



# Internal Phosphorus Loading from USJRB Lakes

*Tracey Schafer, Ashley R. Smyth, Mark Brenner, K.R. Reddy, Rex Ellis, Josh Papacek, & Todd Z. Osborne*



# Internal Phosphorus Loading from a USJRB Lake (Blue Cypress Lake)

*Tracey Schafer, Ashley R. Smyth, Mark Brenner, K.R.  
Reddy, Rex Ellis, Josh Papacek, & Todd Z. Osborne*

**Gainesville**



Big Bend Seagrasses Aquatic Preserve

Image Landsat / Copernicus  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google Earth

Imagery Date: 12/13/2015 29°44'21.01" N 78°27'29.33" W elev -2719 ft eye alt 311.18 mi

**Gainesville**

**Blue  
Cypress  
Lake**

Image Landsat / Copernicus  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google Earth

Imagery Date: 12/13/2015 29°44'21.01" N 78°27'29.33" W elev -2719 ft eye alt 311.18 mi

# Why are we interested in Blue Cypress Lake?



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- Blue Cypress Lake is popular for recreational purposes, including:
  - Fishing
  - Boating
  - Sight-seeing



HEALTH

# World Health Organization deems Blue Cypress Lake toxic algae bloom very highly hazardous



[Tyler Treadway](#)

Treasure Coast Newspapers

Published 5:28 p.m. ET June 14, 2018 | Updated 5:39 p.m. ET June 14, 2018



HEALTH

# World Health Organization deems Blue Cypress Lake toxic algae bloom very highly hazardous



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NEWS > TREASURE COAST > REGION INDIAN RIVER COUNTY



## Head scientist at Smithsonian in Fort Pierce explains blue-green algae growing in Blue Cypress Lake

Dr. Valerie Paul says growth likely caused by summer temperatures Florida has been experiencing



HEALTH

# World Health Organization deems Blue Cypress Lake toxic algae bloom very highly hazardous



[Tyler Treadway](#)

Treasure Coast Newspapers

TCPalm.

**BREAKING NEWS:** Former President Donald Trump will be at Fort Pierce courthouse

[ News ] Indian River Martin St. Lucie Sports Advertise Obits eNewspaper Legals

INDIAN RIVER COUNTY

## Harmful algae found at Blue Cypress Lake; Visitors warned not to touch water

*Hot temperatures causing algae blooms*



[Ed Killer](#)

Treasure Coast Newspapers

Published 3:55 p.m. ET March 3, 2023



INDY



## Monian in Fort Pierce is growing in Blue

summer temperatures Florida has

HEALTH

# World Health O Blue Cypress La very highly haz



**Tyler Treadway**

Treasure Coast Newspapers

**BREAKING NEWS:** Former

TCPalm.

[ News ] Indian River Martin St. Lucie Spor

INDIAN RIVER COUNTY

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## Harmful blue-green algae toxins found at Blue-Cypress Lake

Written by: Nick Samuel June 21 2022

INTY



## sonian in Fort Pierce e growing in Blue

summer temperatures Florida has

# Are biosolids to blame?

HEALTH

## Is Blue Cypress Lake phosphorus pollution from Ranch's biosolids?



[Tyler Treadway](#)

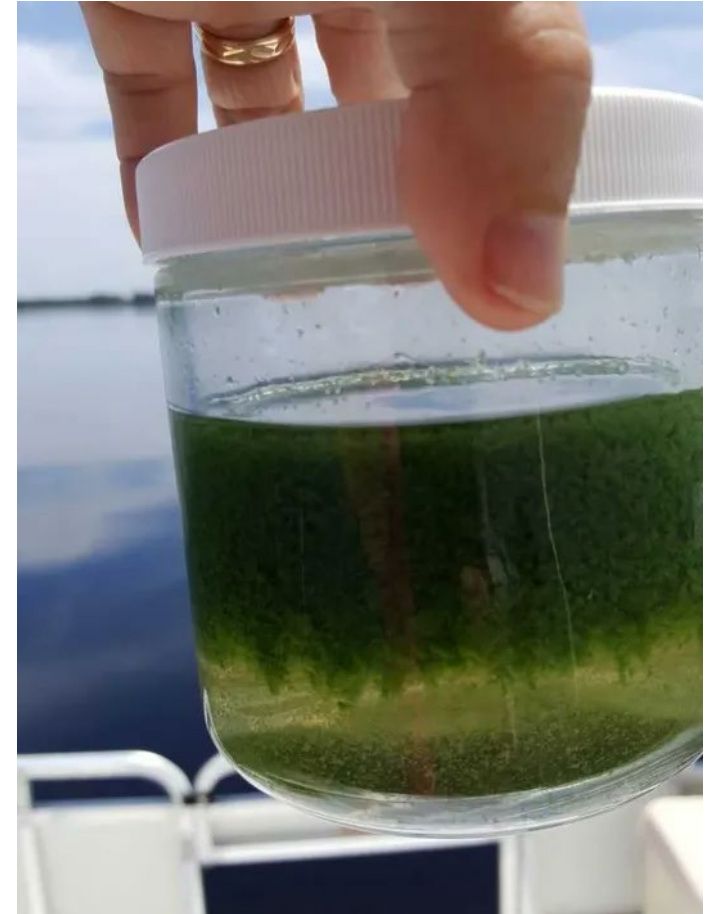
Treasure Coast Newspapers

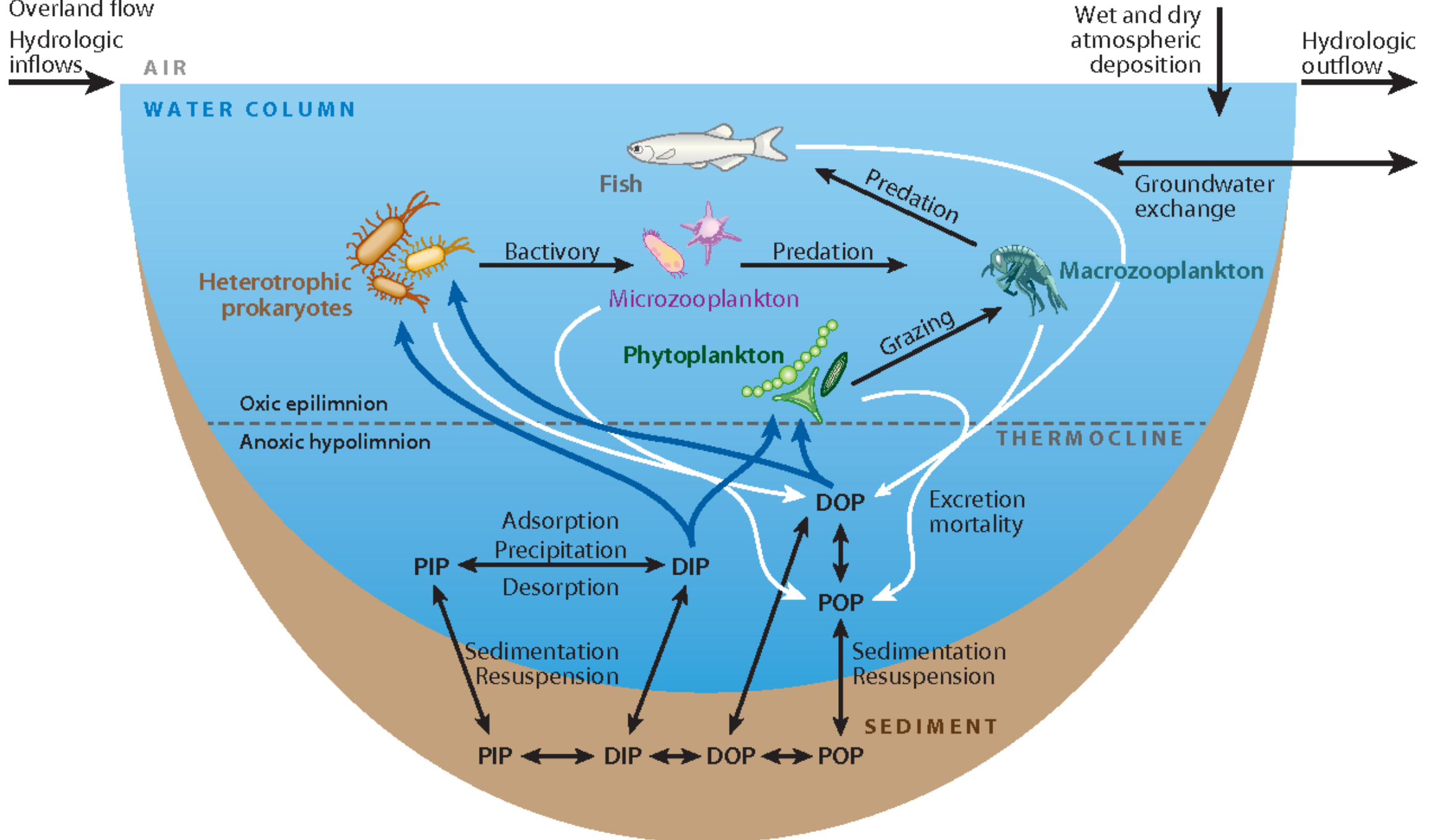
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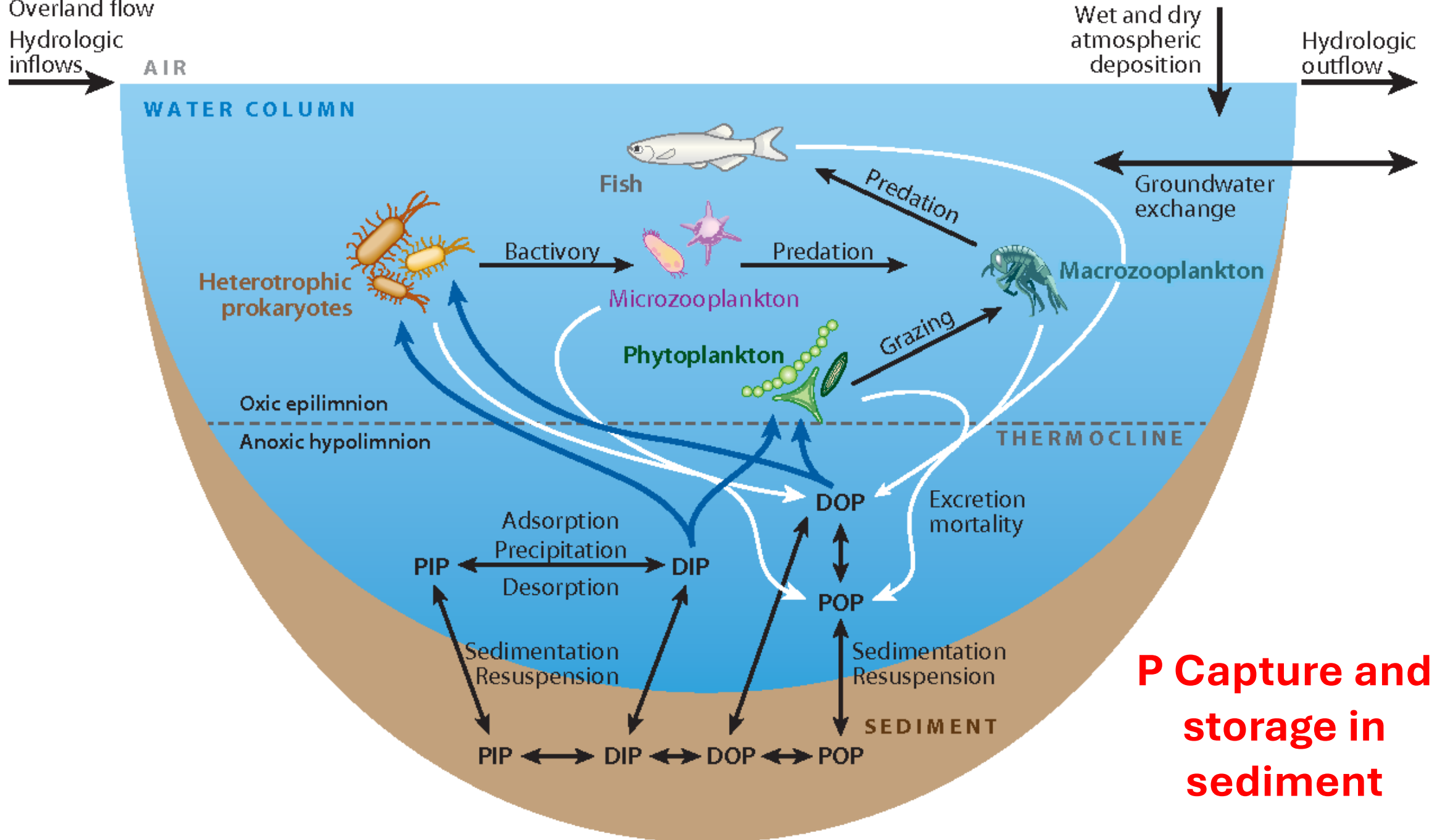


