Investigating Trophic Dynamics in Lake Okeechobee's Pelagic Zone

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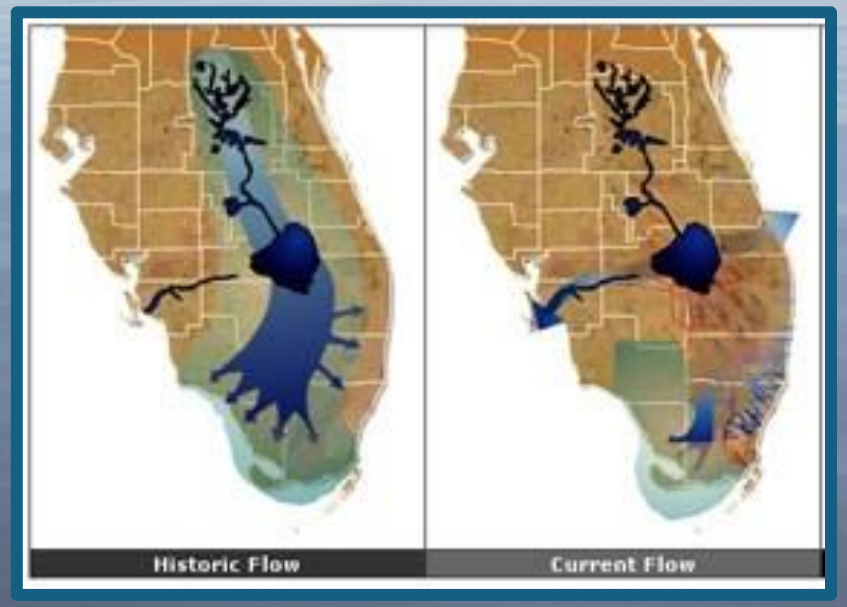
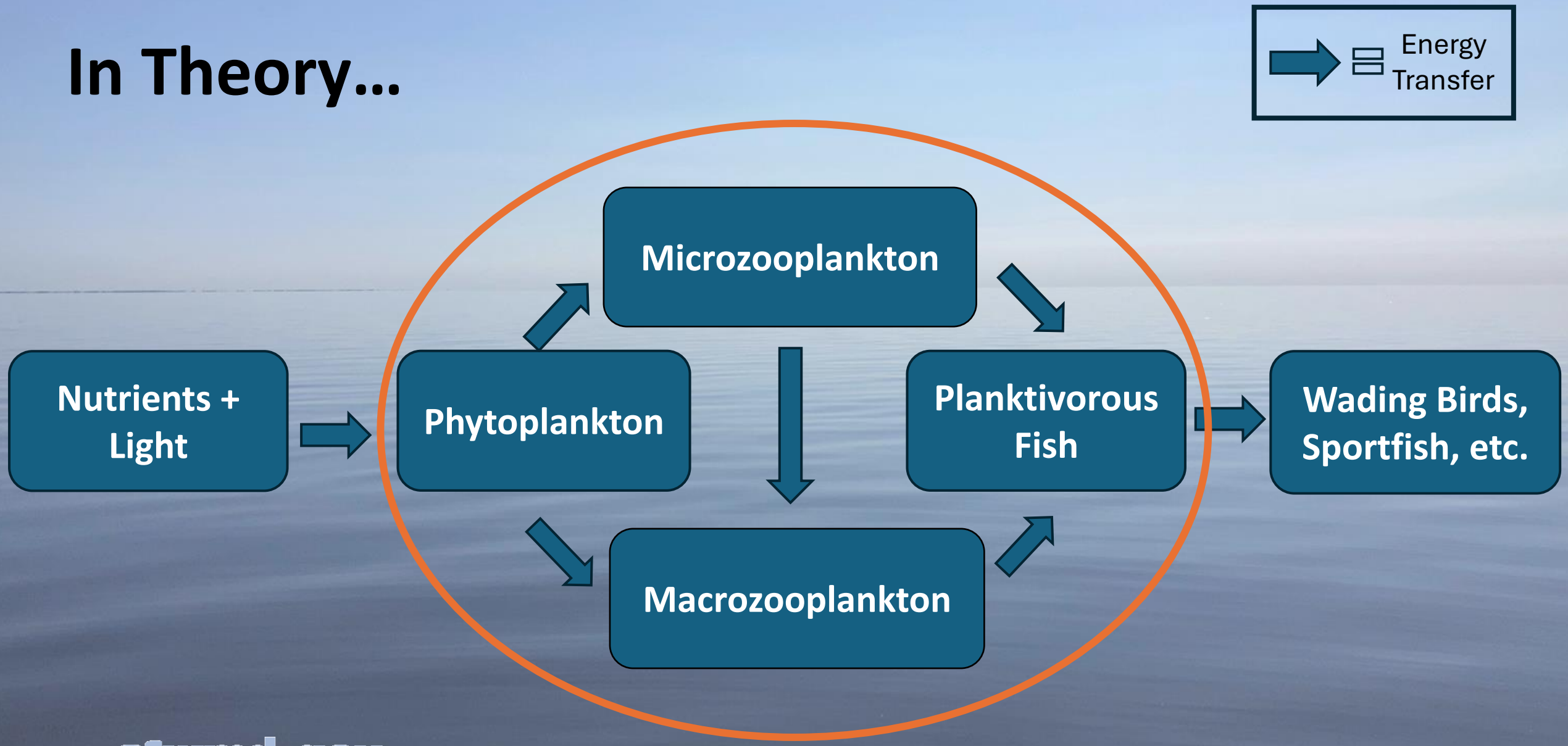
Lake Okeechobee

