



Friends of

**HUMBOLDT PARK**

# PURPOSE

- The purpose of this report is to provide a detailed report regarding Humboldt Park's water and sediment quality assessment.
- The client requested that UWM School of Freshwater Science students conduct field sampling to collect water samples from Humboldt Park and provide options for maintenance to improve water quality, balance nutrients, and provide a safe ecosystem for a thriving wildlife population.



# SAMPLE COLLECTION

Date	Time of Day	Start Time	Water	E. Coli	Sediment	Filteri
June 20	Morning	9:38AM	✓	✓	X	Next L
July 18	Morning	10:27AM	✓	✓	X	Next L
August 22	Morning	9:30AM	✓	✓	X	Same
September 18	Late Afternoon	4:10PM	✓	✓	X	Same
October 23	Late Afternoon	4:10PM	✓	✓	✓	Same

# METHOD/APPROACH



## WATER QUALITY PARAMETERS

### SONDE

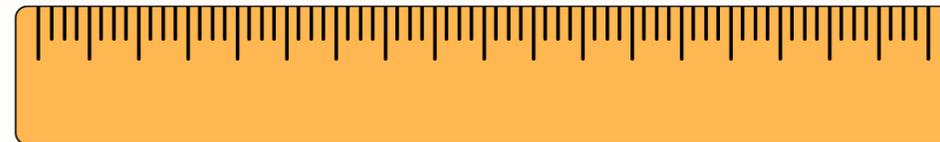
#### MEASUREMENTS

- Temperature
- pH
- Conductivity
- Turbidity
- Dissolved Oxygen (DO)

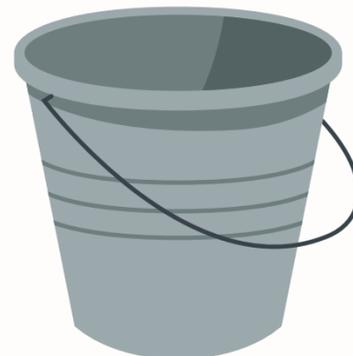


## TARGET COLLECTION DEPTH

Approximately **0.3 meters (1ft)**  
below the surface



## BUCKET AND WADERS



**SITE 1**  
Fishing boardwalk near **Park Rd.**

**SITE 4**  
Large stonepads on the **North** side

**SITE 3**  
Small inlet pipe, Season dependent for total inflow

**SITE 2**  
Small beach opening on the **Southside**



# SITE 1



MARCH 29TH



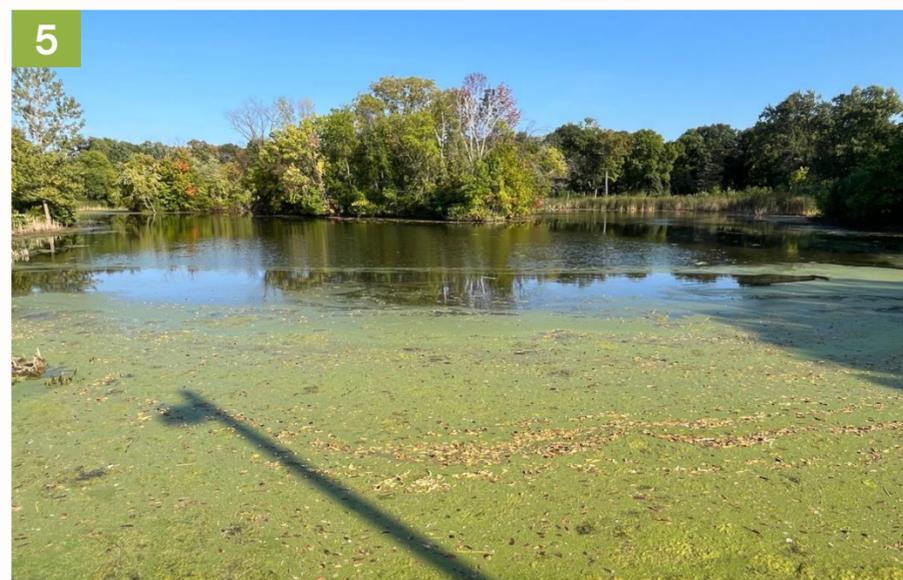
JUNE 20TH



JULY 18TH



AUGUST 22ND



SEPTEMBER 18TH



OCTOBER 23RD

# SITE 2



**MARCH 29TH**



**JUNE 20TH**



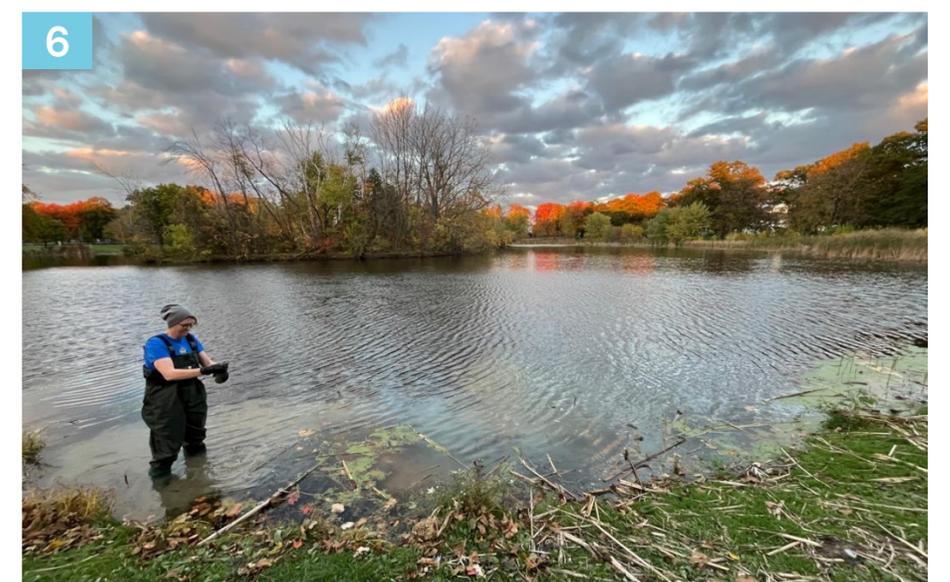
**JULY 18TH**



**AUGUST 22ND**



**SEPTEMBER 18TH**



**OCTOBER 23RD**

# SITE 3



MARCH 29TH



JUNE 20TH



JULY 18TH



AUGUST 22ND



SEPTEMBER 18TH



OCTOBER 23RD

# SITE 4



**MARCH 29TH**



**JUNE 20TH**



**JULY 18TH**



**AUGUST 22ND**



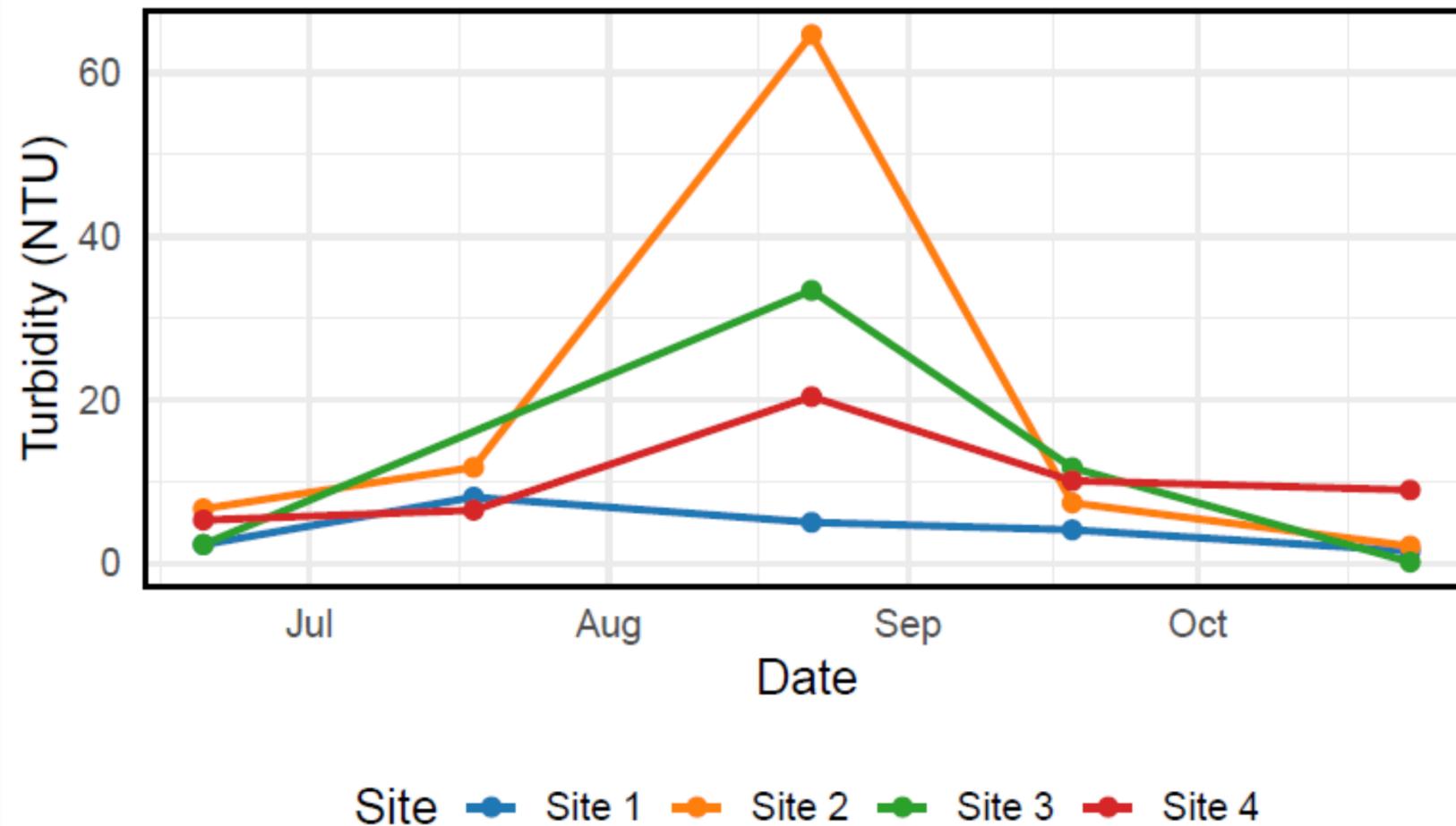
**SEPTEMBER 18TH**



**OCTOBER 23RD**

# FIELD MEASUREMENTS

## Turbidity Across Sites Over Time



## TURBIDITY

- Measurement of Nephelometric Turbidity Units (NTUs) - how much light is scattered from suspended particles
- Higher NTU = More light scattering