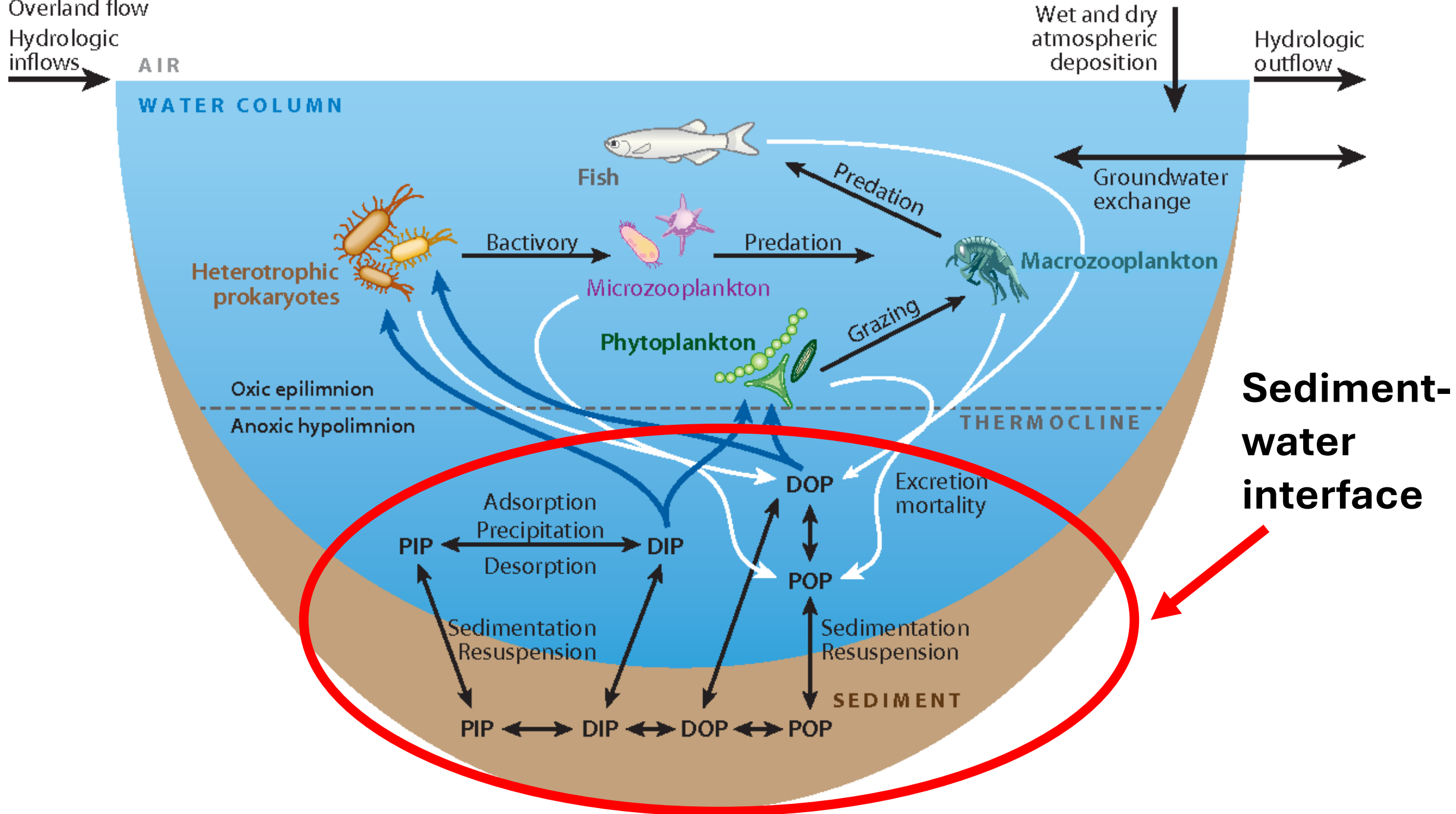
# Are the blooms linked to biosolids?

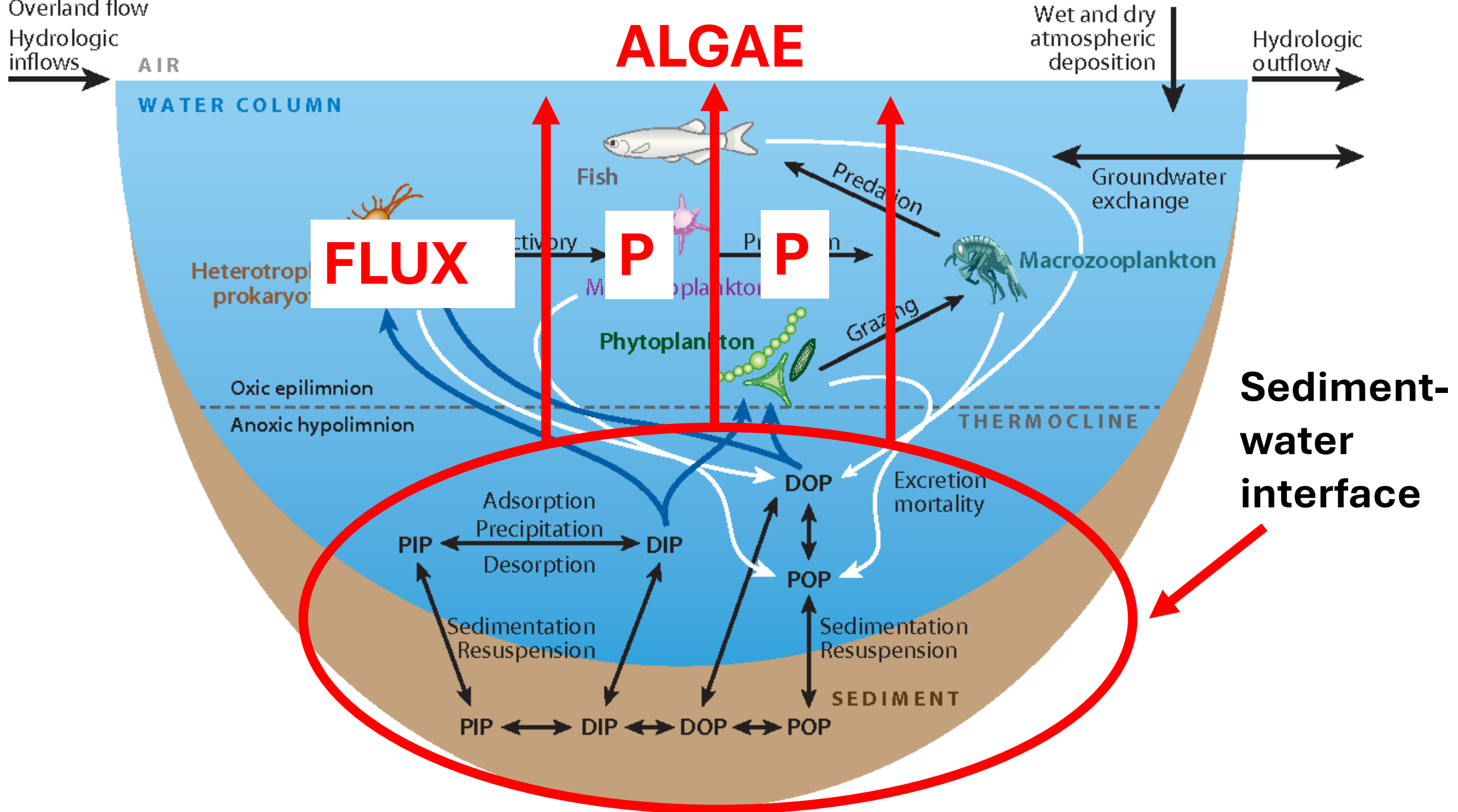
- Biosolids addition in nearby agricultural areas could be culprit of toxic blue-green algal blooms?
- Could these new blooms be coming from historical biosolids loading over the past 40 years that deposits excess P (and N) into benthic sediments?