- Lake Okeechobee is a large, shallow lake that has experienced major anthropogenically-driven changes over the last century.
- Agriculture → increased levels of nitrogen and phosphorus
  - Phosphorus-limited system → nitrogen-limited system
  - Internal loading
    - Turbidity and light
- Dike → limited nutrient export



In Theory…

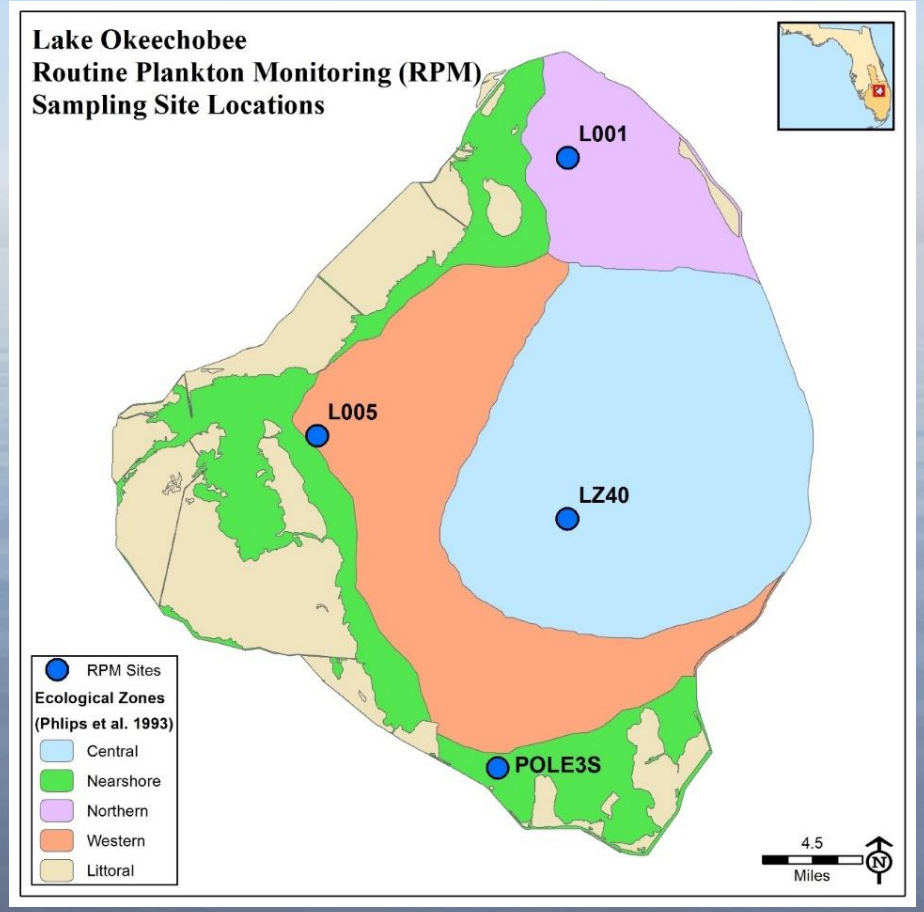

Energy Transfer
Microzooplankton
Nutrients + Light
Phytoplankton
Planktivorous Fish
Wading Birds, Sportfish, etc.
Macrozooplankton