**< 10 NTU is ideal for aquatic life**



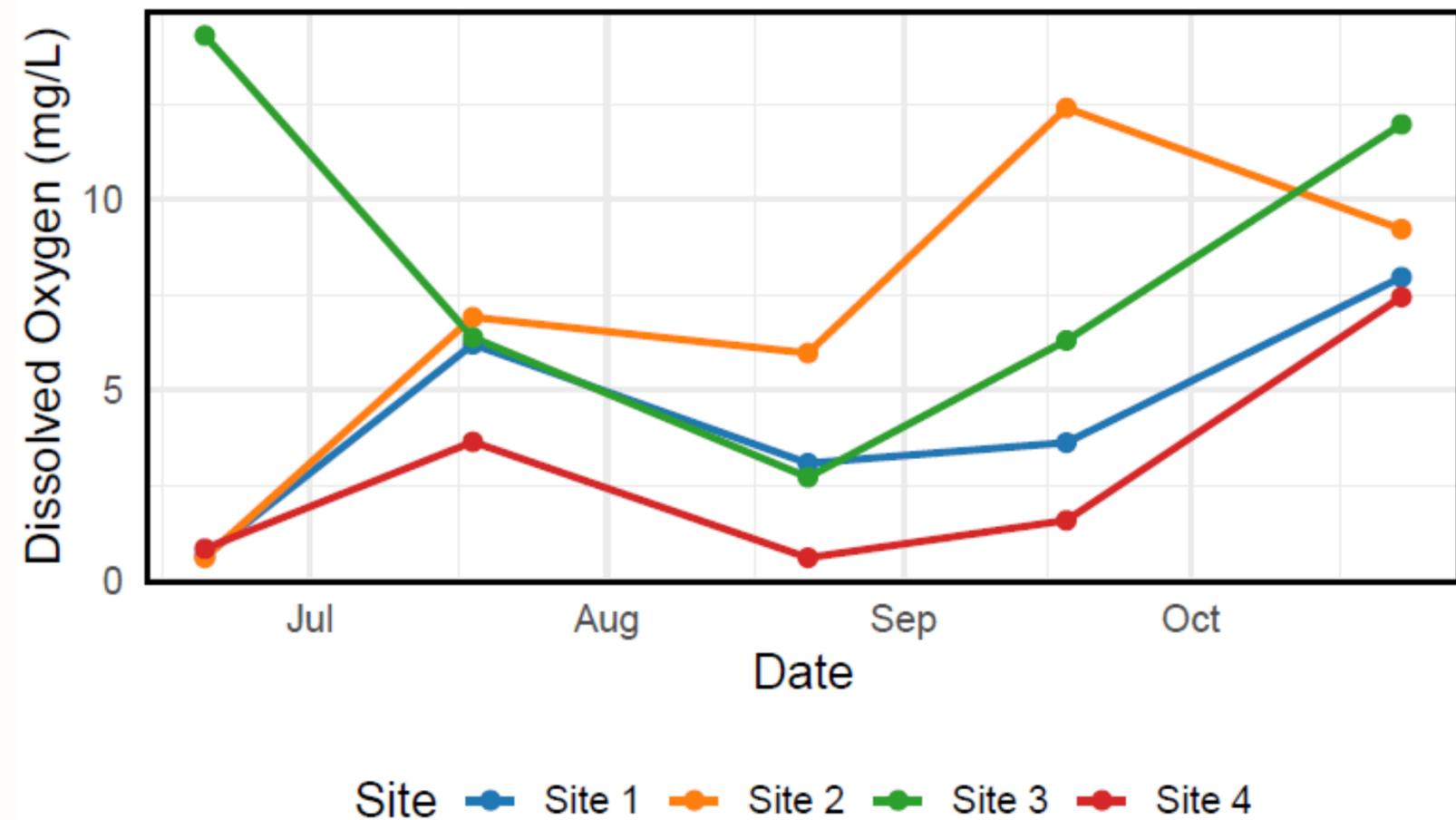
# FIELD MEASUREMENTS

## DISSOLVED OXYGEN (DO)

- Measurement of the amount of oxygen dissolved in a volume of water
- Influenced by: stream velocity, substrate composition, temperature

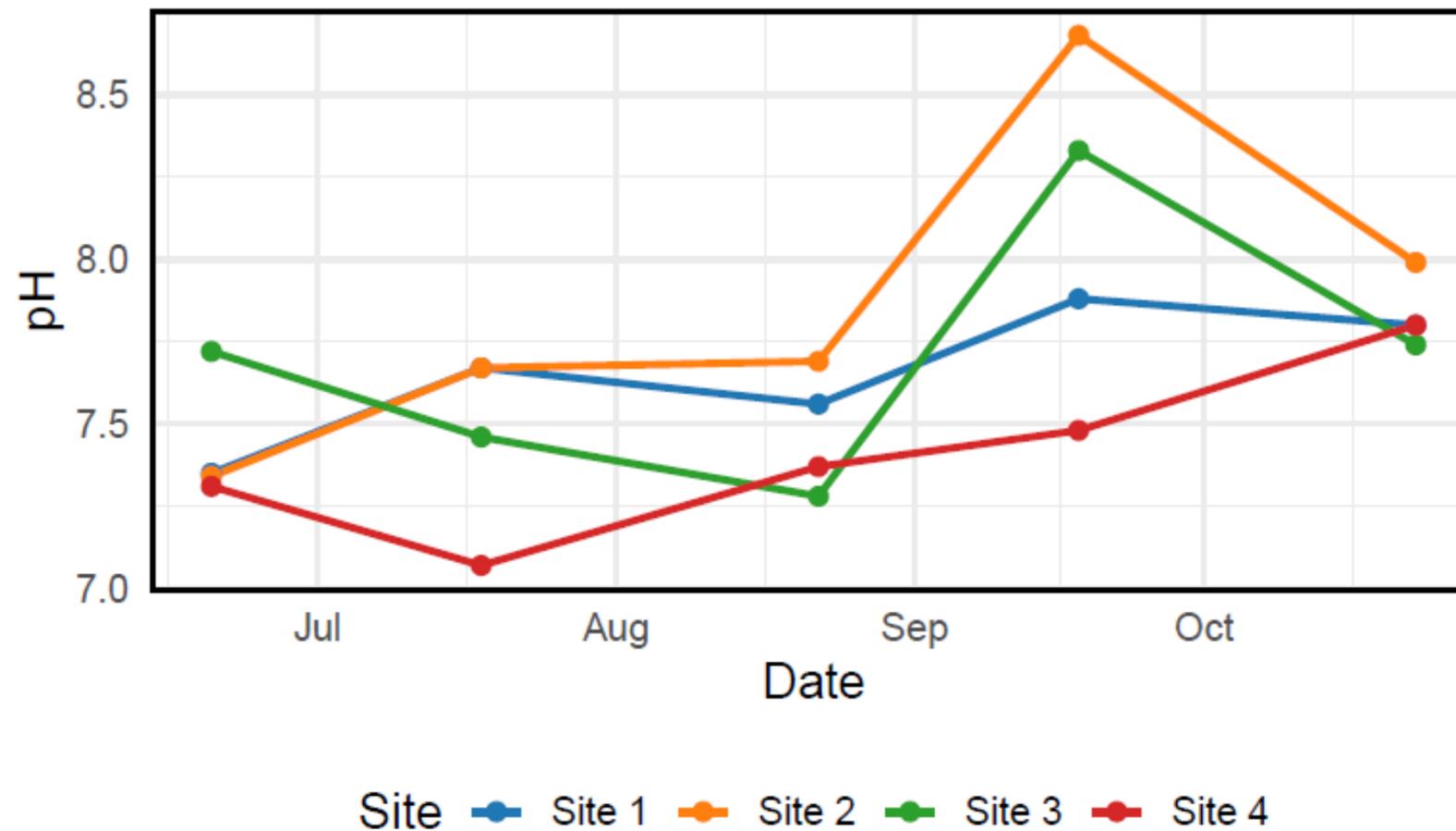
Warm stream > 5.0mg/L  
Cold stream > 6.0mg/L

### Dissolved Oxygen Across Sites Over Time



# FIELD MEASUREMENTS

pH Across Sites Over Time



## PH

- pH stands for the potential of hydrogen and indicates the concentration of hydrogen ions
- Lower pH, 0-6 is acidic, meaning a higher hydrogen concentration. 8-14 is basic, meaning a lower hydrogen ion concentration

**6.5-8.5 is ideal for a healthy ecosystem**



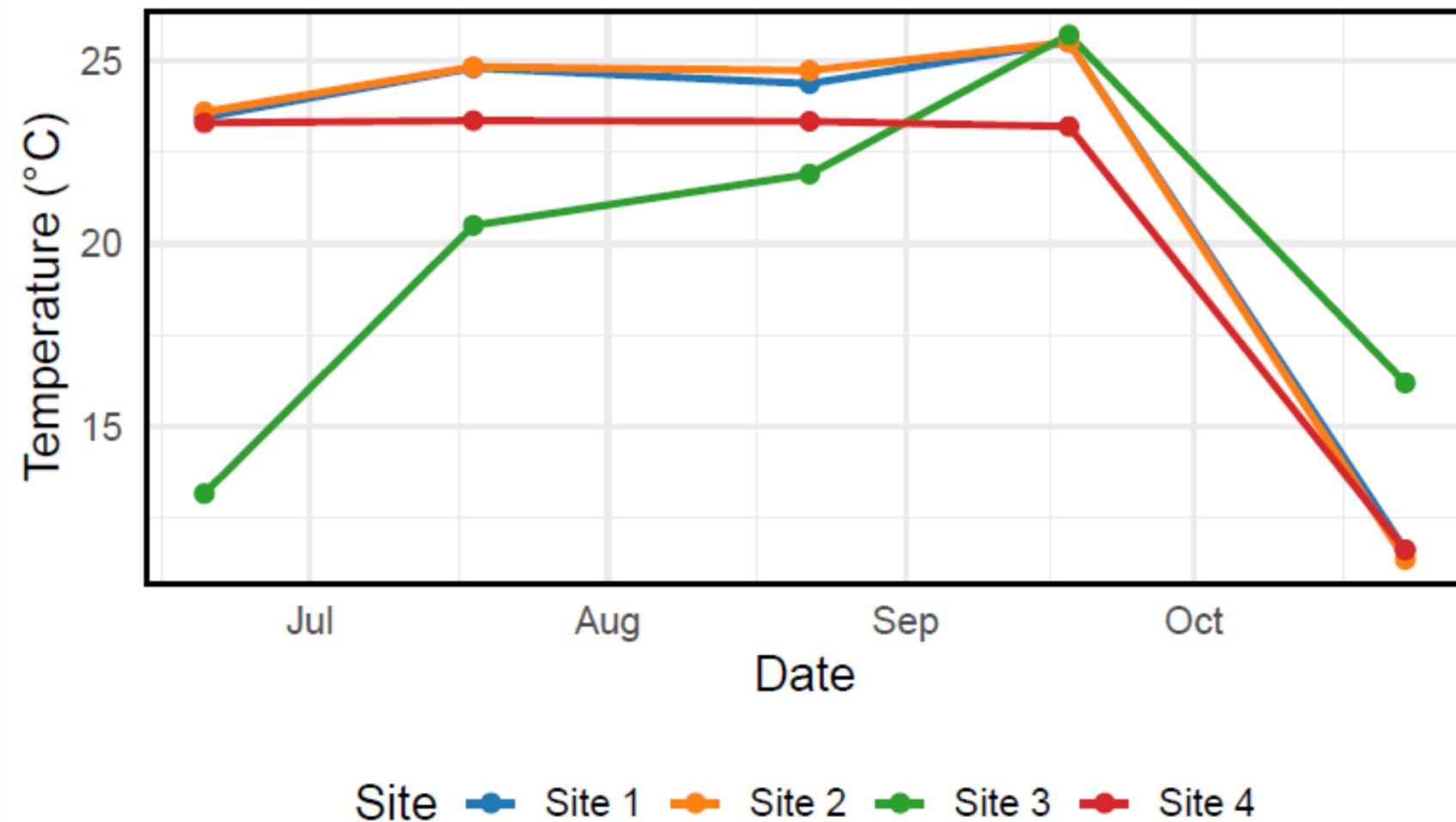
# FIELD MEASUREMENTS

## TEMPERATURE

- Temperature tolerance range for organisms – designates where organisms live
- Plays a role in nutrient cycling and chemical processes, particularly DO

20-27°C is ideal for a healthy ecosystem

Temperature Across Sites Over Time



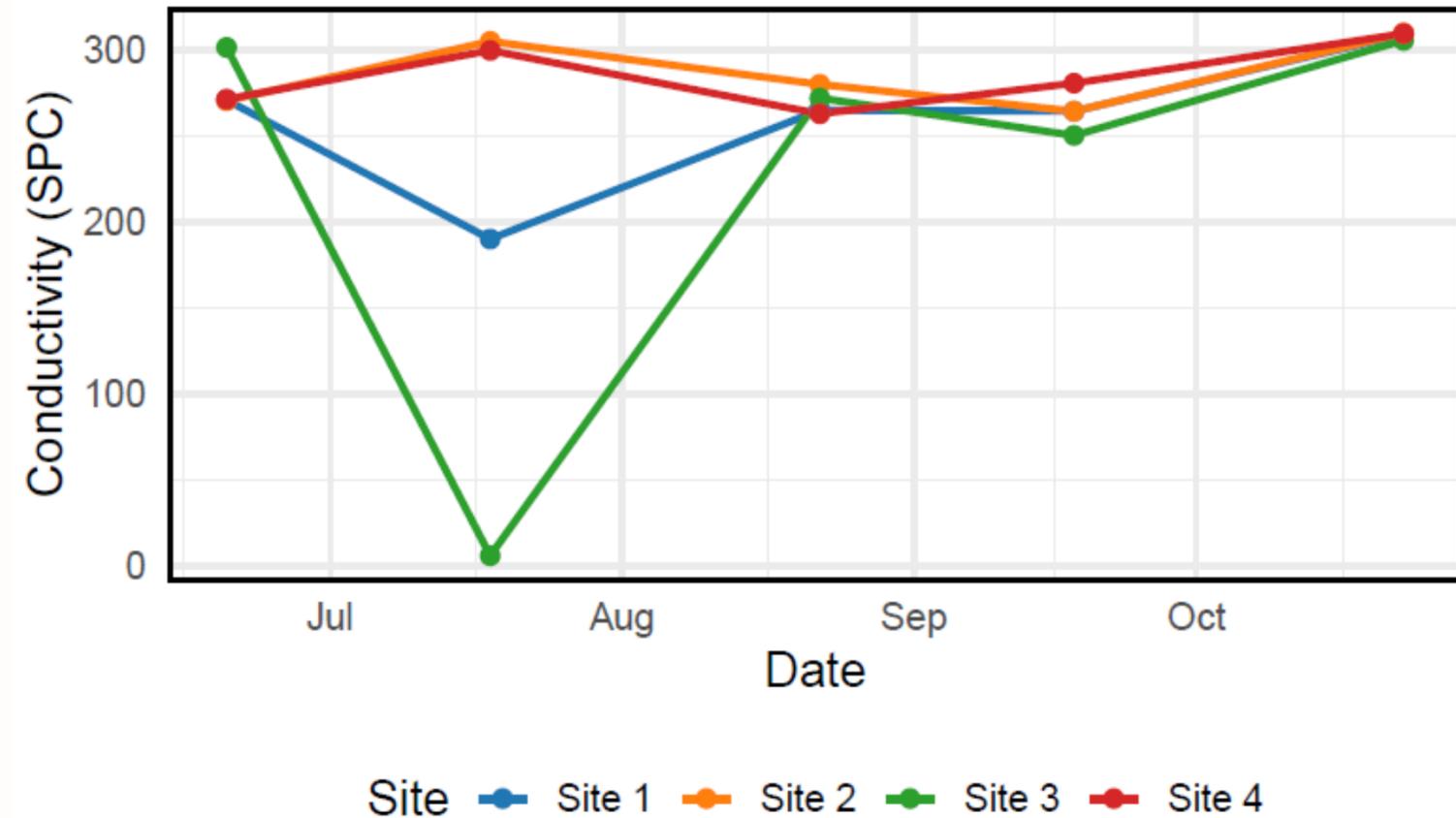
# FIELD MEASUREMENTS

## CONDUCTIVITY

- Measurement of the ability of water to pass an electrical current
- Influenced by: cation (+)/anion (-), geology, anthropogenic activities
- Discharge from industry or sewage can raise conductivity