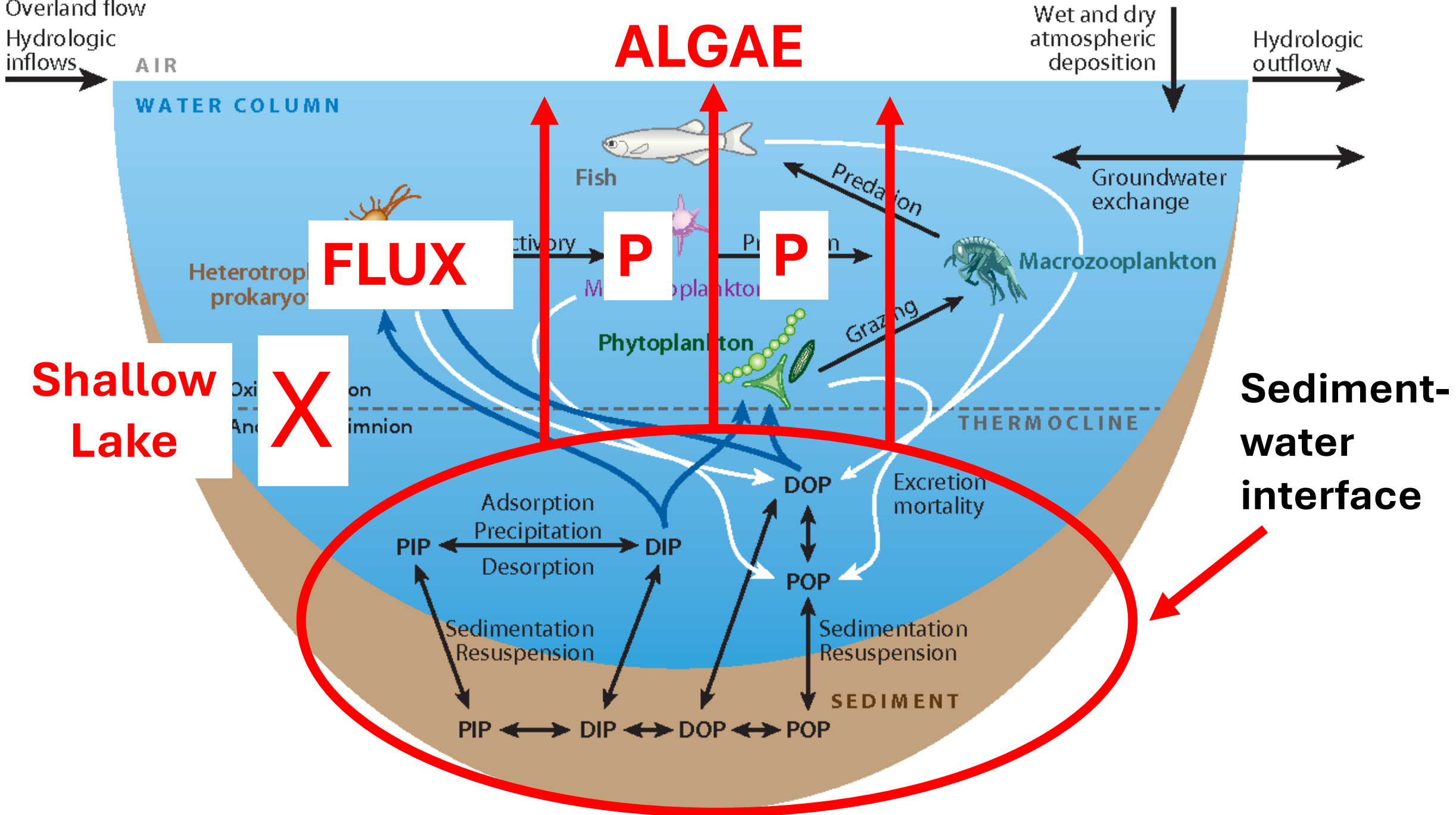


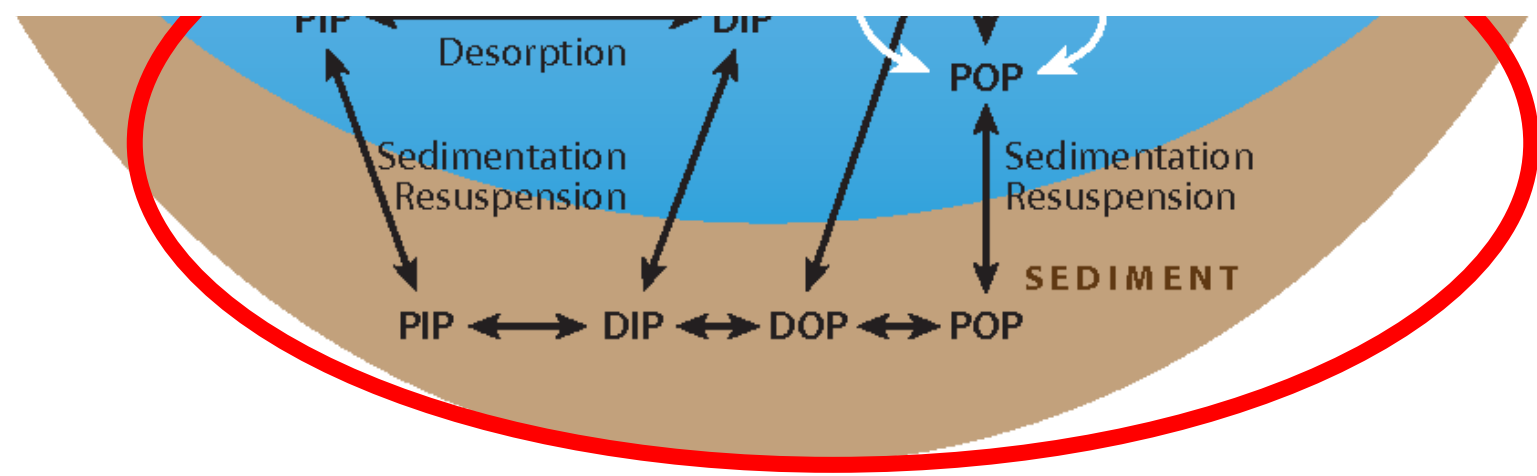
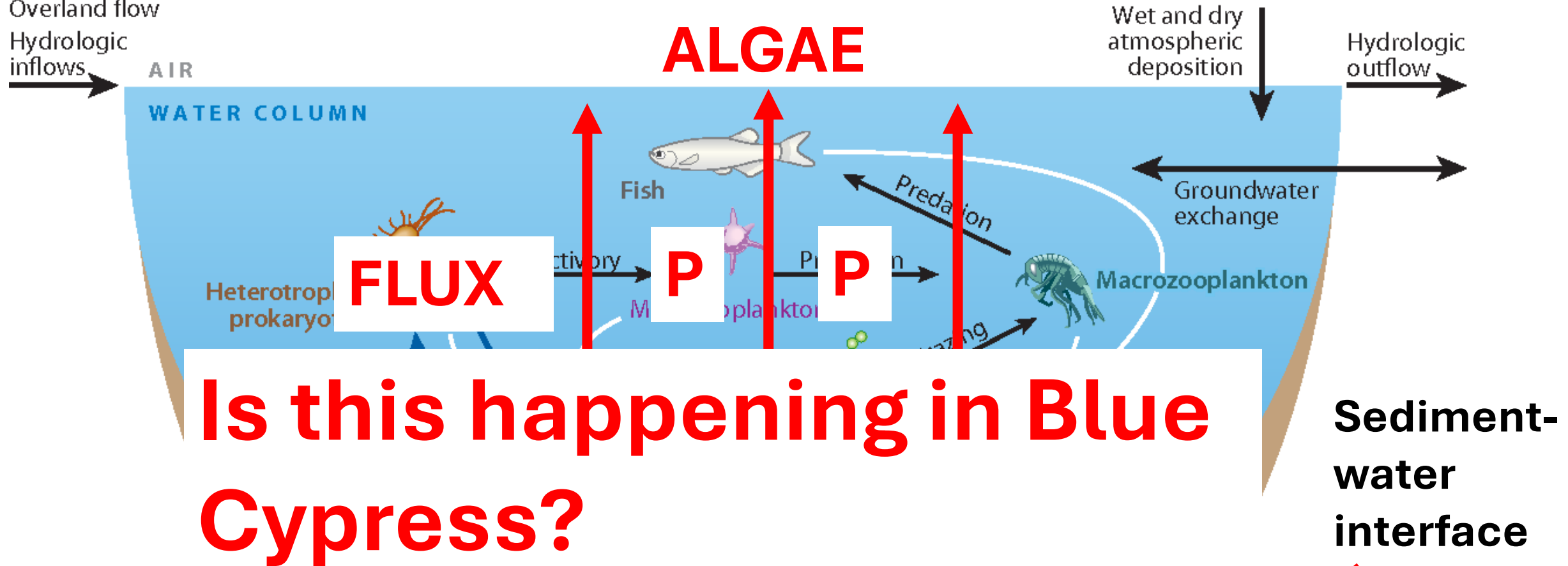












# Methodology

- Characterize sediment
  - Short 10 cm cores looking at various forms of P (and other nutrients/metals)
  - Long 80 cm cores dating source material
- Flux experiment
  - Examining fluxes of various P (and N) species from the sediments into the water column in a laboratory setup

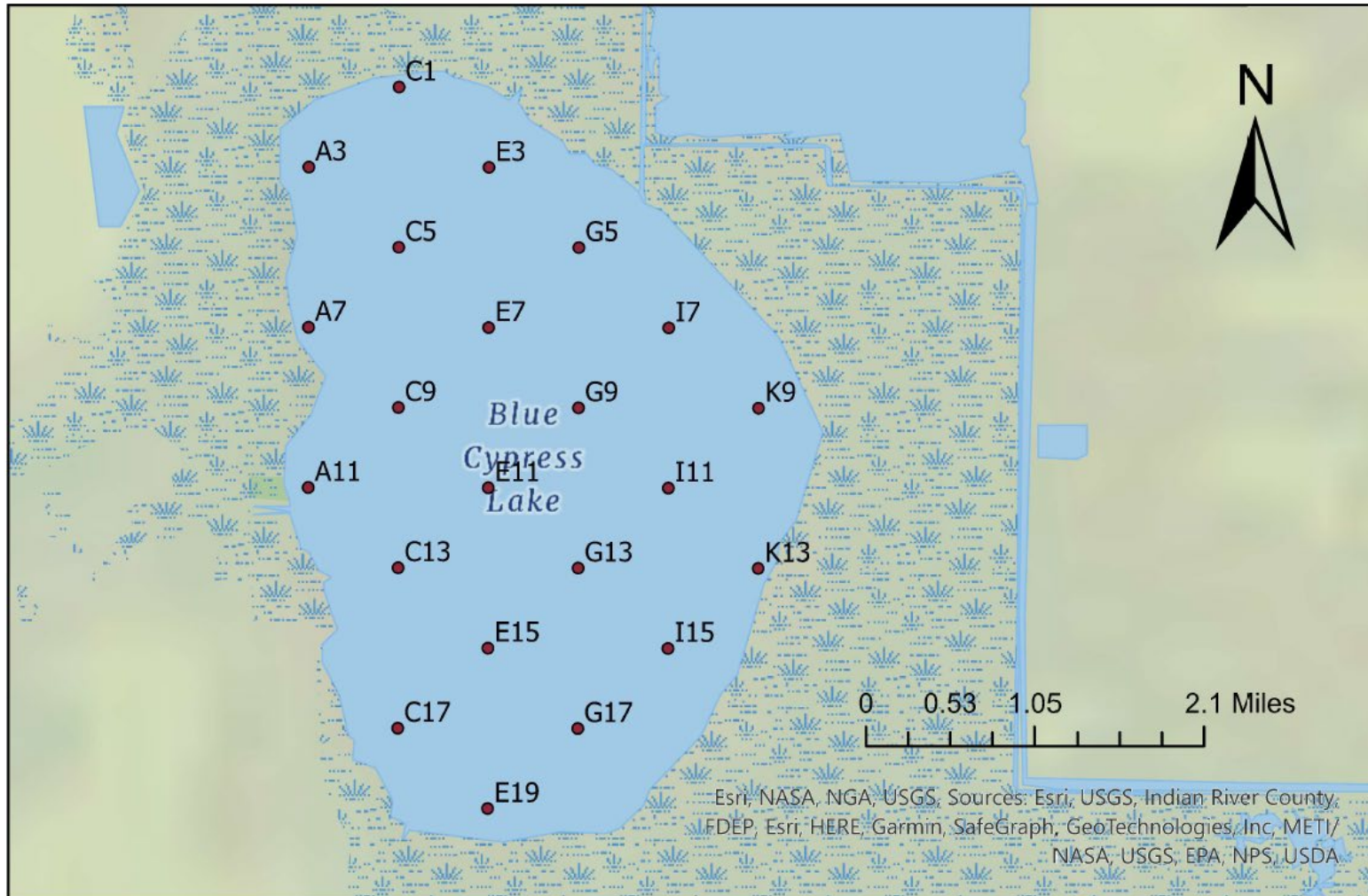
# Methodology

- Characterize sediment
  - **Short 10 cm cores looking at various forms of P (and other nutrients/metals) (Tracey Schafer and Todd Osborne)**
  - Long 80 cm cores dating source material (Mark Brenner and Jason Curtis)
- Flux experiment
  - **Examining fluxes of SRP species from the sediments into the water column in a laboratory setup (Ashley Smyth)**

# Core Incubation



# Characterization of Blue Cypress Lake



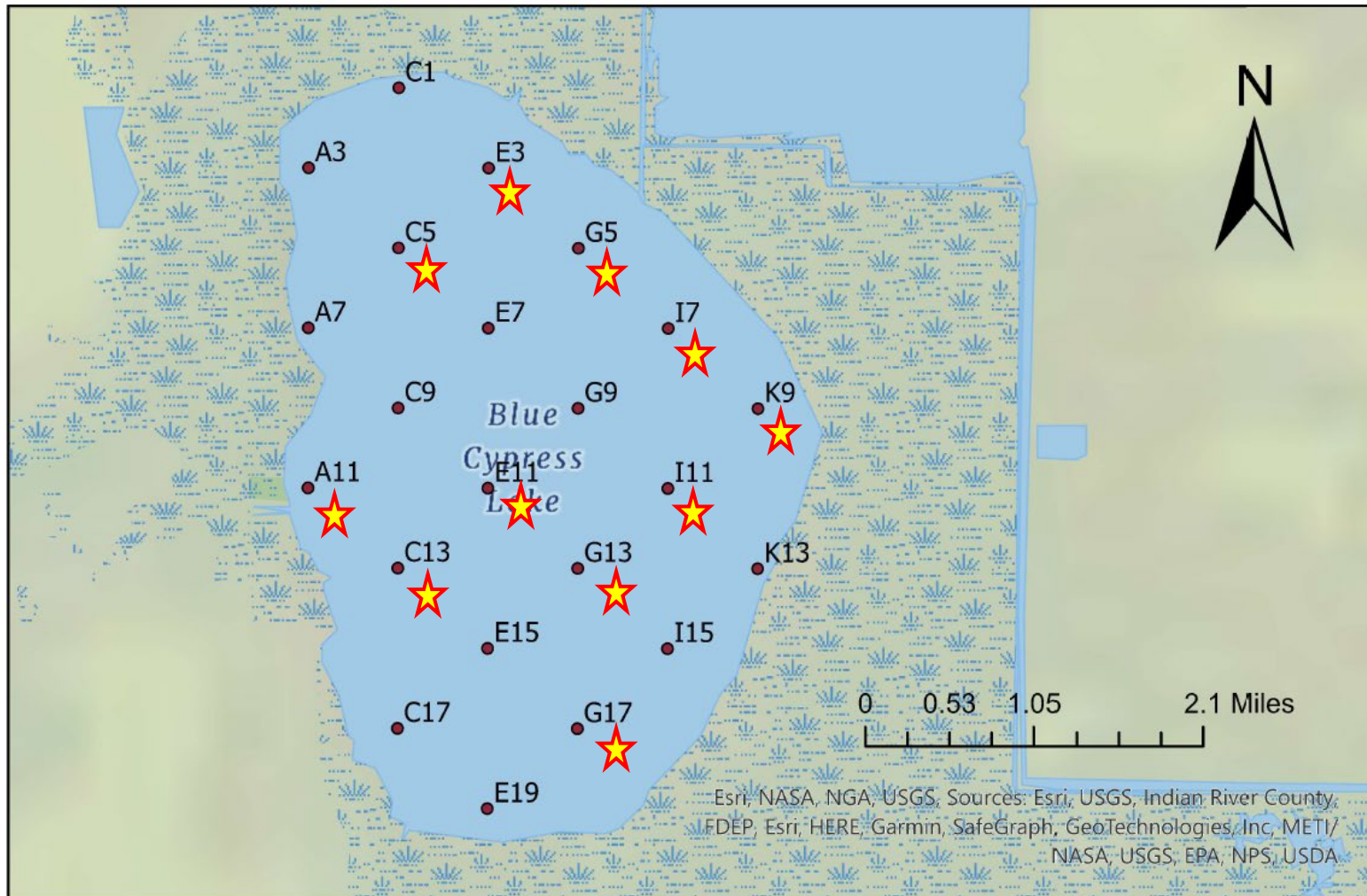
## Field:

- **22 sites**
- **10% sites replicated**

## Lab:

- **TP, OM, Fe in sediment and SRP in porewater**

# Flux Experiment of Blue Cypress Lake



## Field:

- **11 duplicate sites**
- **Cores collected and brought intact to TREC in Homestead, FL**

## Lab:

- **SRP flux**

# **Characterization Results**



# Correlations

	Sediment TP	PW SRP
Al	-0.24898	0.073958
Ca	-0.33039	0.066819
Fe	<b>0.73761</b>	-0.29212
Mg	0.022998	0.016275
TP	1	-0.31977
OM (%)	<b>0.856133</b>	<b>-0.44416</b>
PW_SRP	-0.31977	1
PW_Ca	-0.15393	-0.00216
PW_Fe	0.292981	0.019138
PW_Mg	0.201303	-0.09181

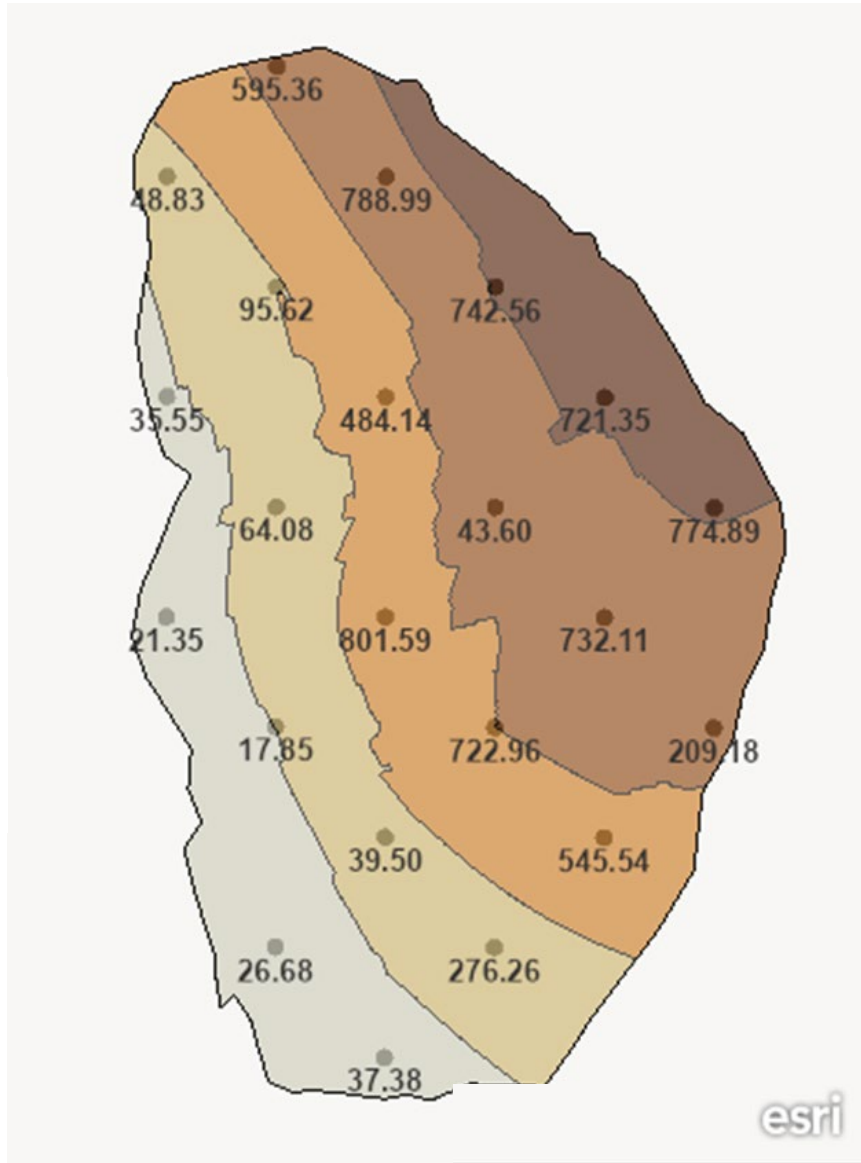
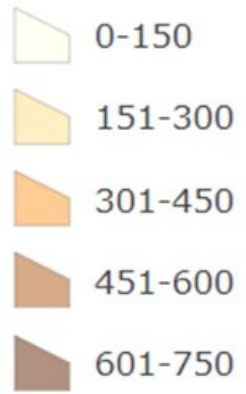
# Correlations

**TP appears to be most strongly linked to Fe and OM concentrations**

\* Not too surprising and can be seen in other lakes

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### Soil TP (mg/kg)

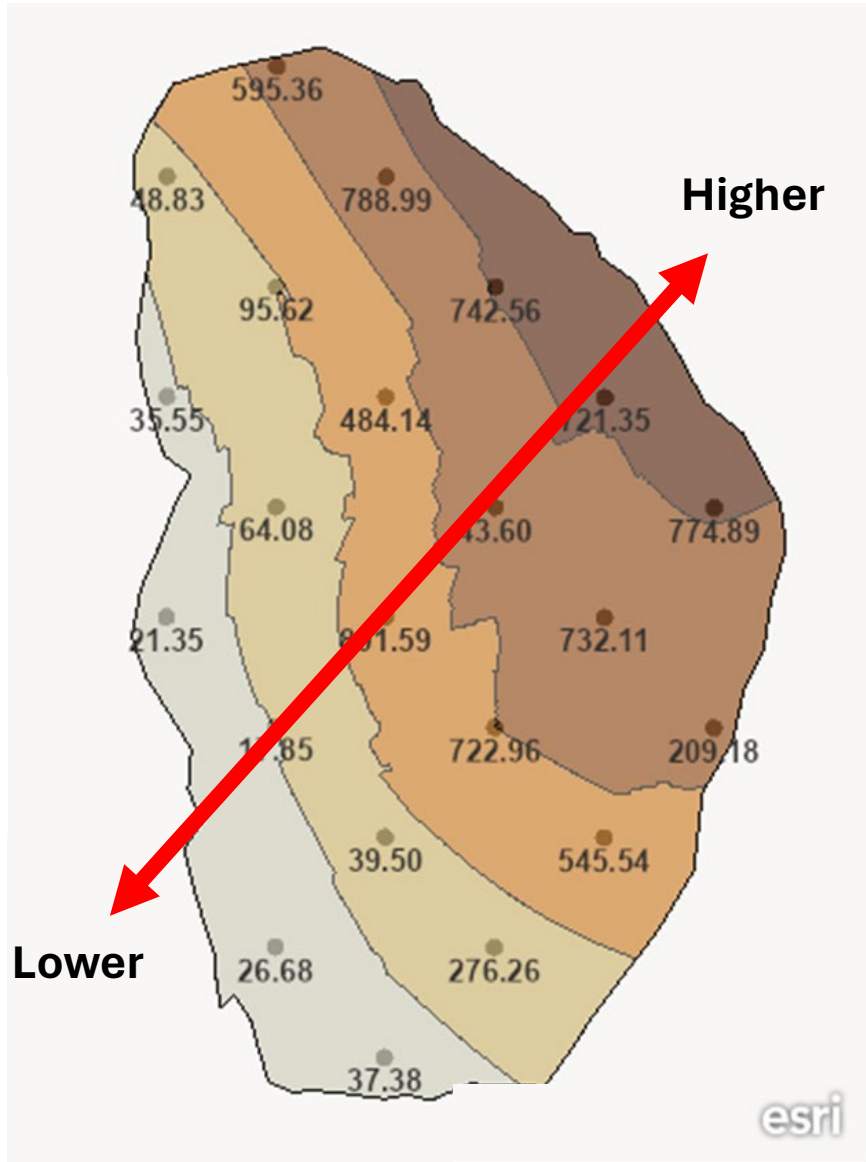
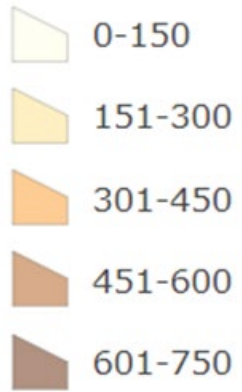


esri

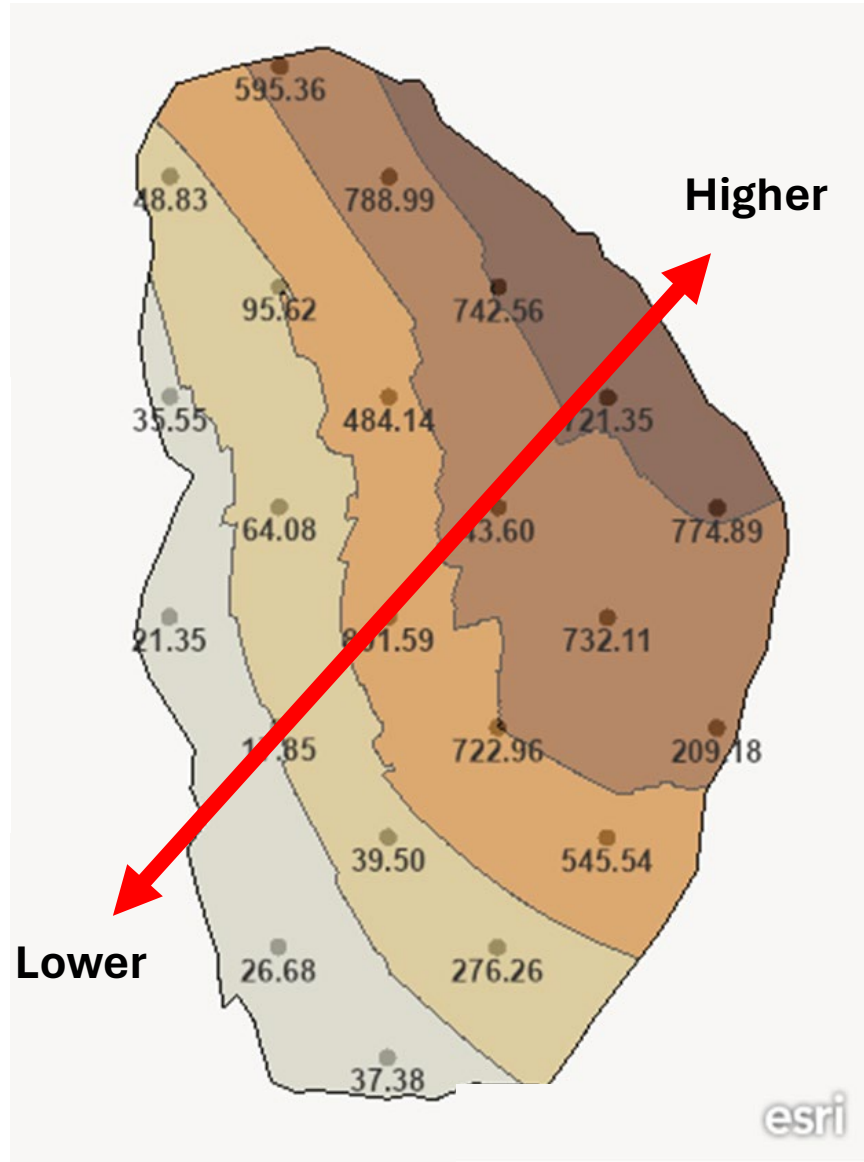
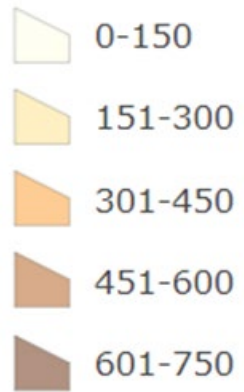
2km