Plankton

- Zooplankton and phytoplankton
- Phytoplankton are photosynthetic, floating organisms that respond quickly to changes in nutrients and light.
  - Base of pelagic trophic web
  - Harmful algal blooms
  - Chlorophyll-*a*
- Zooplankton are non-photosynthetic organisms that float in the water column
  - Filter feeders
  - Microzooplankton and macrozooplankton

The Project

- Routine Plankton Monitoring = long-term plankton monitoring effort initiated by SFWMD in 1994
- Sampling frequency change: Quarterly → Monthly
- Data Range: January 2023 → December 2024
- Parameters:
  - Phytoplankton (Chl-*a*)
  - Zooplankton
    - Microzooplankton (including nauplii)
    - Macrozooplankton
  - Water Quality
    - Temperature, TN, TP, TSS, DO, and more
- Sites in four ecological zones
  - Northern (L001)
  - Western (L005)
  - Central (LZ40)
  - Nearshore (POLE3S)



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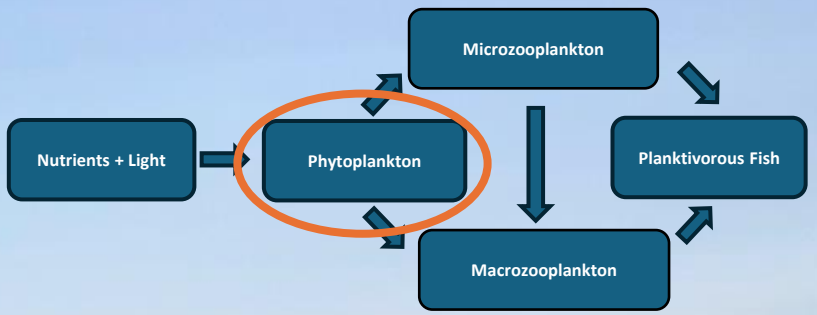
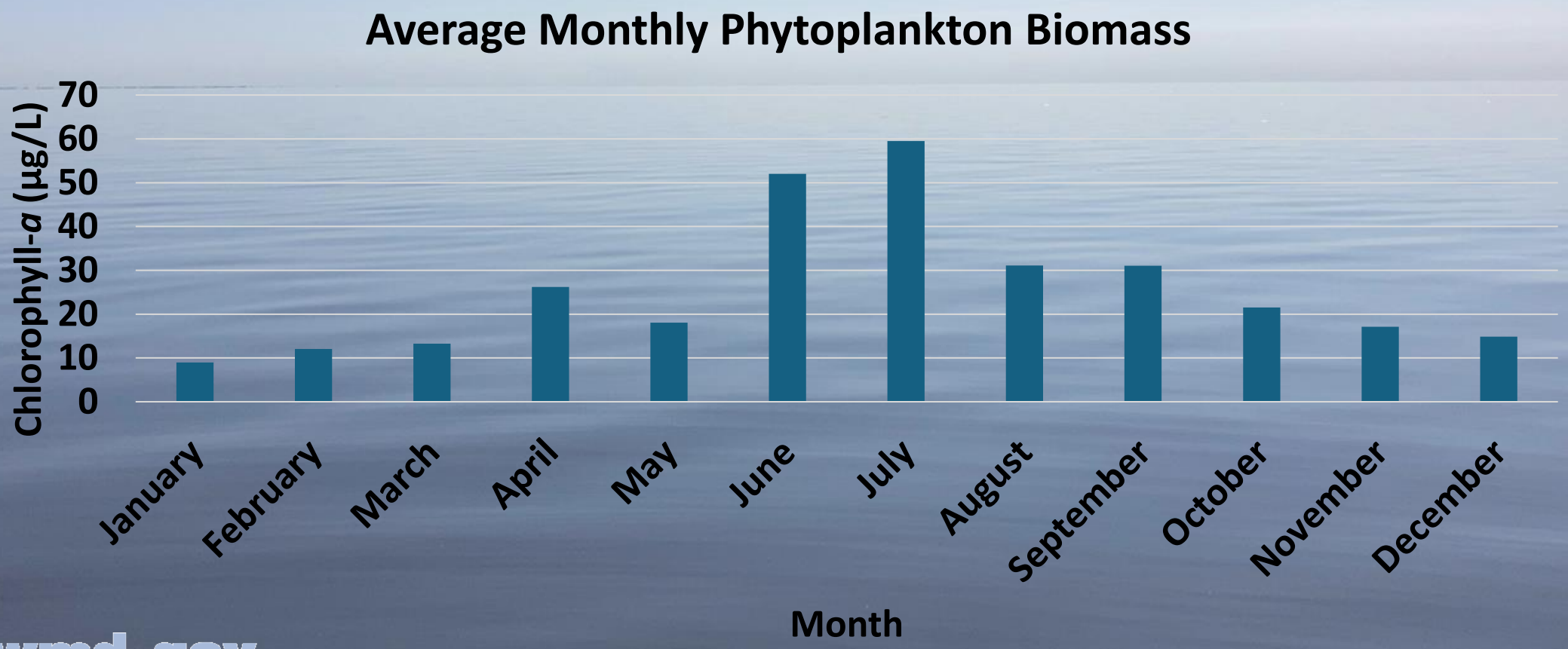
Phytoplankton