Target conductivities shifted from 500 to 800  $\mu\text{S}/\text{cm}$  per the Wisconsin DNR and the Southeast Wisconsin Regional Planning Commission

Conductivity Across Sites Over Time



CHLORID  
E

BROMIDE

PHOSPHAT  
E

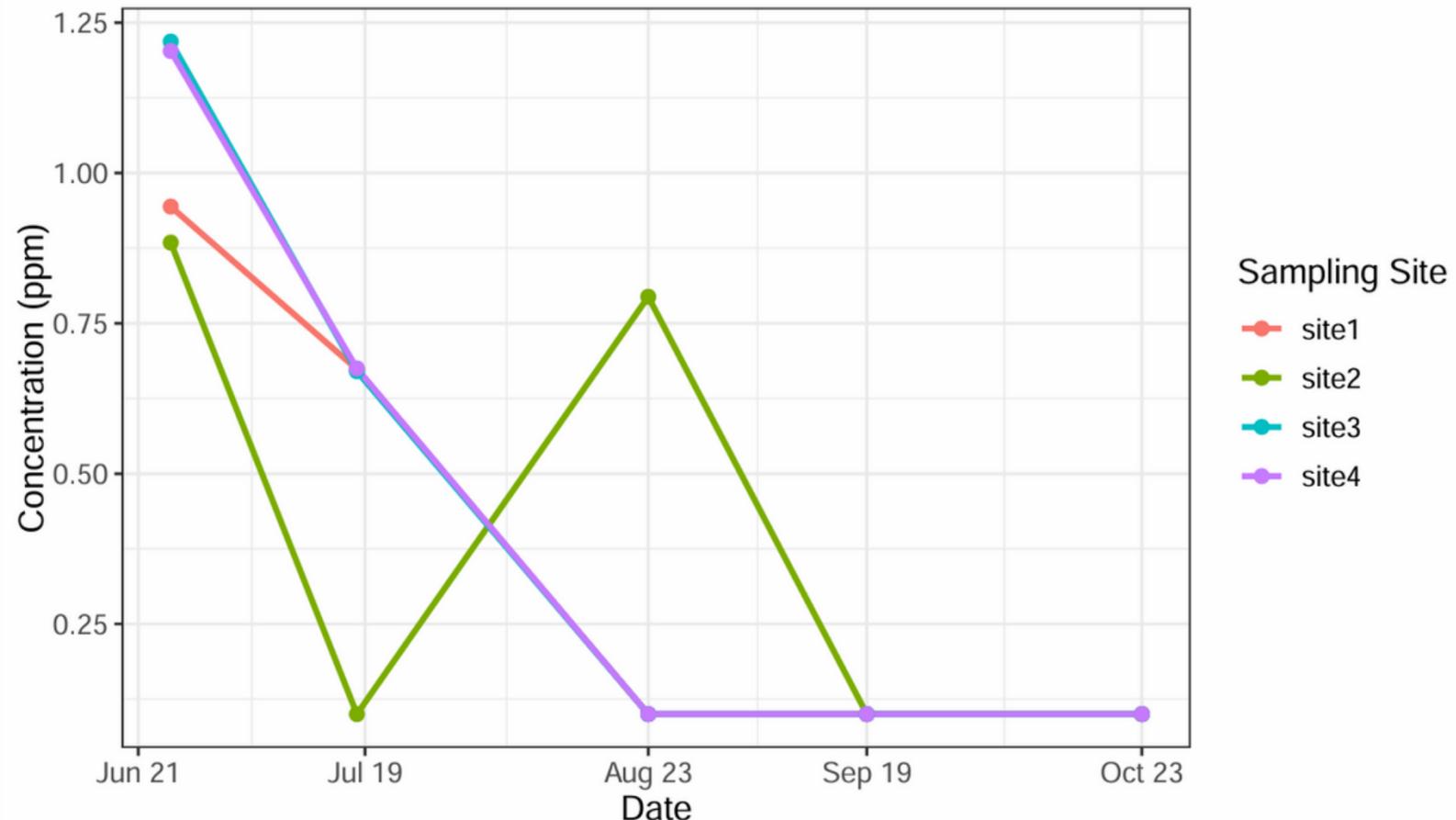
NITRAT  
E

SULFAT  
E

# PHOSPHATE

Large Streams <0.1 mg/L  
Small streams <0.075

Phosphate Concentration Over Time by Site



- Phosphorus is a **key nutrient** in organism growth and development
- Many different forms, total P is most applicable
- **Anthropogenic inputs** are a large contributor to increased phosphate levels
  - Fertilizer runoff, industrial discharge
- An abundance of phosphate can make a system eutrophic and fuel the creation of large algal mats
  - Algal mats can starve a system of dissolved oxygen, causing fish stress or deaths



SULFAT  
E

CHLORID  
E

BROMIDE

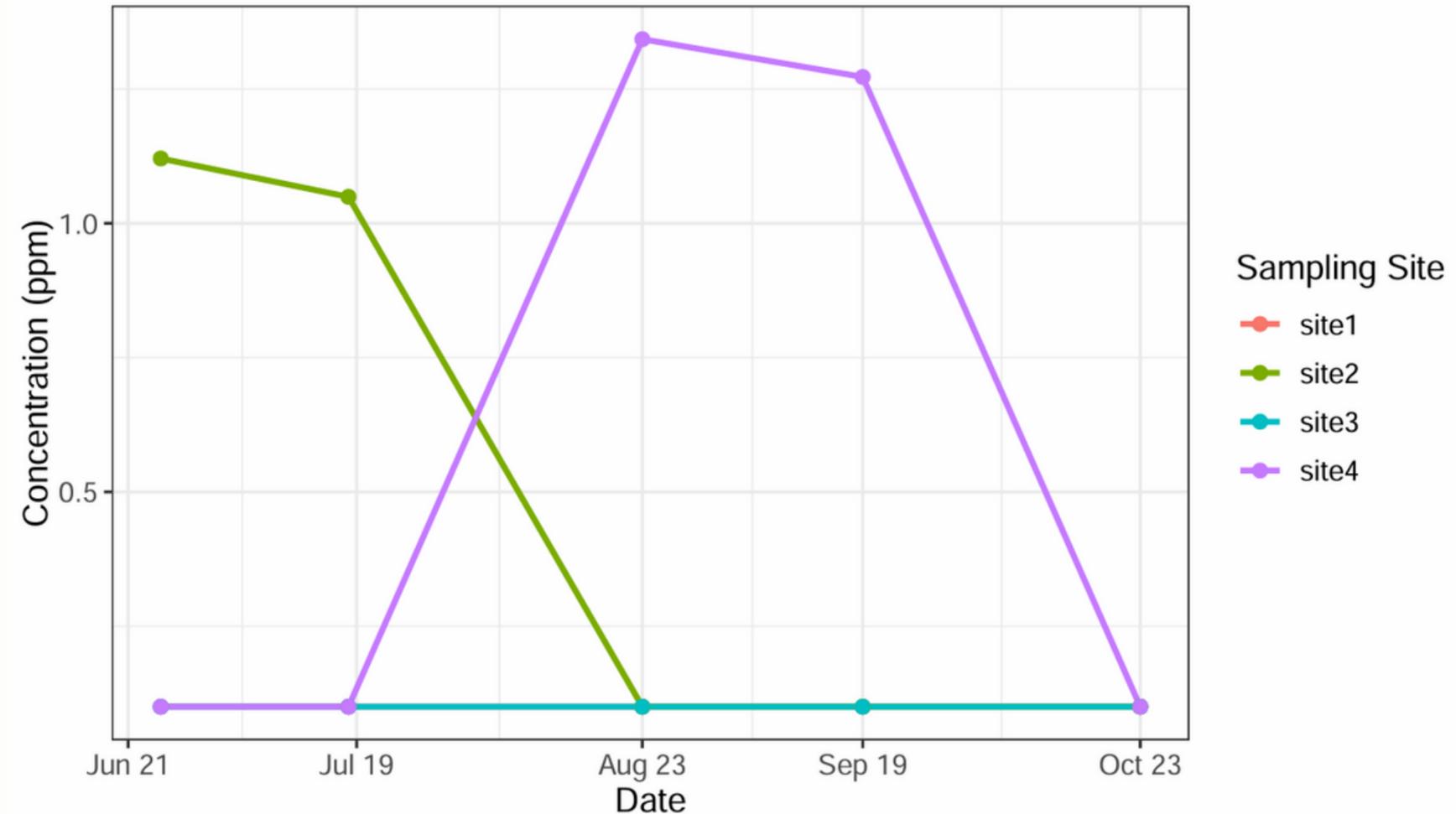
PHOSPHAT  
E

NITRAT  
E

# BROMIDE

Concentration target:  
<0.5 mg/L or ppm  
More strict regulations for  
drinking water

Bromine Concentration Over Time by Site



- Bromide is a **micronutrient** required for organism growth
- Elevated levels of bromide and **oxidizing processes can create bromate** which can cause chronic health risks for organisms
- Relatively more important in wastewater and drinking water treatment, respectively
- Graph trends highlight site 4 as changing drastically - potentially attributed to experimental error