Esri, NASA, NGA, USGS, FEMA

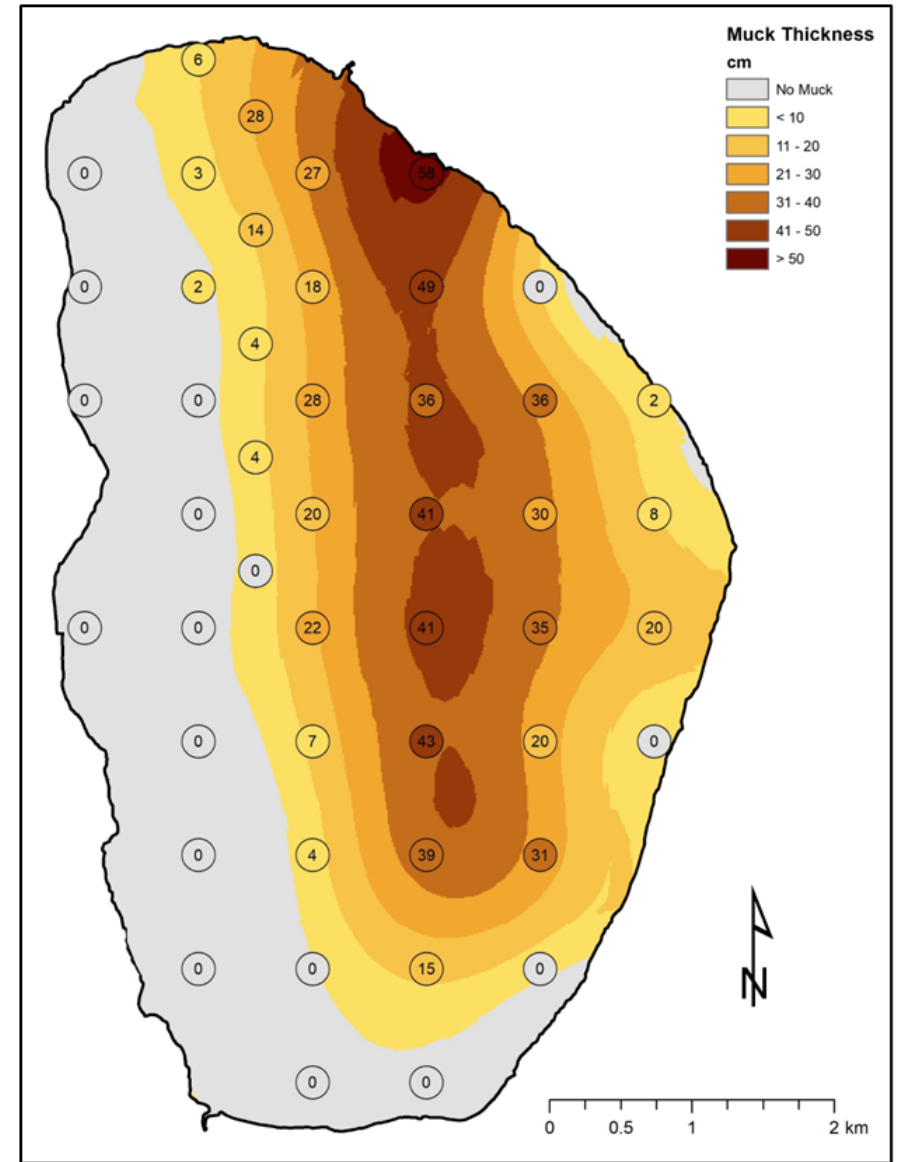
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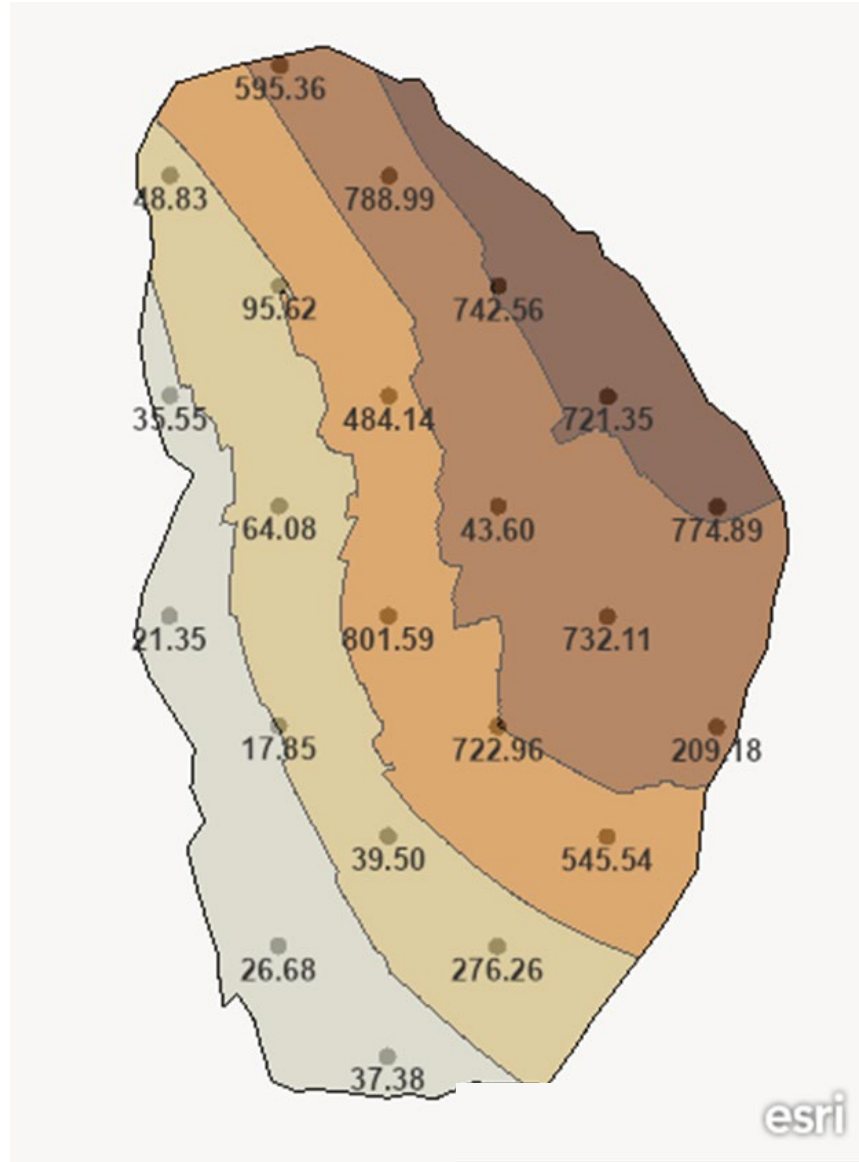
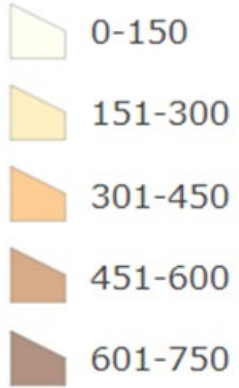


Esri, NASA, NGA, USGS, FEMA

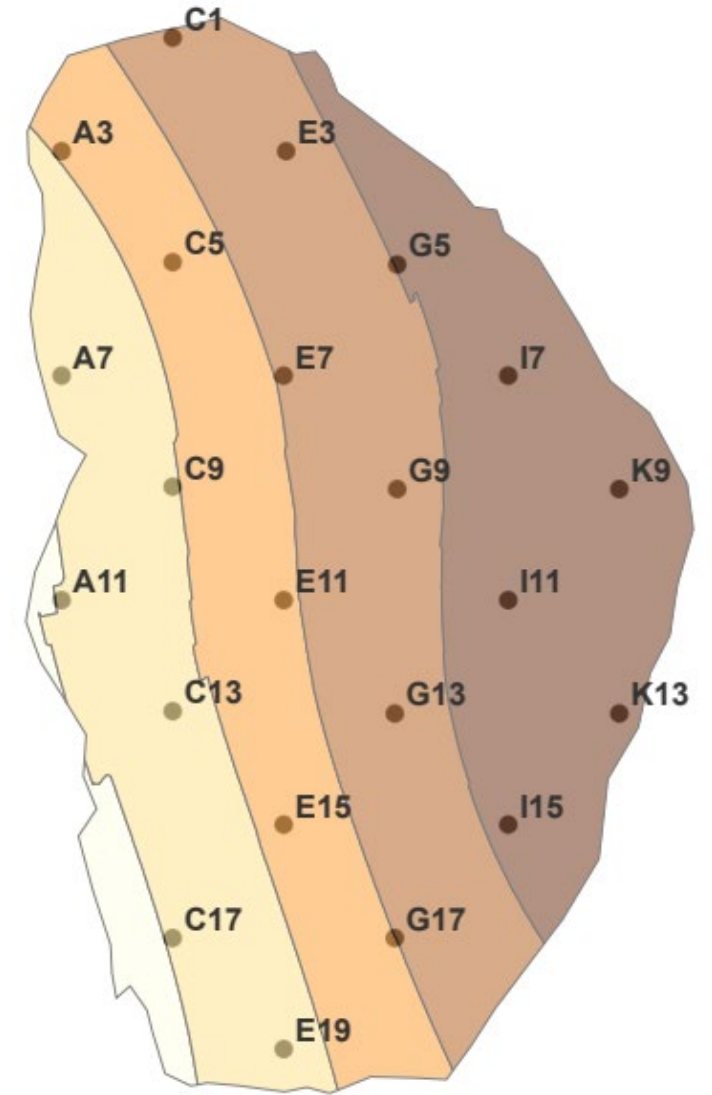
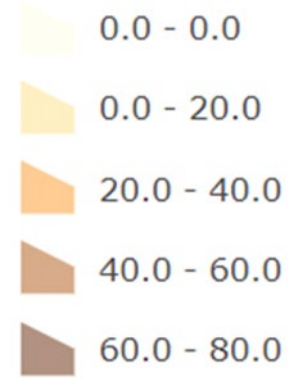


Field Data collected and  
Map generated by Rex Ellis

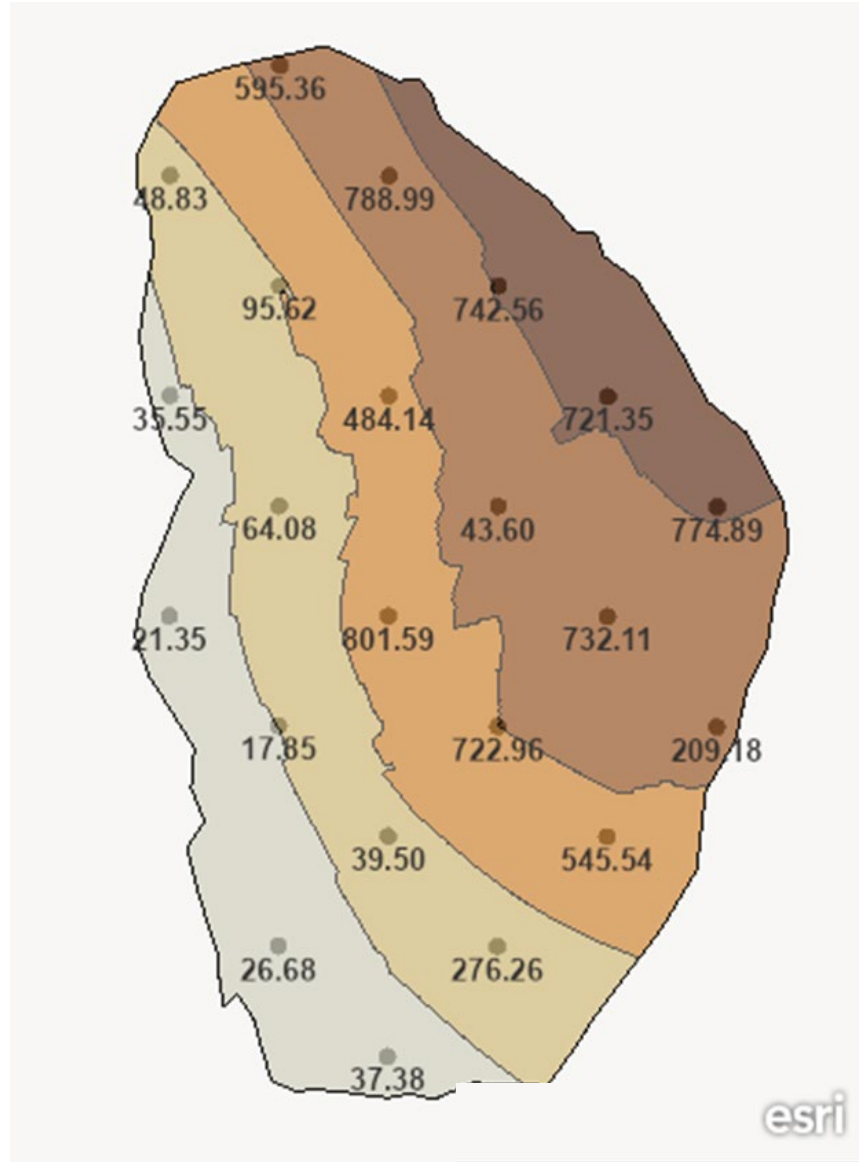
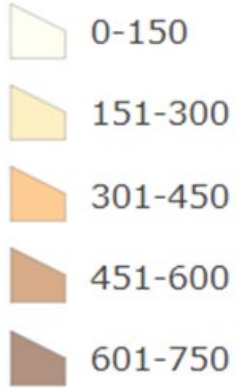
### Soil TP (mg/kg)