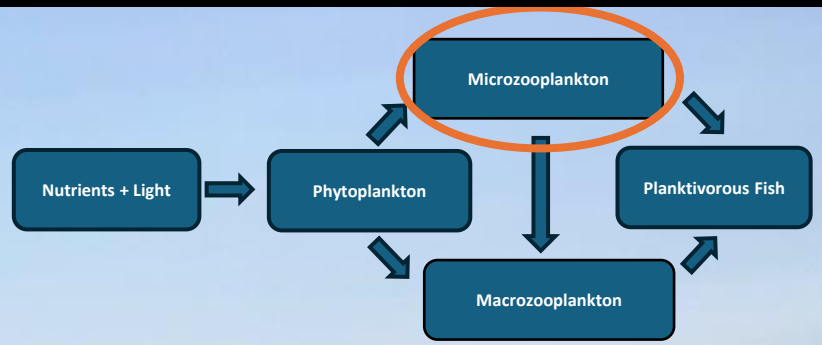


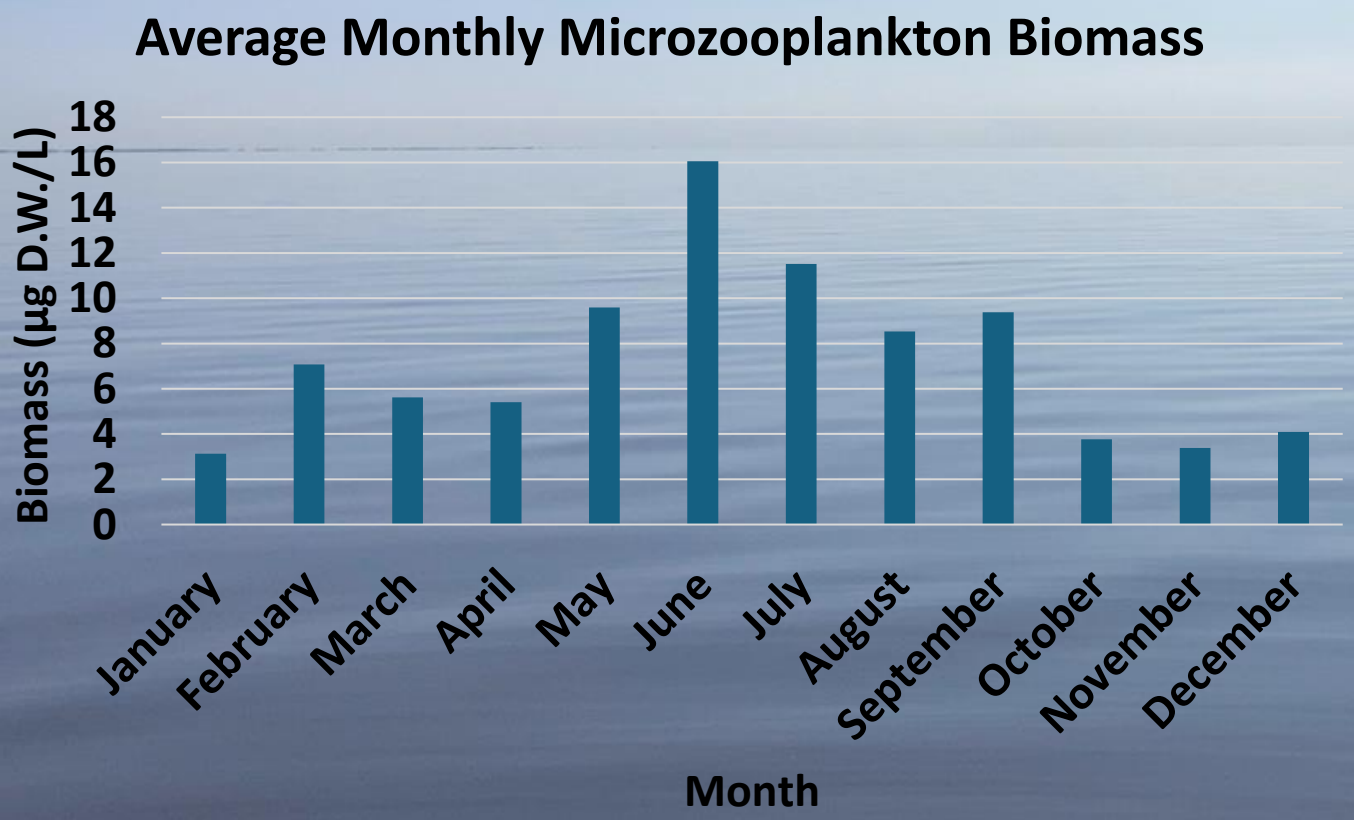
- Recall: Chlorophyll-*a* as proxy for biomass