# CHLORIDE

Concentration target: < 250 mg/L or ppm

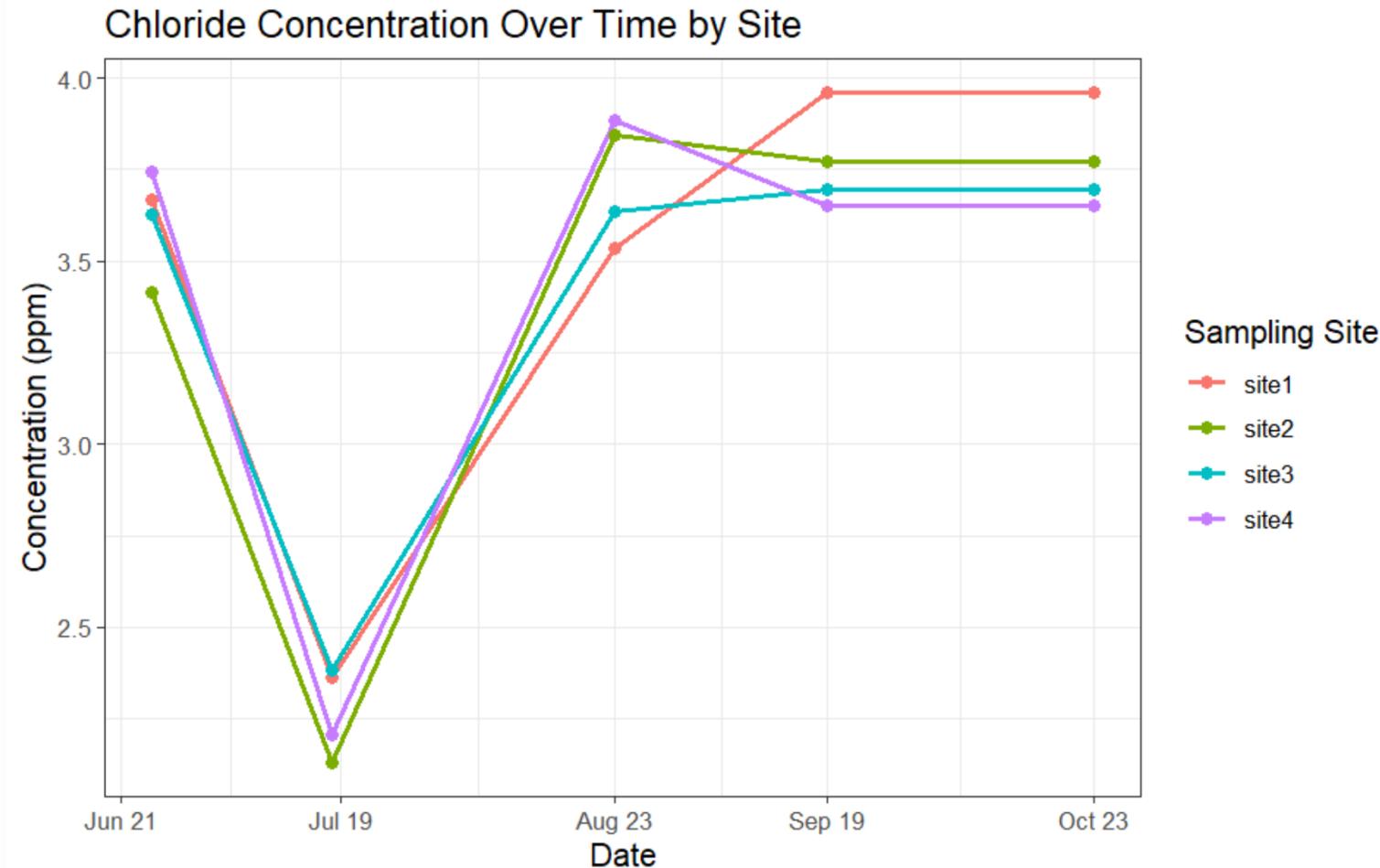
NITRATE

SULFATE

CHLORIDE

BROMIDE

PHOSPHATE



- Chloride serves as an **indicator for salinization** in freshwater
  - Commonly found in road salts and wastewater
- Serves an important **micronutrient** role; small quantities required for protein synthesis
- Elevated levels directly **interfere** with an organisms' ability to **maintain osmotic pressure** - making cell functioning considerably harder
- Can also create stress on infrastructure, like pipes, due to corrosion



PHOSPHAT  
E

NITRAT  
E

SULFAT  
E

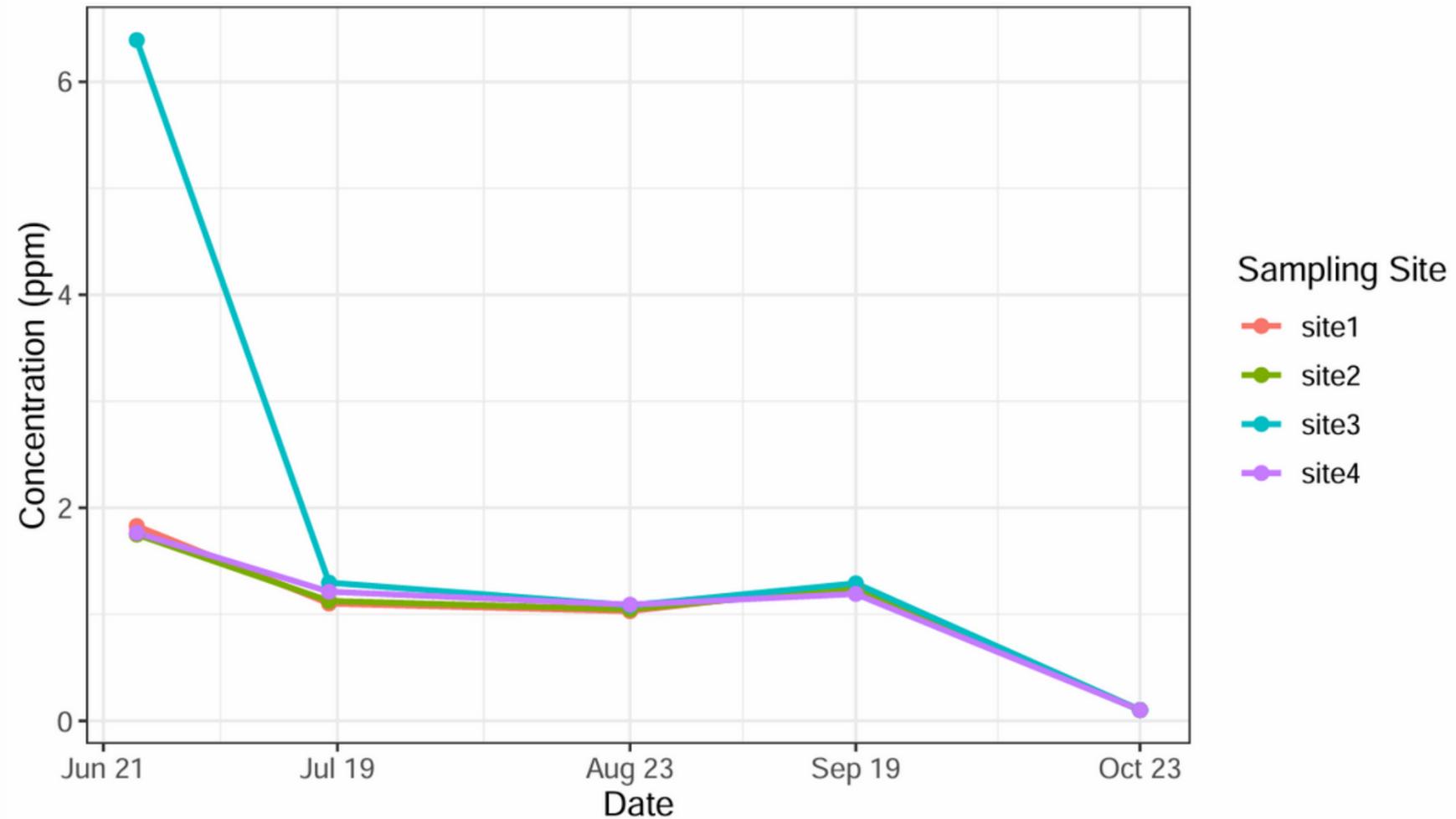
CHLORID  
E

BROMIDE

# SULFATE

Concentration target: < 250 mg/L  
or ppm

Sulfate Concentration Over Time by Site



- Limited direct ties to organism growth but, does **affect nutrient cycling** and release of phosphorus from sediments
- Elevated levels of sulfate can **disrupt ion balance** within organisms, causing stress
  - Plants: Reproduction impacts
  - Invertebrates: Growth inhibition and reproductive stress
  - Fish: Behavioral changes and physical damage
- Common sources include mining and industrial discharge, and fertilizer runoff



BROMIDE

PHOSPHAT  
E

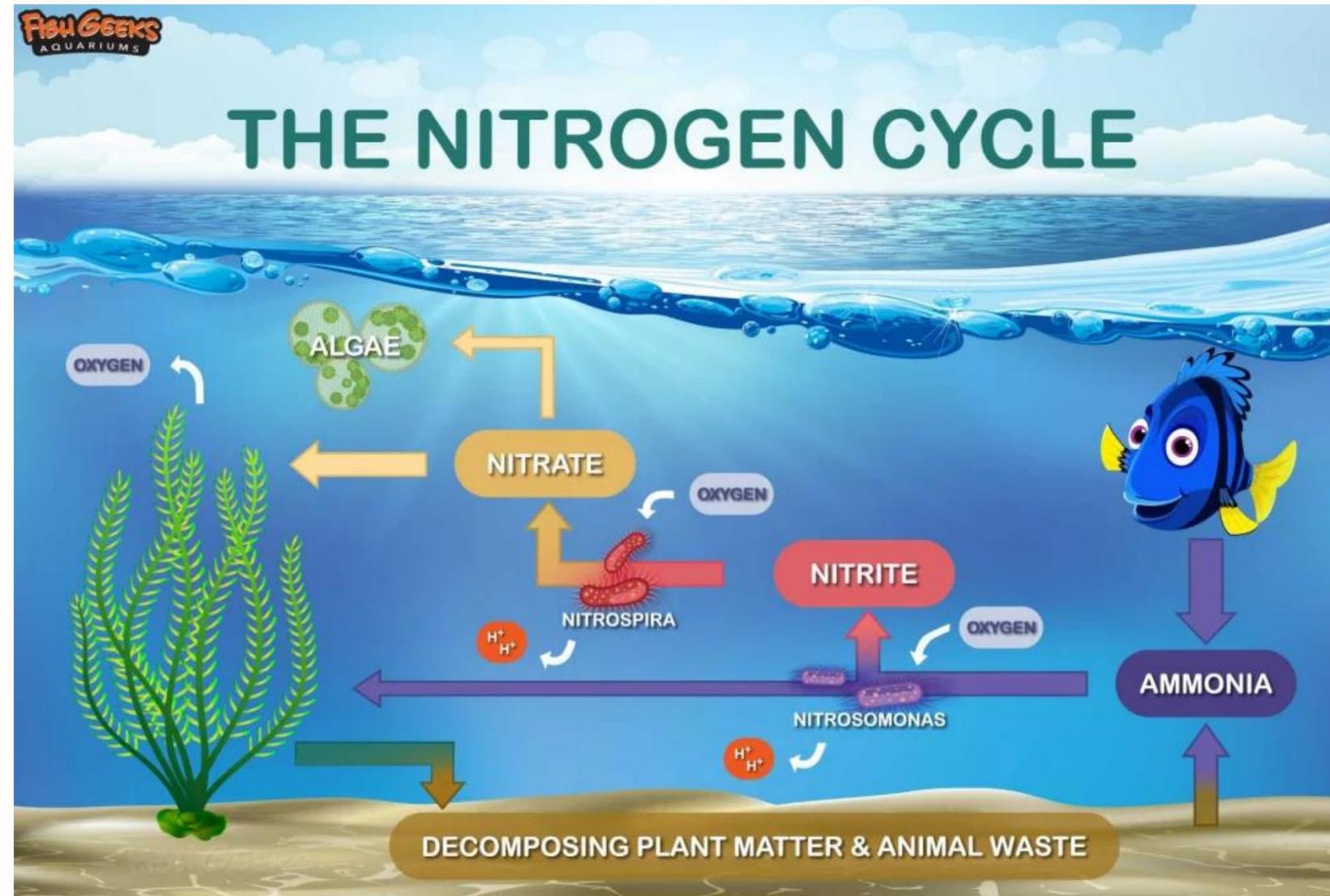
NITRAT  
E

SULFAT  
E

CHLORID  
E

# NITRATE

Target guidelines: < 10 ppm  
Long-term goal: < 1 ppm



Source: <https://fishgeeks.com/the-nitrogen-cycle/>

- Calculated nitrate concentrations were **below the detection limit** for the instrument; low concentrations in the lagoon
- **Crucial nutrient** for organism growth, required for development
- At high concentrations, can be toxic to organisms and humans
- Common sources include: agricultural fertilizer runoff and sewage