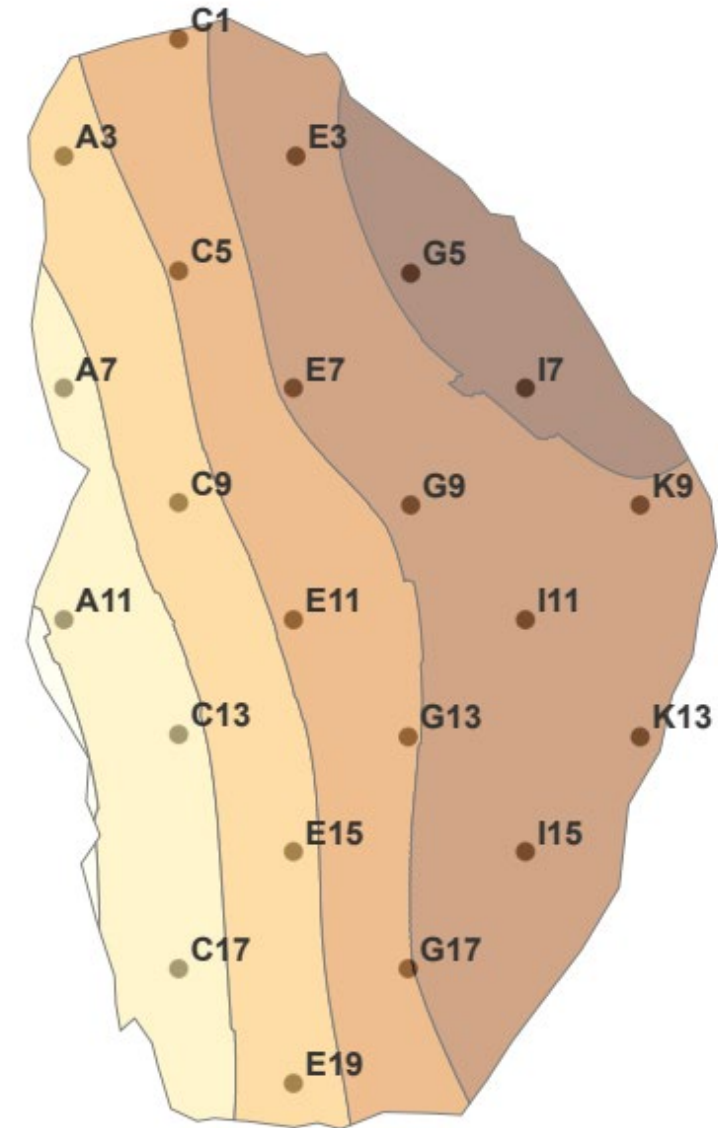
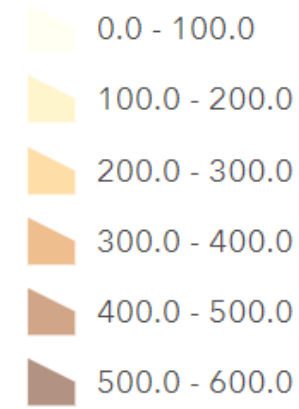
### Organic Matter (%)



### Soil TP (mg/kg)



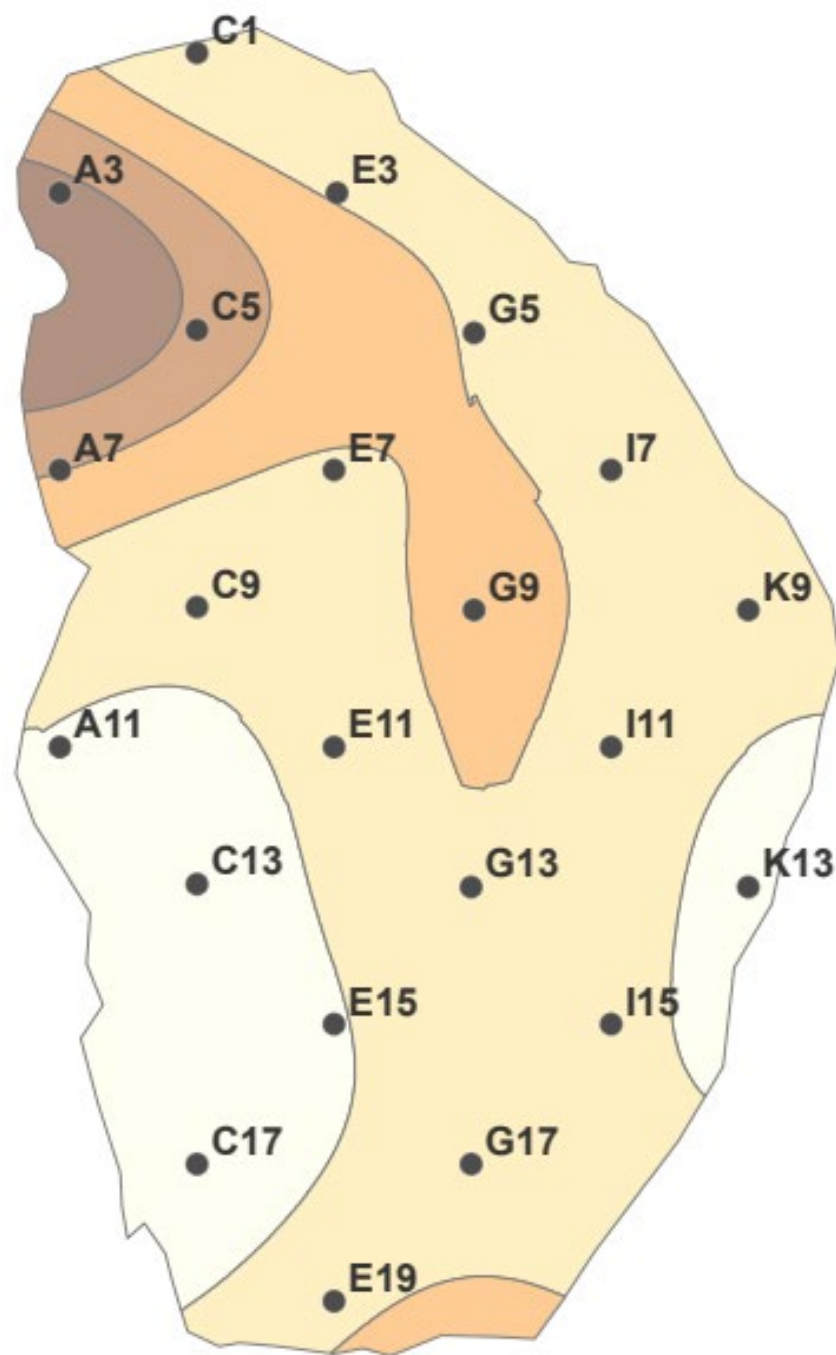
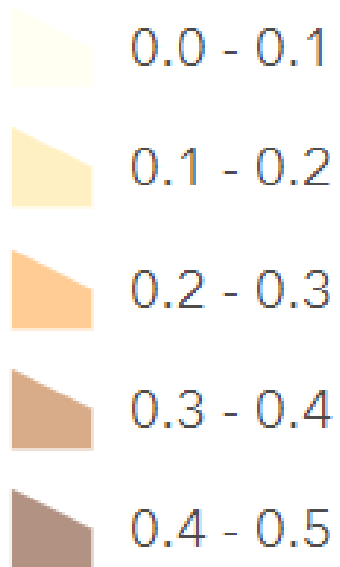
### Fe (mg/kg)



2km

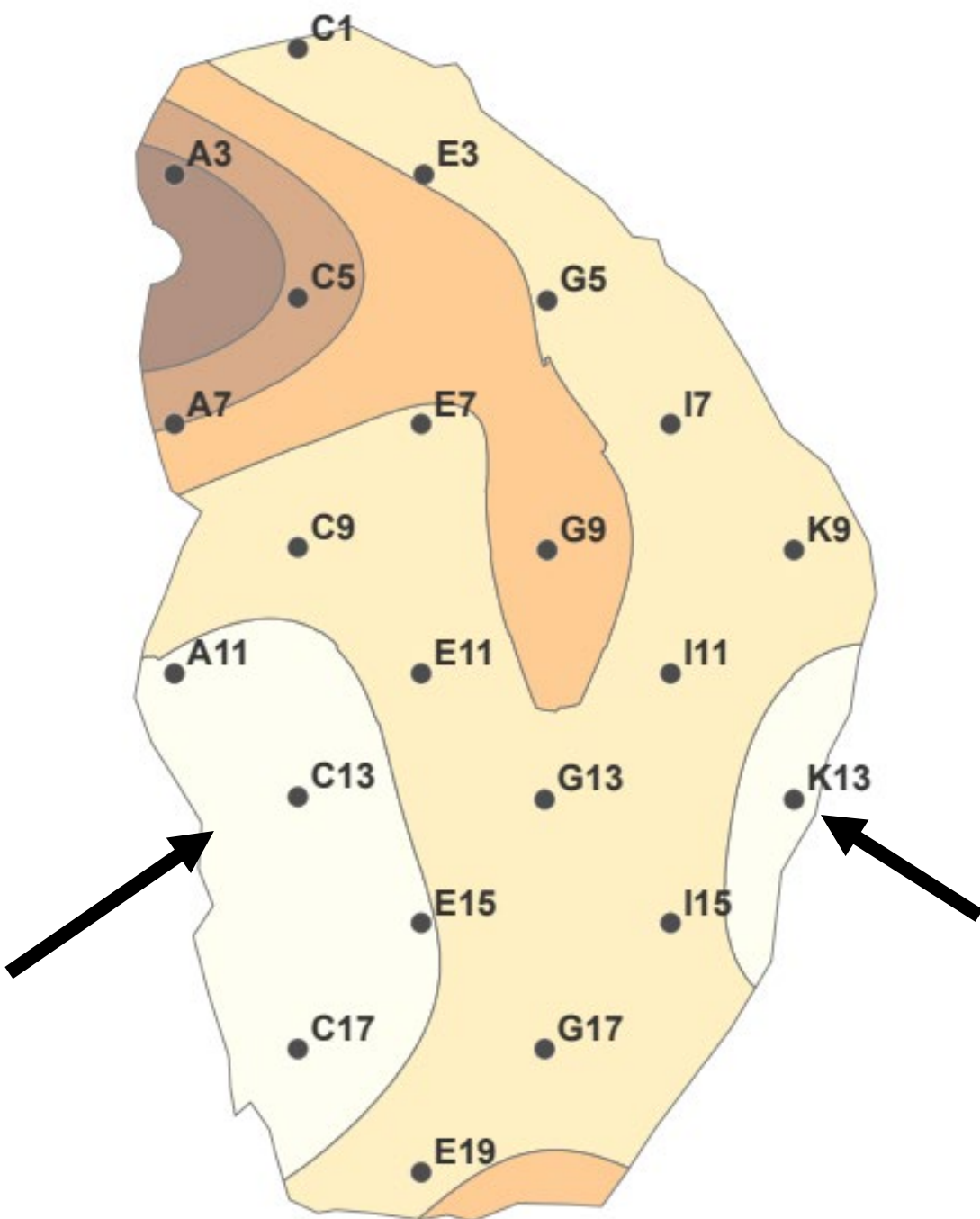
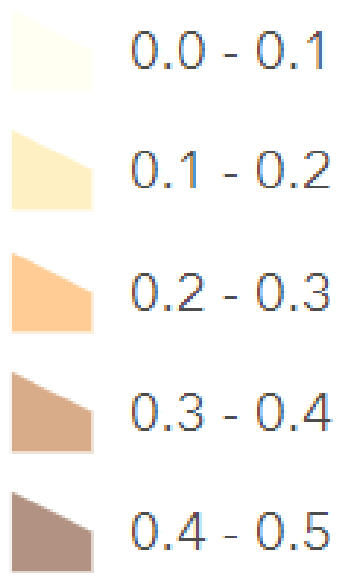
Esri, NASA, NGA, USGS, FEMA

