH_3) or released NH_3 into surface waters, based on experiments of field-collected, lab-incubated soils cores.

Management Considerations

The Forder Bridge Project primarily removes nutrients from a subsurface tile drain that drains agricultural fields. The Maumee River rarely, if ever, floods this wetland, and thus the project does not function as a floodplain wetland. The amount of precipitation needed to generate flow into the wetland through the tile drain depends on previous soil moisture.

Researchers are not certain of the total nutrient load removed by the Forder Bridge Project because it is difficult to estimate the area of land that drains into the wetland. Estimates of the area draining into the wetland area differ depending on if they are based on surface topography or assessment by drainage engineers (see below, ***Forder Bridge Wetland Nutrient Budget Calculation***).

Example from Annual Report

Management Considerations

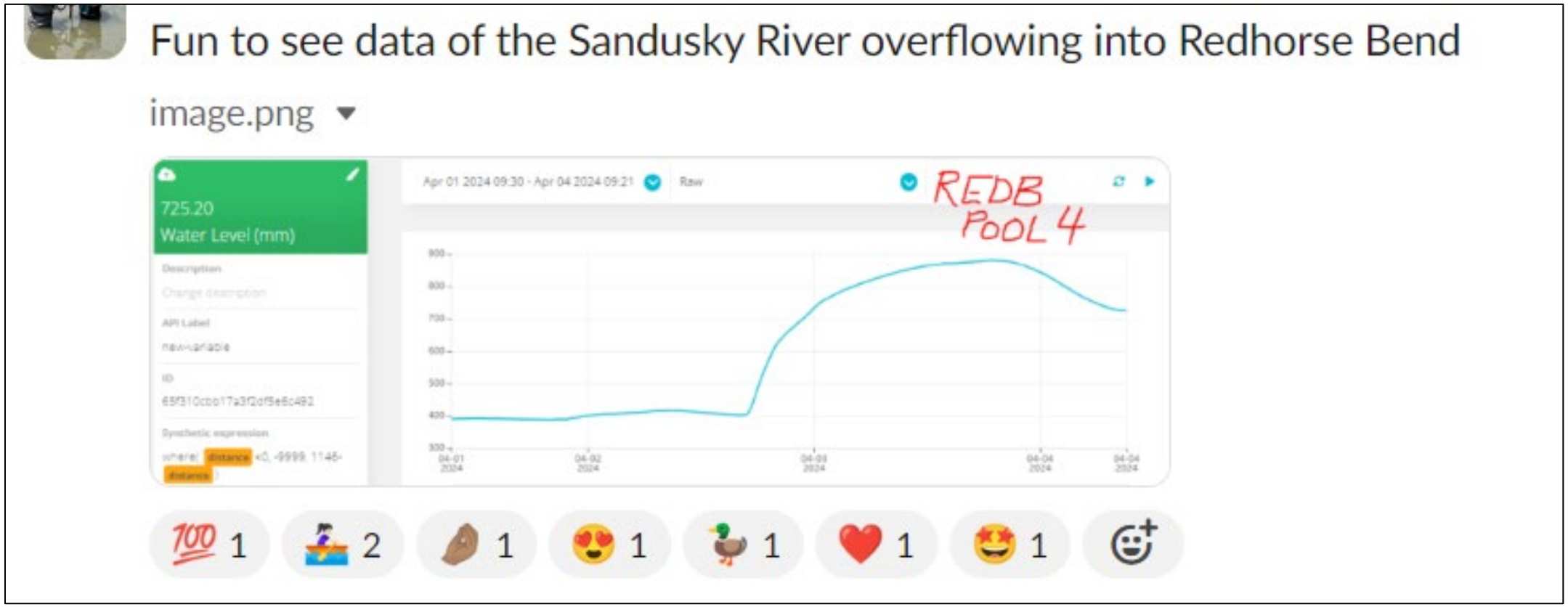
This Project has the potential to mitigate substantial nutrient loads because of its connectivity to agricultural drainage. However, higher P concentrations were observed at the outlet of the largest pool (Pool B) than at the inlet during hot conditions. Researchers attribute this observation of potential internal sediment P release to Pool B surface waters to transient low-oxygen conditions. Additional assessment is needed to determine whether transiently high P concentrations in this location contribute to net P export from the system.

Fiscal year versus water year

(timing, timing, timing – people, people, people)

- Timing of reporting requirements and ecologically relevant events
  - Storm sampling in spring, the same time we are writing previous year's report
- Timing differences between agency-provided budget and university hiring workflow
  - Importance of overlapping projects to provide human resource buffer and resilience
  - **People, people, people!!**

Example from Real-time Communication



Examples from “Day in the Life of H2Ohio Technician”

Morgan Jutte walking at Burntwood-Langenkamp Wetland during routine sampling trip.

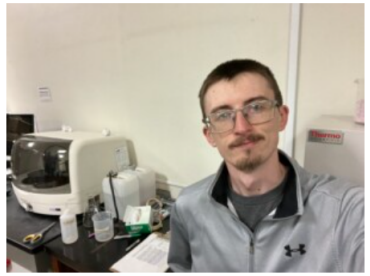
Who do you work with (almost) every day and how?

I work with Dr. Stephen Jacquemin and undergraduate students daily. Stephen and I work together to coordinate sampling of multiple wetlands in the southwest portion of Ohio. I have four undergraduate students working in the lab who have touched H2Ohio in some way. I teach them things such as water and sediment sampling, nutrient analysis, and data organization.

What are three things you do (almost) every week in your job?

1. Analyze water, soil, and plant samples for nutrients.
2. Provide upkeep to our AQ2 discrete analyzer.
3. Oversee students work and provide advice.

How does your job vary day to day?

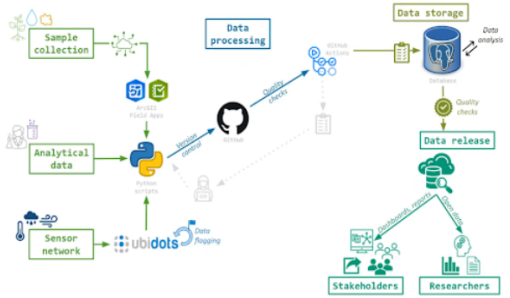


Corbin Kohart, Northwest Coastal Inland Base Crew Lab Coordinator, stands by the AQ2 discrete analyzer, which measures nutrient content from H2Ohio Wetland soils and water samples.

While every day is spent in the lab, work can vary greatly on what needs to be done. Days include a combination or sole focus on various tasks that are needed to keep the lab running smoothly. These include things like setting up and testing samples, cleaning lab equipment, and taking stock of materials. Lab work can feel a bit tedious but once you get the flow and start planning you can make each day both productive and different enough to stay feeling fresh.

What is one skill you recommend a student learns to be successful in this job?

Without a doubt, the ability to communicate complex findings in simple terms. A solid foundation in computational statistics, data science, and coding is essential, but translating those insights for end-users and stakeholders is equally critical. It’s about making your findings actionable and relevant to the broader community.



Data Management, QA/QC workflow

Effective collaboration requires coordination, trust, and persistence.

Building institutional appreciation for long-term monitoring; investing in people, inviting participation in the process of intermediate products.

Thank you!

Olivia Schloegel, ojohns16@kent.edu

Lauren Kinsman-Costello, lkinsman@kent.edu