# UNDIGESTED PHOSPHATE



## DEFINITION

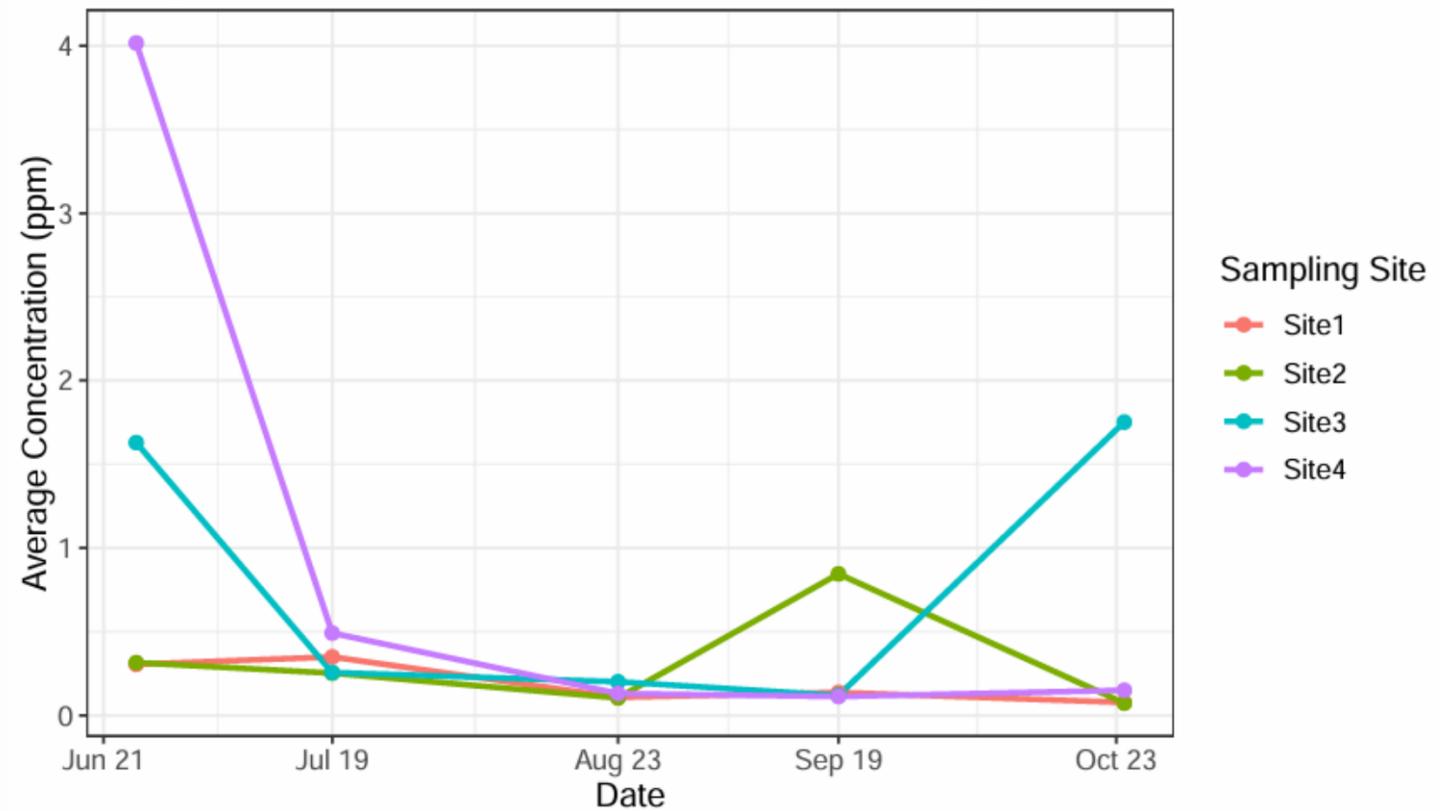
- A measurement of the amount of **orthophosphate** (or dissolved inorganic phosphate) in a sample
- Important in understanding the abundance of **readily available phosphate** for organisms



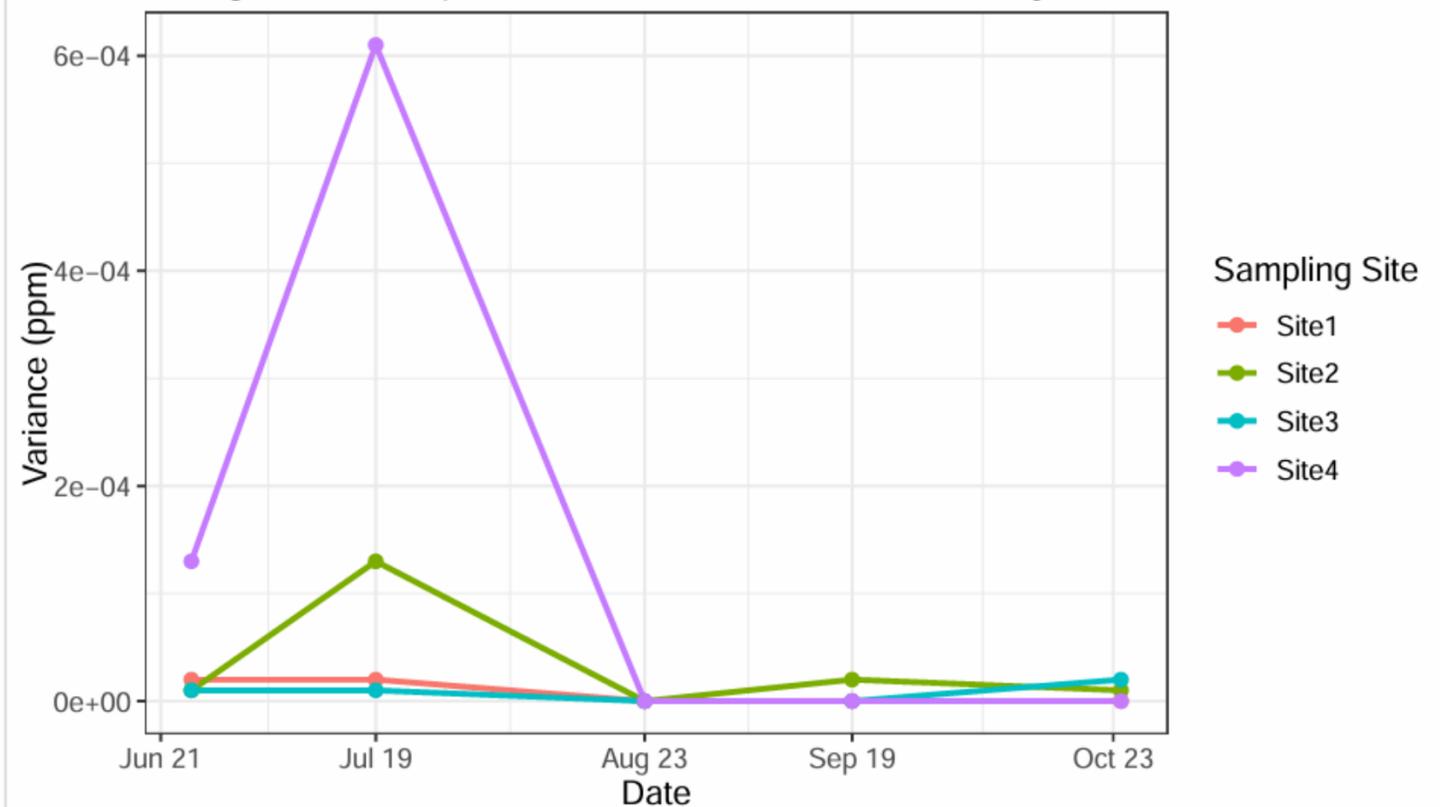
## DATA INTERPRETATION

Extremely low variance between samples; y-axis scale is very small

Undigested Phosphate Concentrations Over Time by Site: Average



Undigested Phosphate Concentrations Over Time by Site: Variance



# DIGESTED PHOSPHATE



## DEFINITION

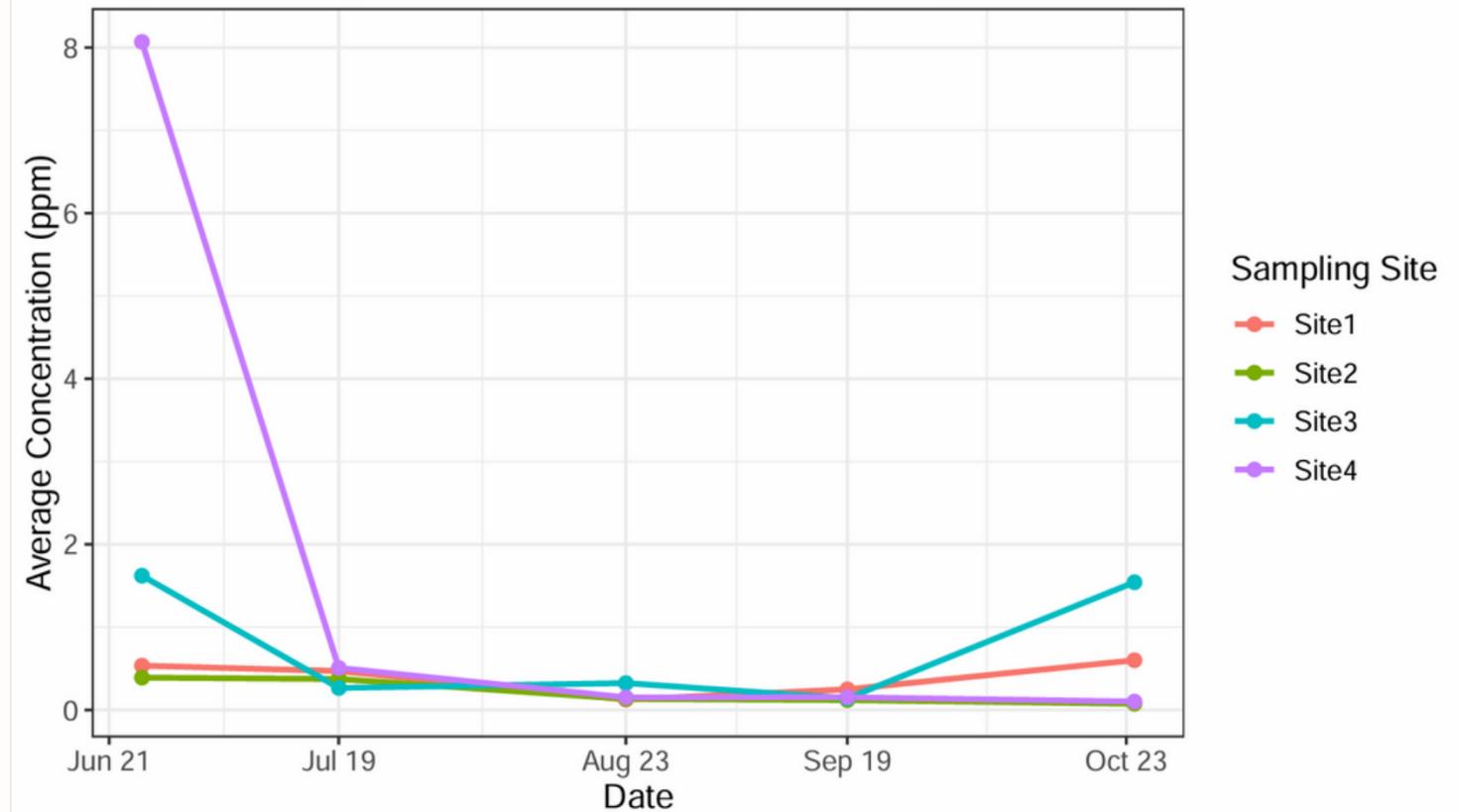
- A measurement of the **total amount of phosphate in a sample** (orthophosphate + any P stored in organic matter)



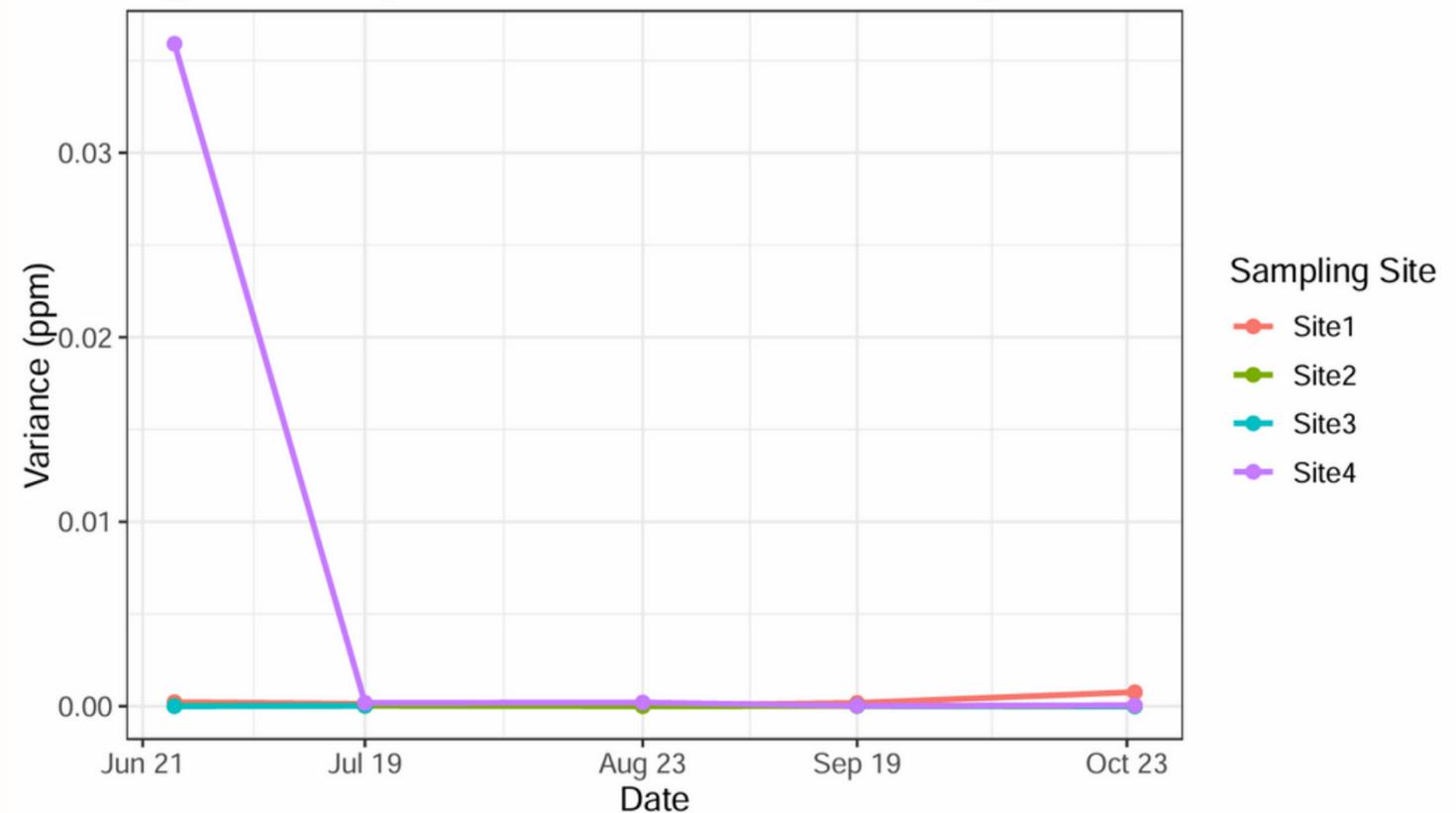
- Important in understanding **large-scale ecosystem processes** and nutrient **DATA INTERPRETATION** cycling