SRP (mg/L)





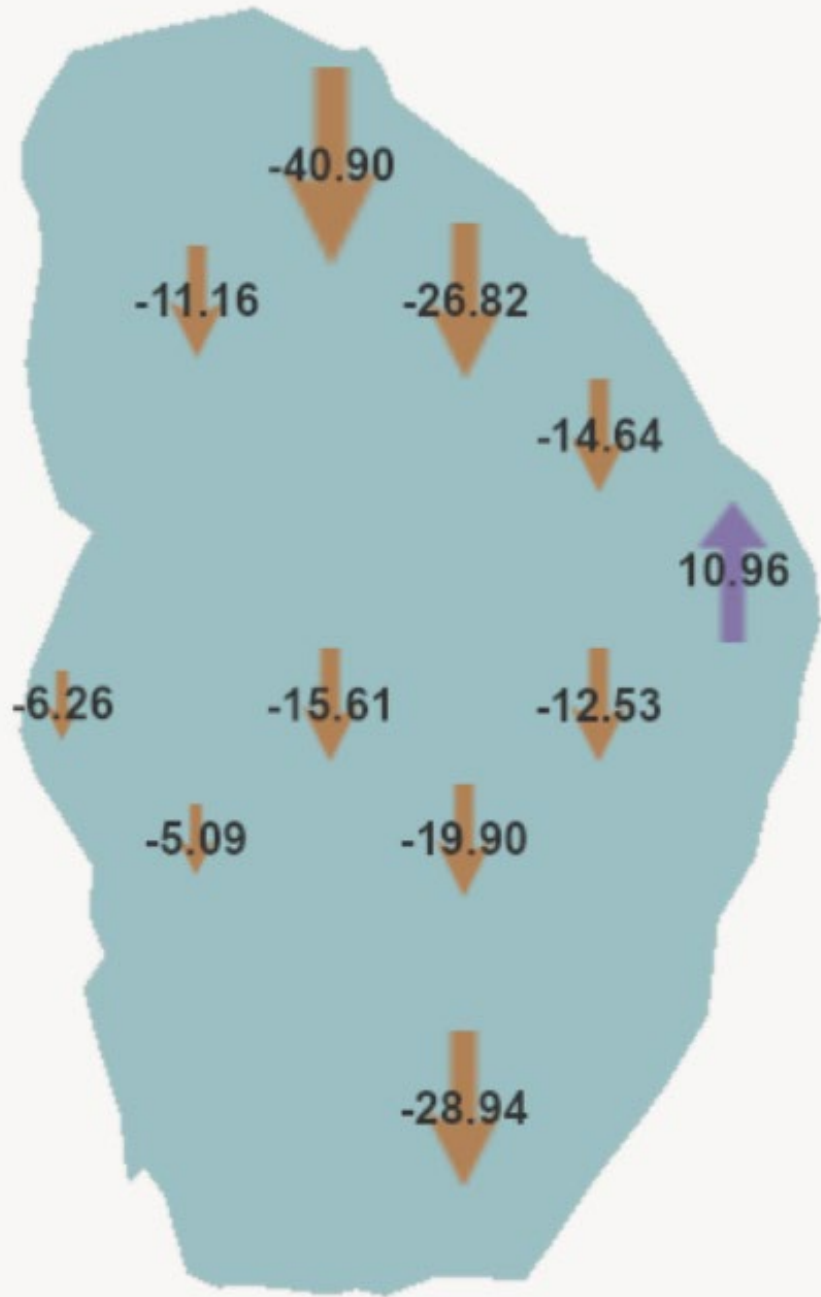
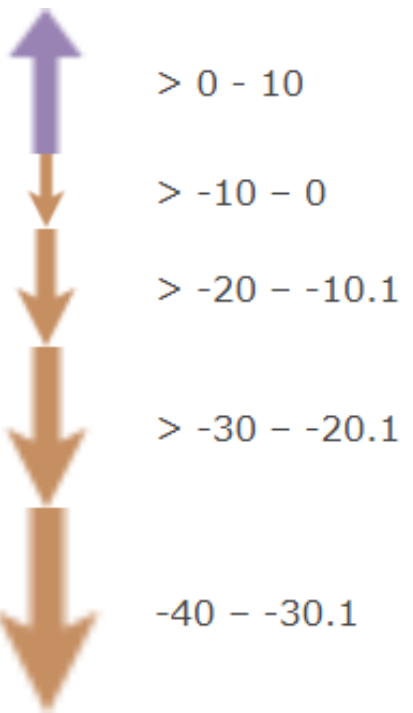
SRP (mg/L)



Sites were too sandy for our primary porewater extraction method and will be resampled

# Flux Experiment

# Average P Fluxes ( $\mu\text{mol m}^{-2} \text{hr}^{-1}$ )



# Average P Fluxes ( $\mu\text{mol m}^{-2} \text{hr}^{-1}$ )



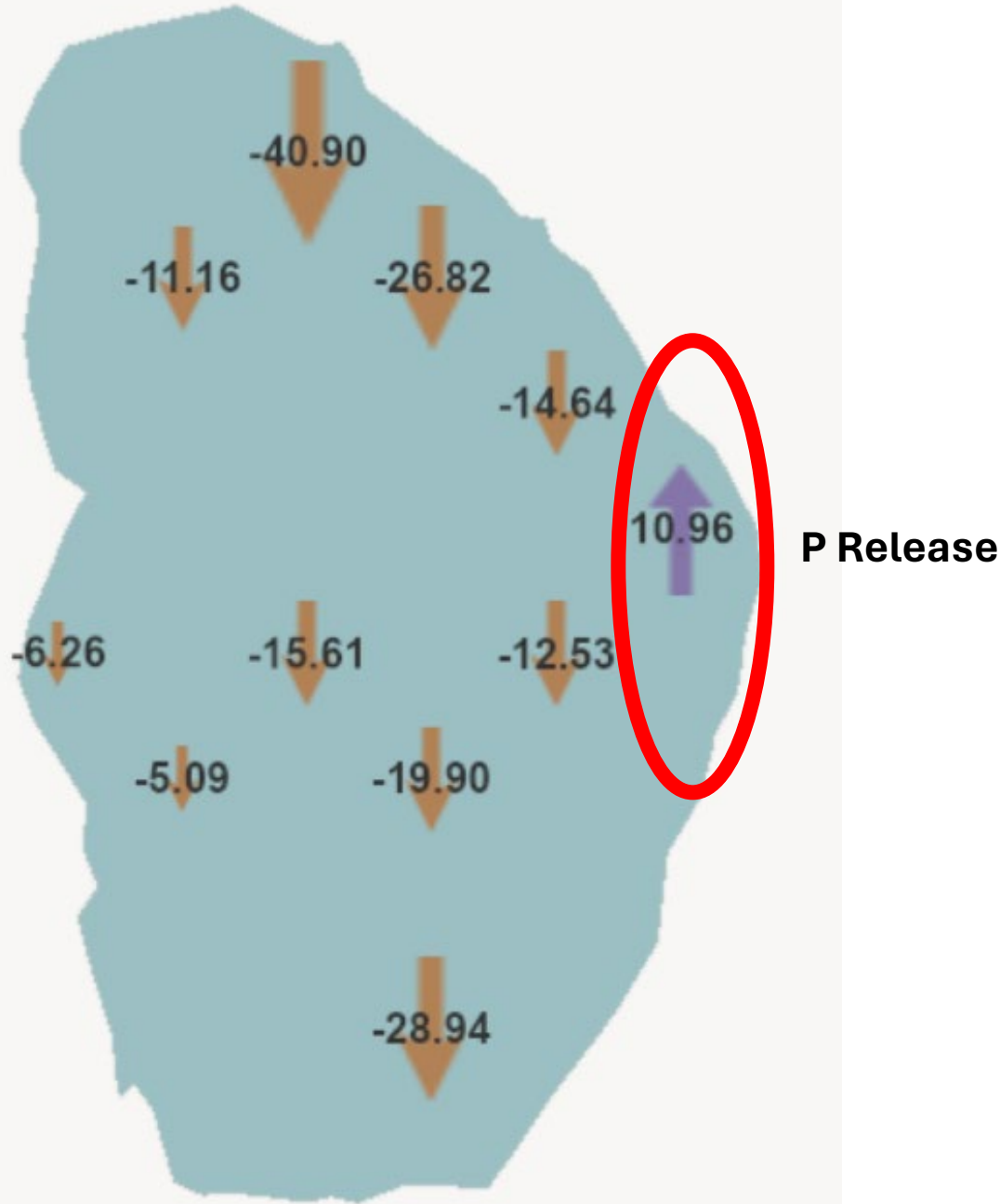
> 0 - 10

> -10 - 0

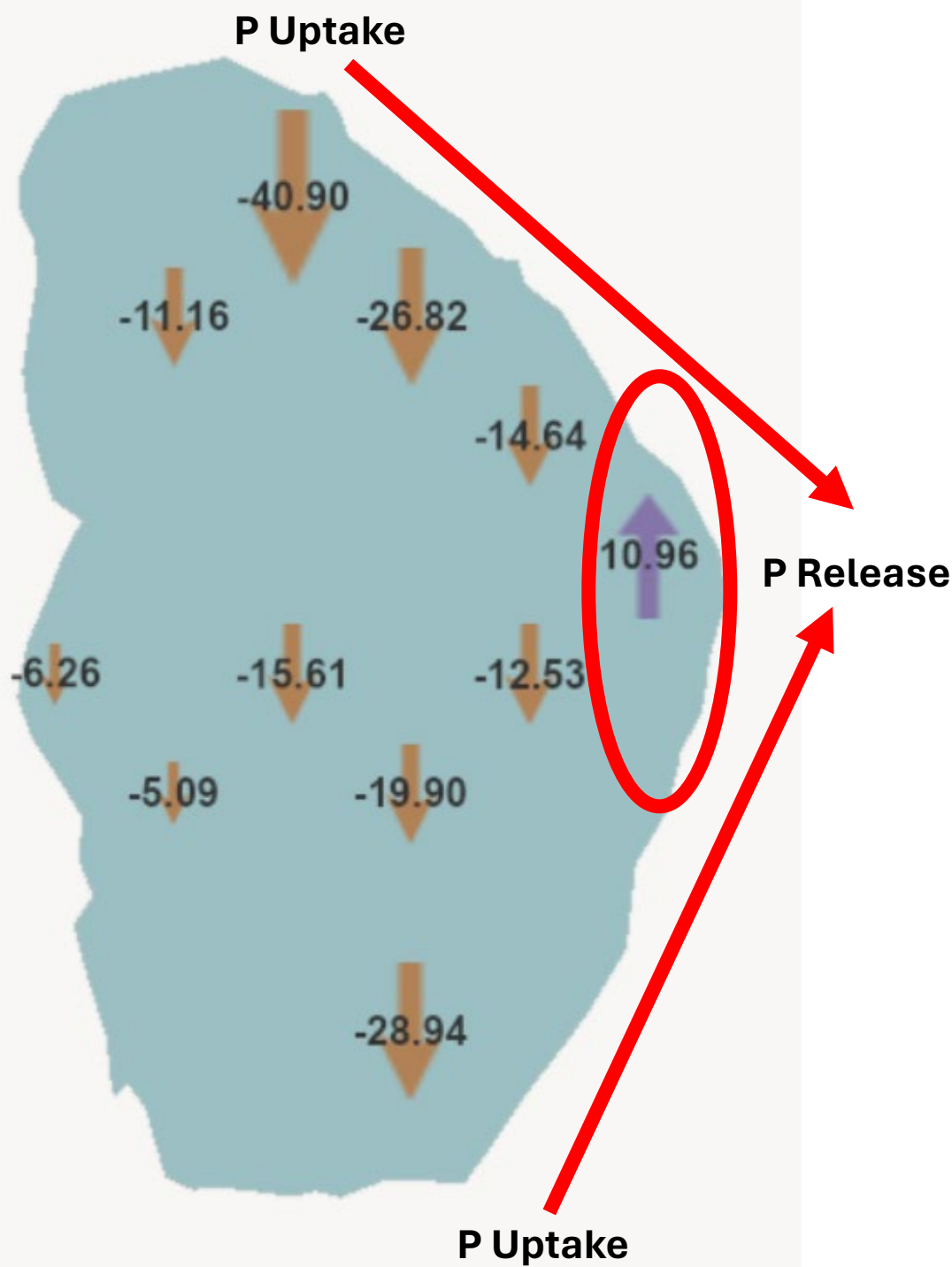
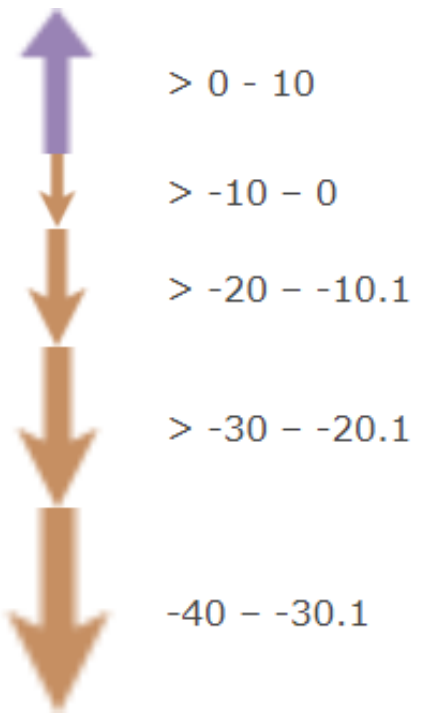
> -20 - -10.1

> -30 - -20.1

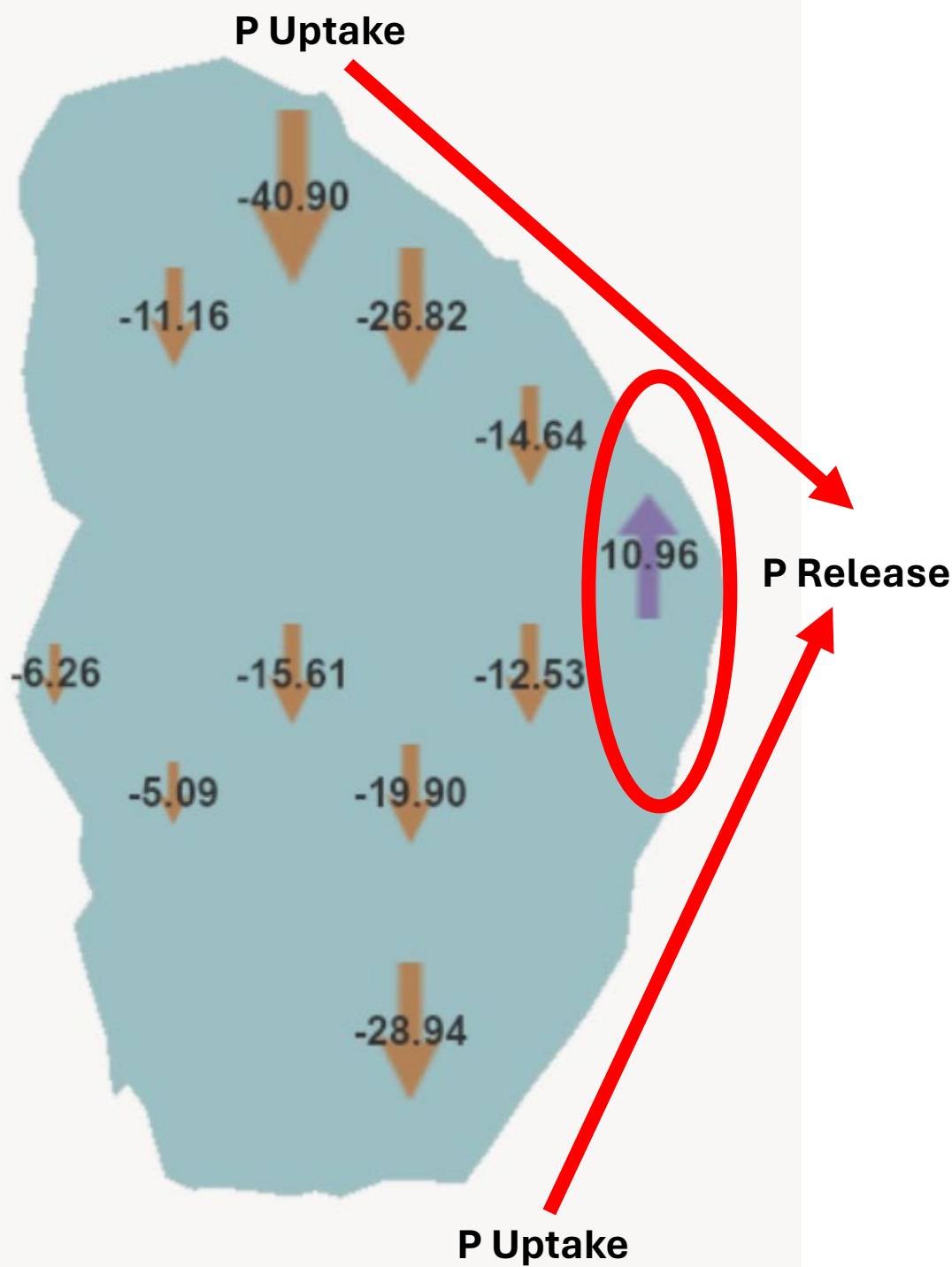
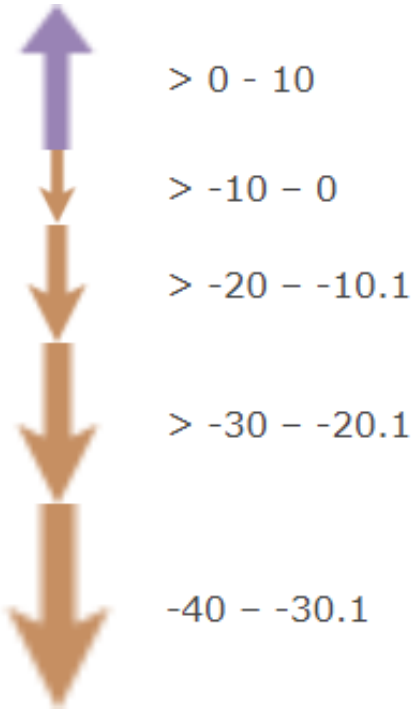
-40 - -30.1



# Average P Fluxes ( $\mu\text{mol m}^{-2} \text{hr}^{-1}$ )

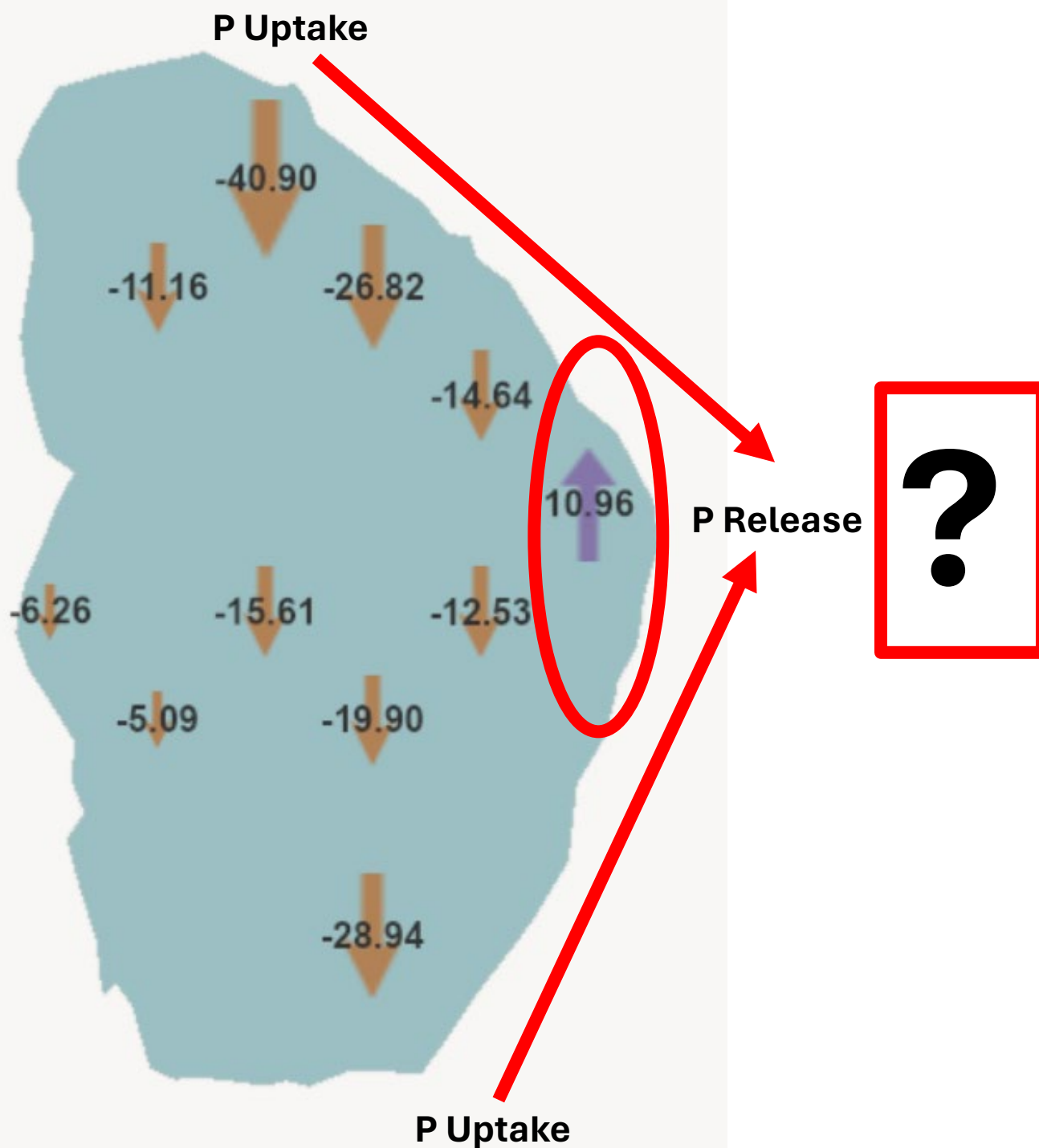
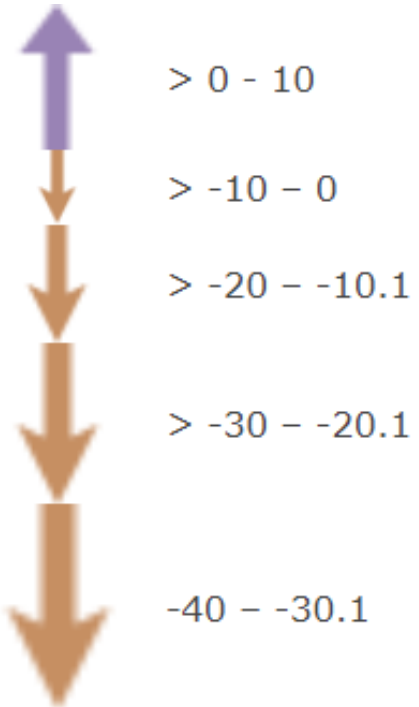


# Average P Fluxes ( $\mu\text{mol m}^{-2} \text{hr}^{-1}$ )



# Net P Sink

# Average P Fluxes ( $\mu\text{mol m}^{-2} \text{hr}^{-1}$ )





# **Thank you!**

**Lab: Sean Goggin, Lexis Massey, and Harrison  
Hobbs**

**Field: Sean Westley**