Variance between samples was low, relatively insignificant

Digested Phosphate Concentrations Over Time by Site: Average



Digested Phosphate Concentrations Over Time by Site: Variance



# E. COLI ANALYSIS



## DEFINITION

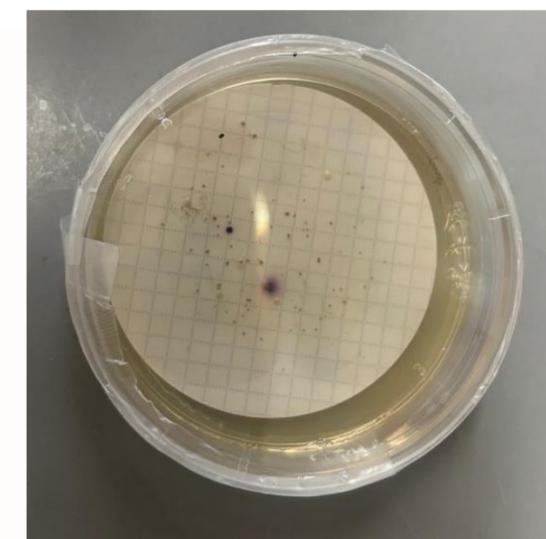
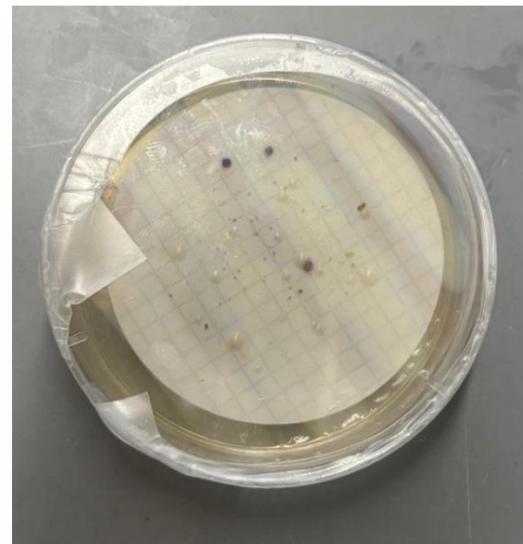
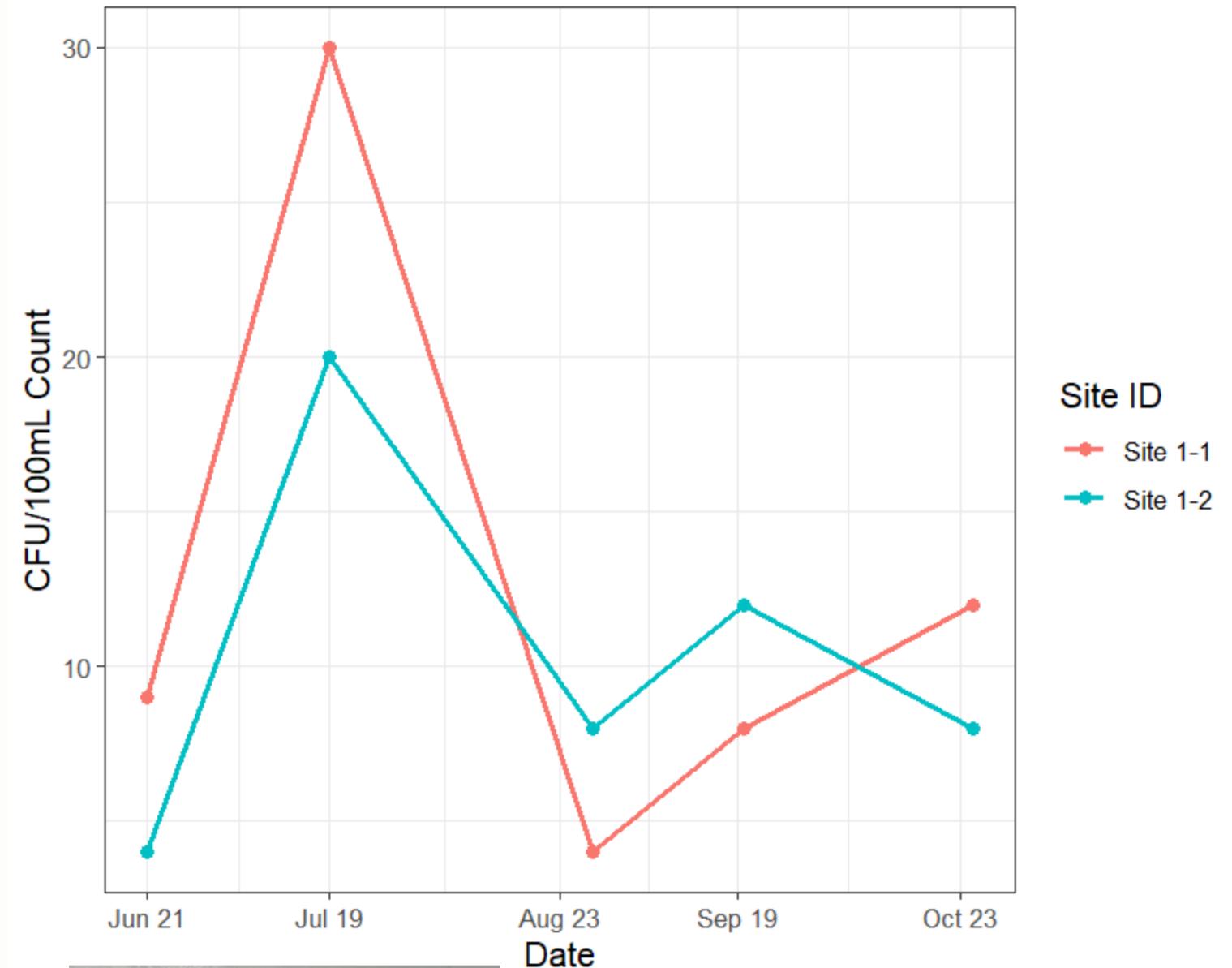
*Escherichia coli* (commonly referred to as *E. coli*) is an indicator of fecal contamination in water. High CFU/100mL counts can directly harm humans and other organisms.



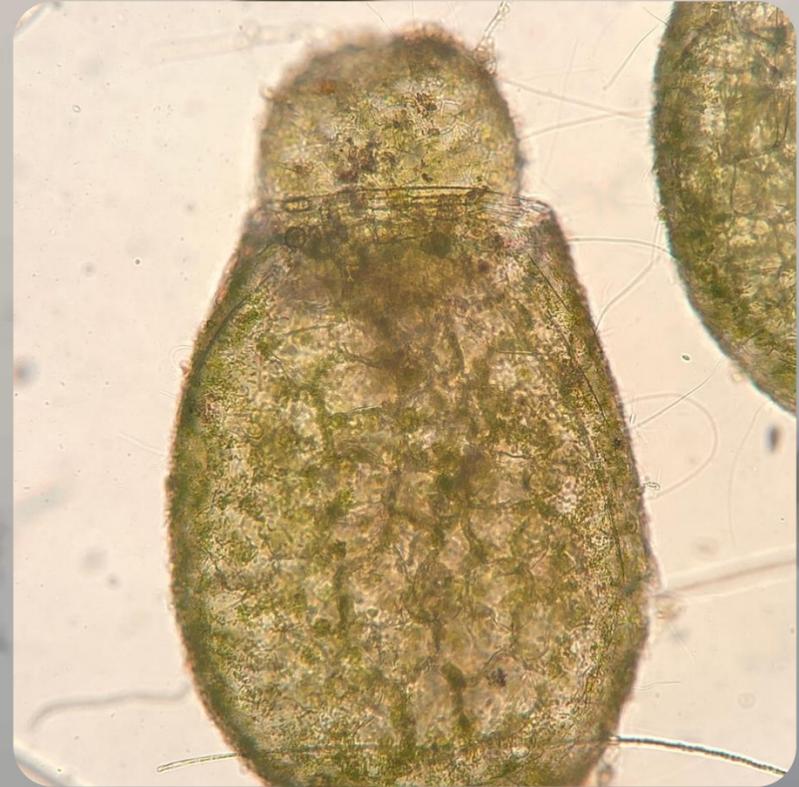
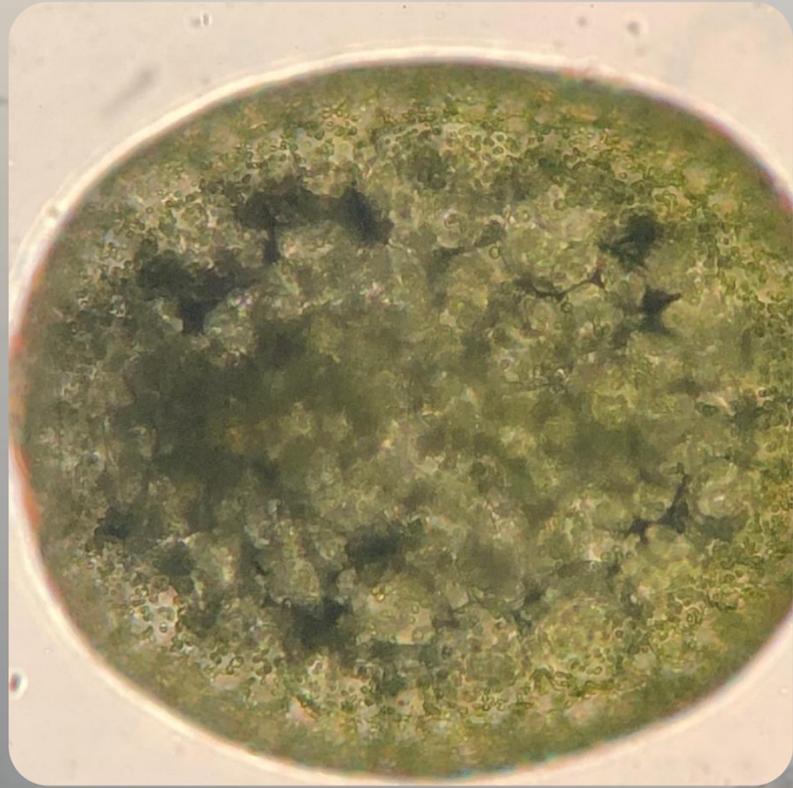
## DATA INTERPRETATION

- 235 CFU/100mL required for beach warning on Bradford beach
- 1000 CFU/100mL required for beach closure on Bradford beach
- CFU counts were <30 on average; low *E. coli* levels suggest few drastic inputs

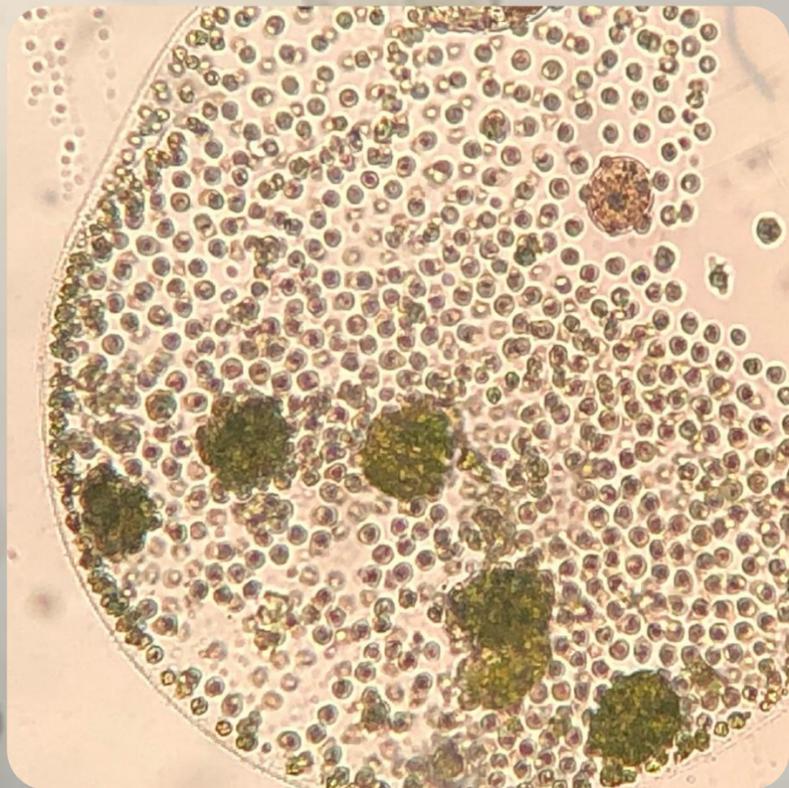
*E. coli* CFU/100mL Counts Over Time



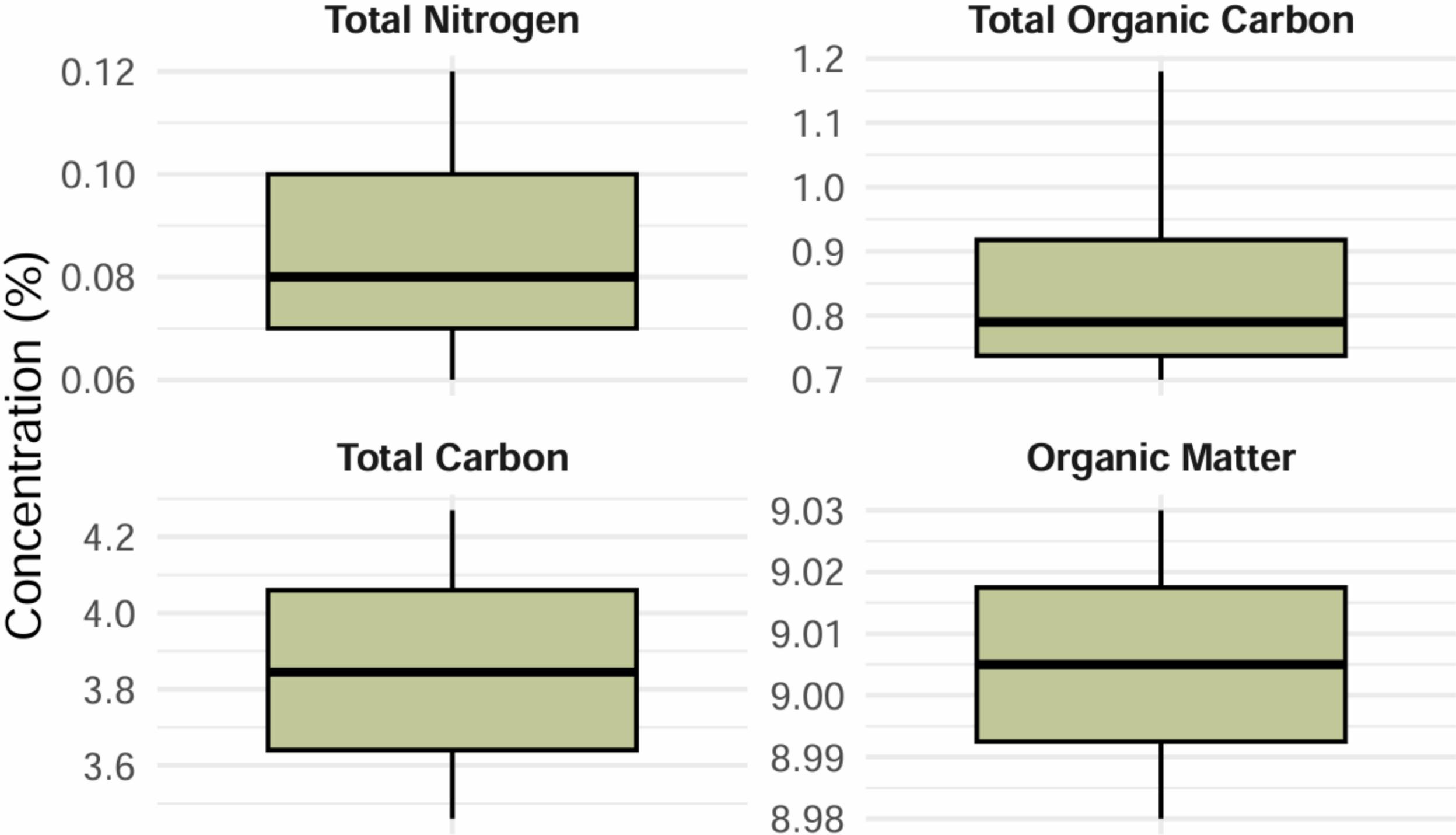








# Sediment Metrics

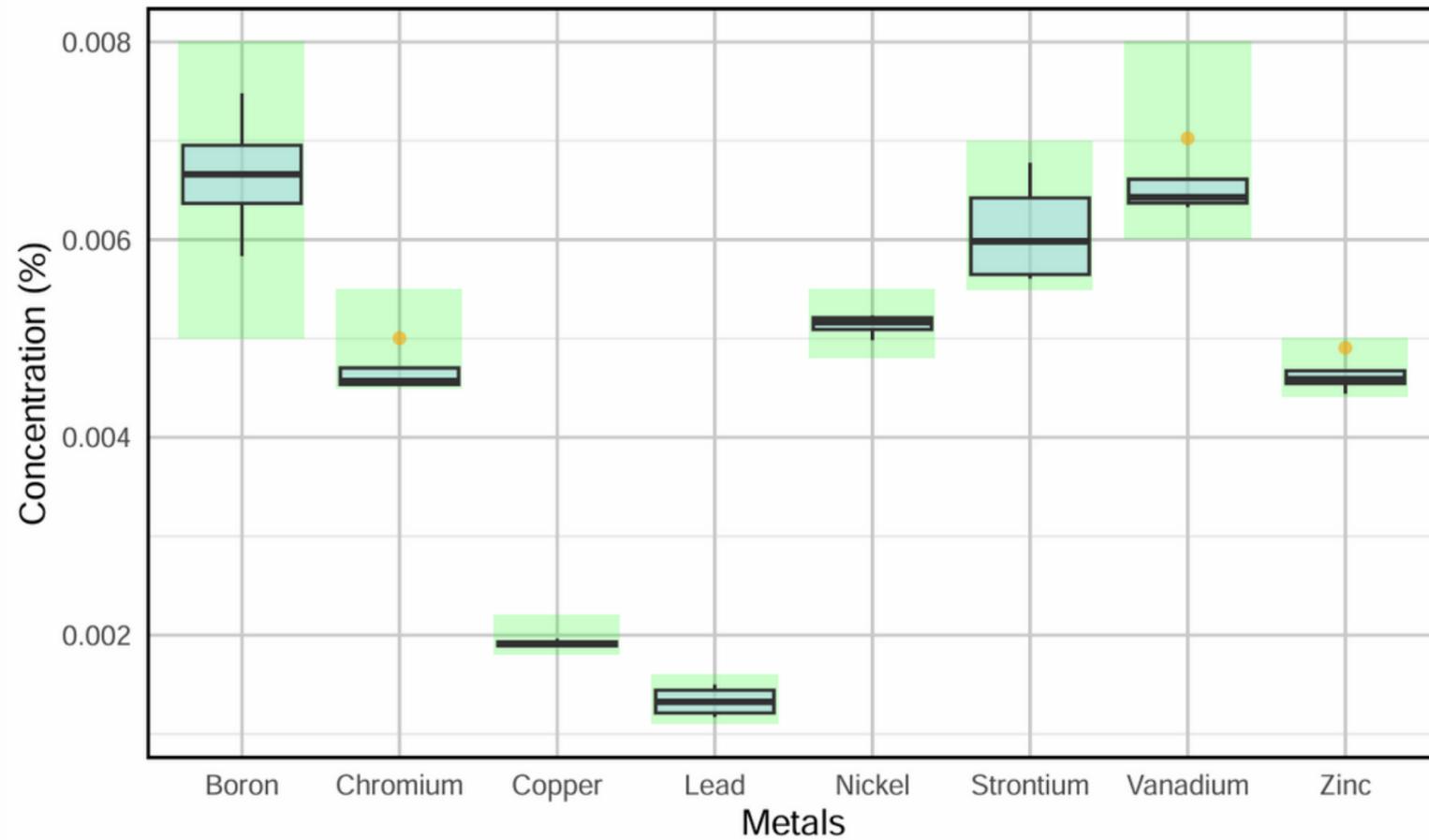


Sediment sampling was carried out on 10/23/25. The following plots show percent concentration of analytes on that same day.



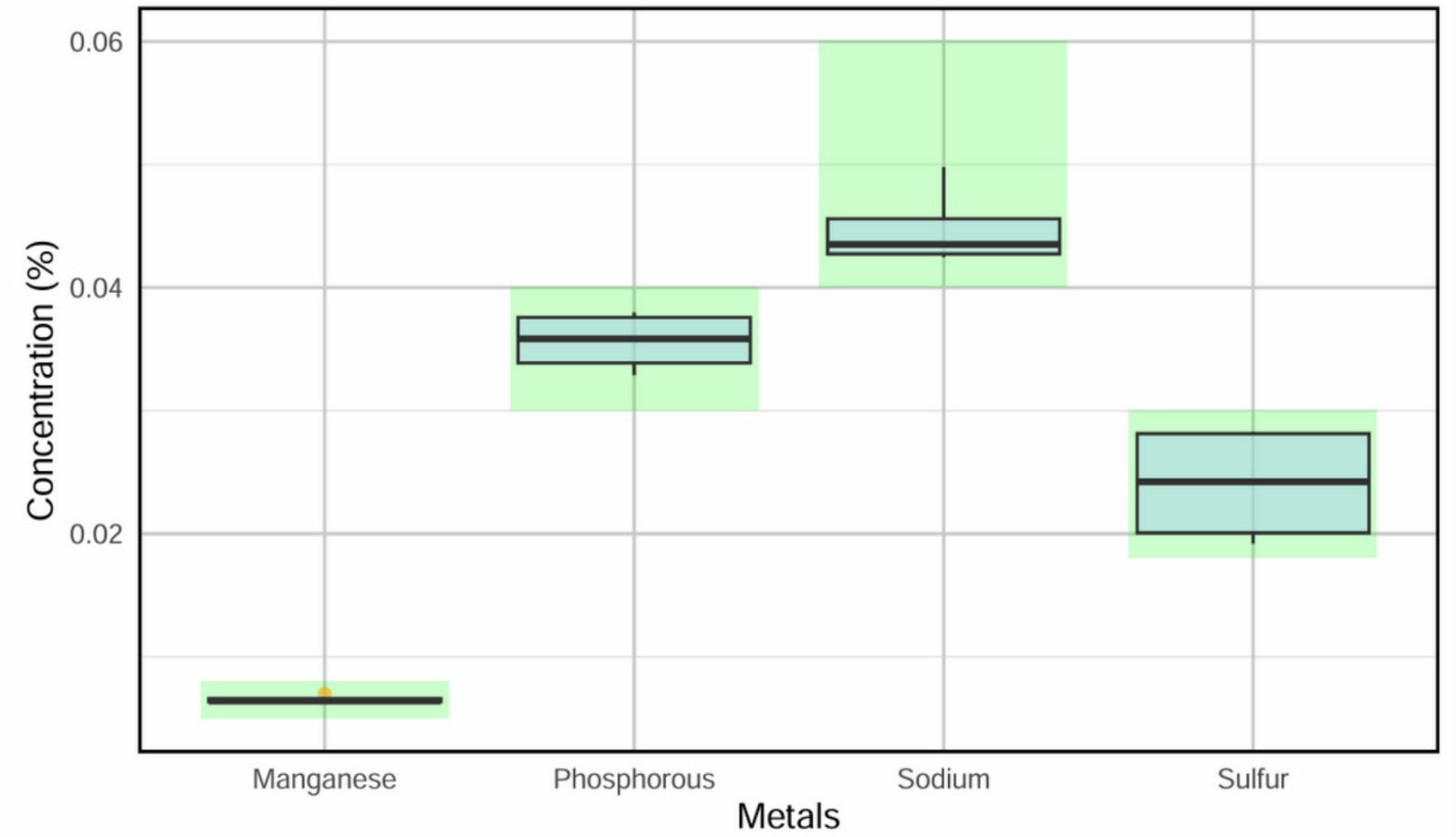
# SEDIMENT

**Additional Trace Metal Concentrations with Freshwater Ranges**



Legend ■ Normal Freshwater Range  Observed Concentrations

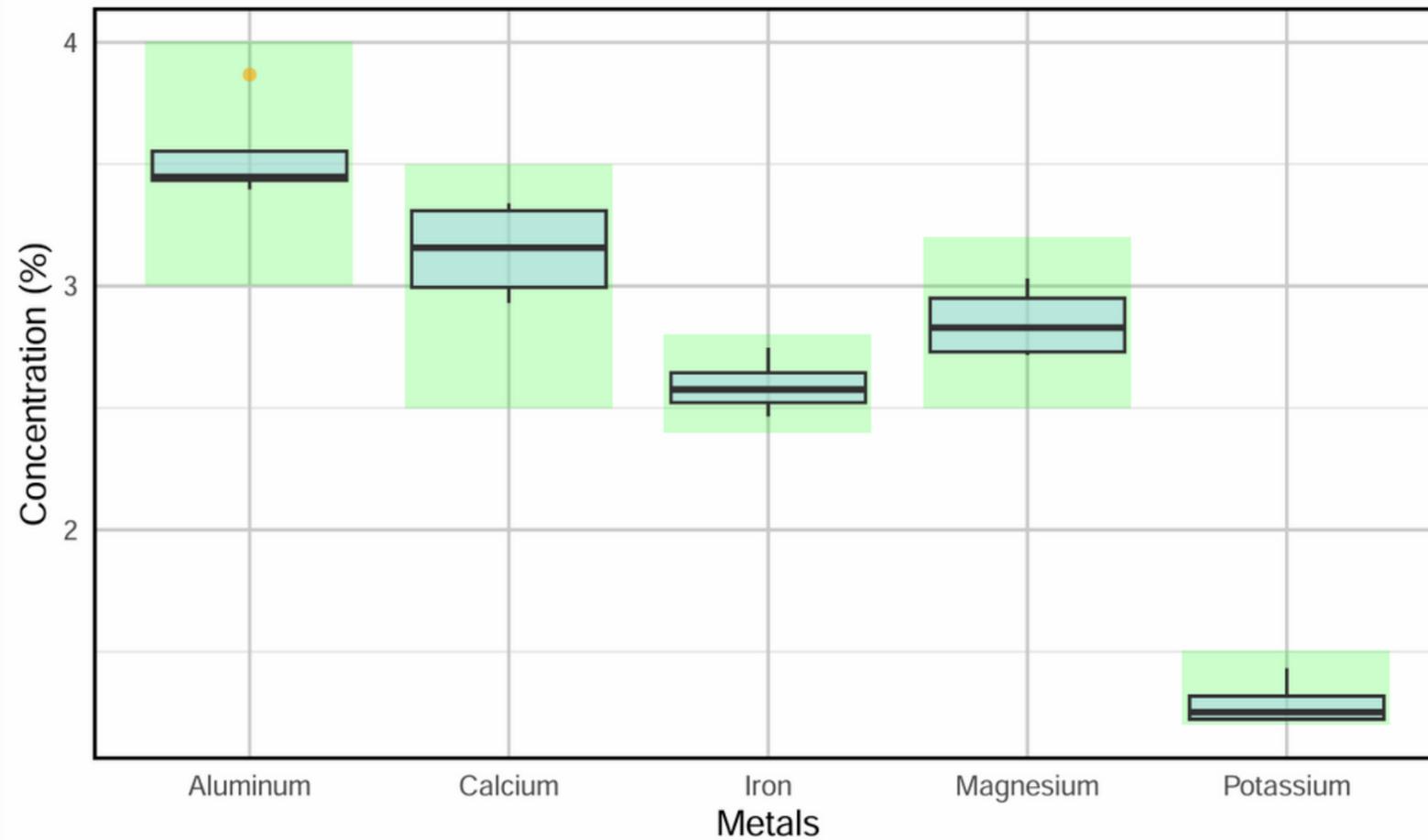
**Trace Element Concentrations with Freshwater Ranges**



Legend ■ Normal Freshwater Range  Observed Concentrations

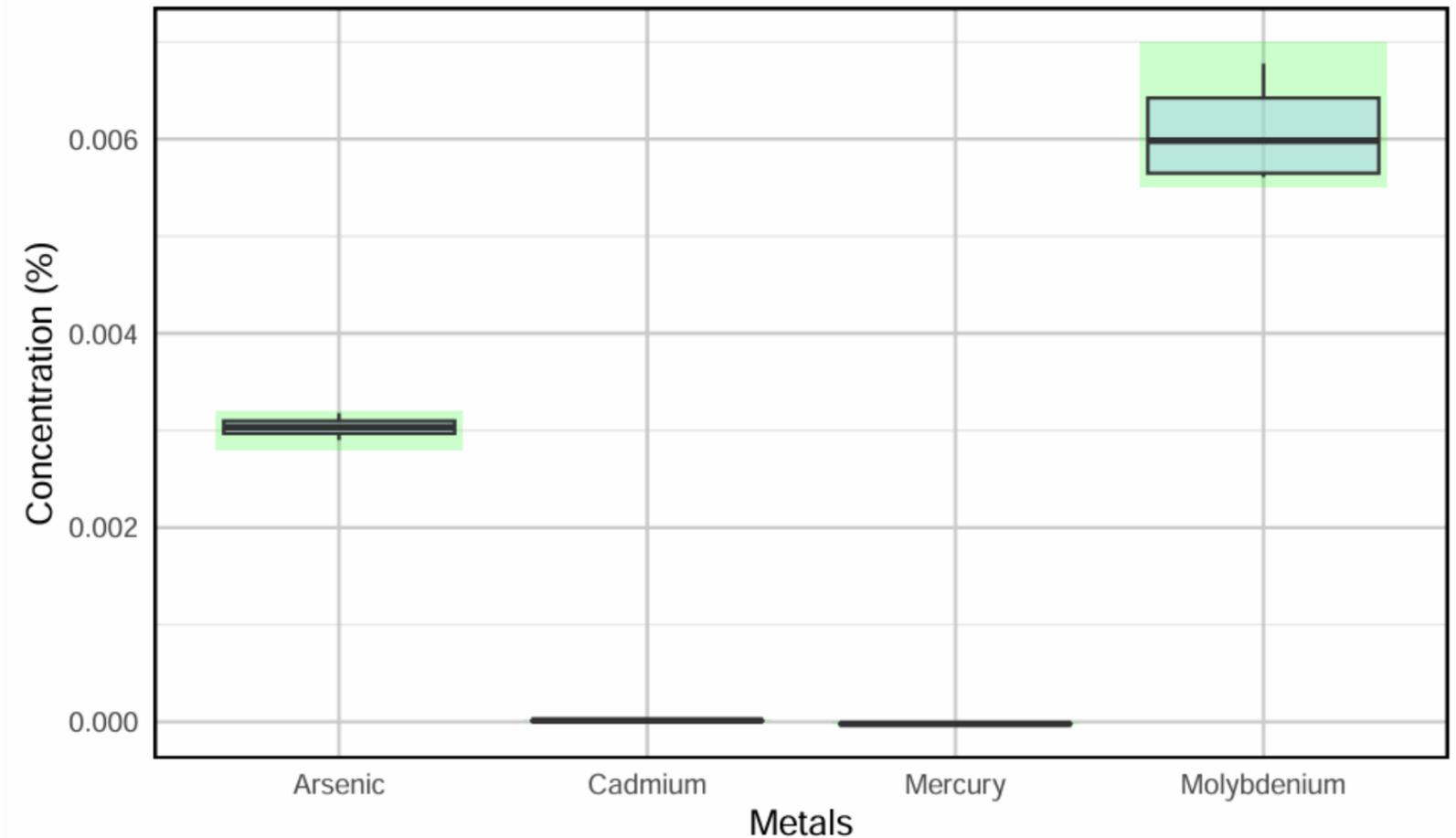
# SEDIMENT CONTINUED

### Sediment Metal Concentrations with Freshwater Ranges



Legend Normal Freshwater Range Observed Concentrations

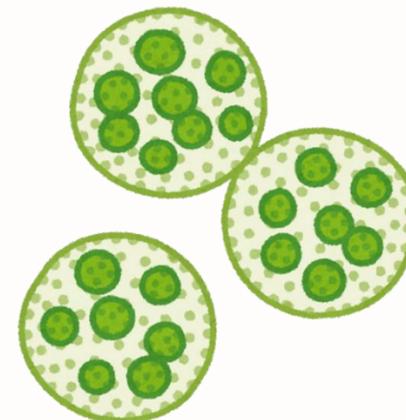
### Final Trace Metal Concentrations with Freshwater Ranges



Legend Normal Freshwater Range Observed Concentrations

# ALGAL BLOOM CAUSES

- High phosphorus and low Nitrogen in water
- Summer heat
- Heat trapping
- Stagnant hydrology
- Organic sediment matter





# UPLAND BUFFER & TRANSITIONAL ZONES



**BOG BIRCH**  
**(*BETULA PUMILA*)**



**WINTERBERRY**  
**(*ILEX VERTICILLATA*)**



**GREY DOGWOOD**  
**(*CORNUS RACEMOSA*)**



**RED OSIER**  
**(*CORNUS SERICEA*)**





# PRAIRIE TYPE PLANTS



**BONESET (EUPATORIUM  
PERFOLIATUM)**



**SPOTTED JOE-PYE WEED  
(EUTOCHIUM  
MACULATUM)**



**BLUE VERBENA  
(VERBENA HASTATA)**



**CARDINAL FLOWER  
(LOBELIA CARDINALIS)**



# EMERGENT WETLAND PLANTS



**PICKERELWEED  
(PONTEDERIA CORDATA)**



**SOFT-STEM BULRUSH  
(SCHOENOPLECTUS  
TABERNAEMONTANI)**



**ARROWHEAD  
(SAGITTARIA LATIFOLIA)**



**THREEWAY SEDGE  
(DULICHIMUM  
ARUNDINACEUM)**



## **FLOATING LEAF PLANTS (ROOTED)**



**FRAGRANT WATER LILY  
(*NYMPHAEA ODORATA*)**



**WATER SMARTWEED  
(*PERSICARIA AMPHIBIA*)**



**WATERSHIELD  
(*BRASENIA SCHREBERI*)**



**SPATTERDOCK  
(*NUPHAR ADVENA*)**

# HUMBOLDT PARK REPORT CARD 2025

## WATERSHED SCORING

LAGOON GRADE  
**B-**

	JUNE 20	JULY 18	AUG. 22	SEPT. 18	OCT. 23	
TEMPERATURE .....	B	A	A	A	D	B
DISSOLVED OXYGEN .....	D	C	D	D	D	D
pH .....	A	A	A	C	B	B
TURBIDITY .....	A	B	D	A	A	B
PHOSPHORUS .....	C	A	A	A	B	B
CONDUCTIVITY .....	A	B	A	A	A	A
E. COLI .....	A	A	A	A	A	A
NITROGEN .....	A	A	A	A	A	A
TRACE METAL .....	-	-	-	-	A	A

JUNE 20	JULY 18	AUG. 22	SEPT. 18	OCT. 23	
B	B	B	B	C	<b>B-</b>

# COST OPTIONS



## MEDIUM-COST OPTIONS TARGETED INTERVENTIONS

- Phosphorus binding treatments
- Hotspot dredging.



## LOW-COST OPTIONS

- Volunteers
- Aerators or Fountains
- Canoeing and Kayaking



## LONG-TERM OPTIONS - SUSTAINABLE MANAGEMENT

- Regular monitoring
- Habitat restoration
- Larger-scale circulation



A photograph of two individuals in outdoor gear on a wooden dock. The person on the left is wearing a blue jacket, black beanie, and glasses, crouching and holding a white bottle. The person on the right is wearing a grey jacket, grey beanie, glasses, and green rubber boots, pouring water from a blue bucket into a white bottle. The background shows a lake and trees with autumn foliage.

**THANK YOU**