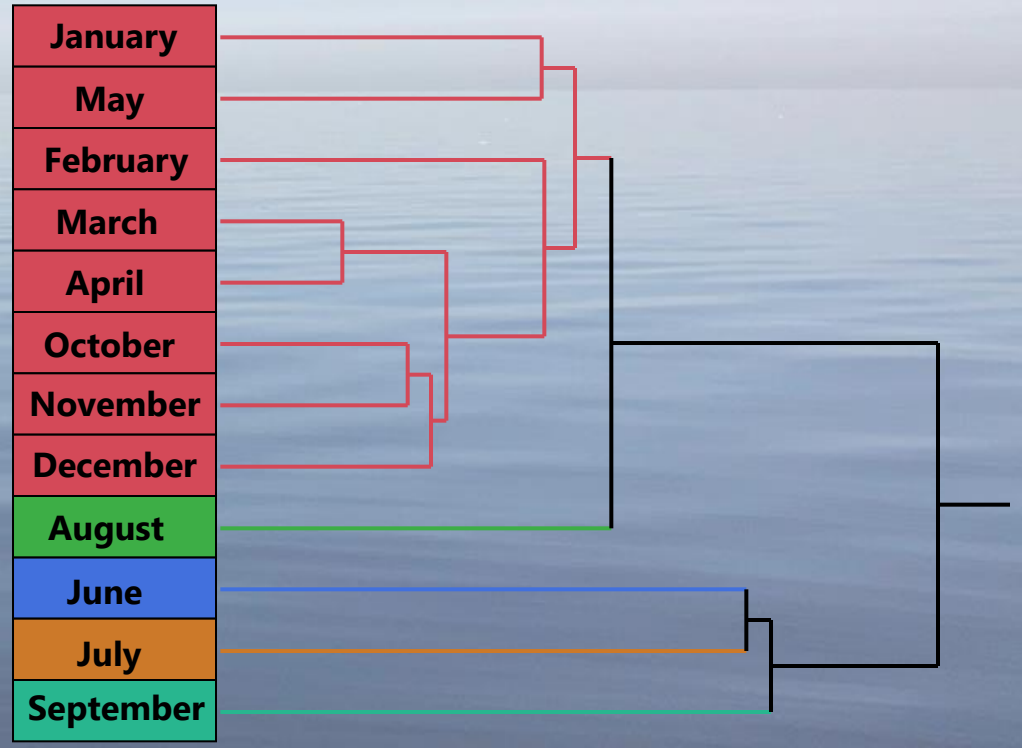


Microzooplankton

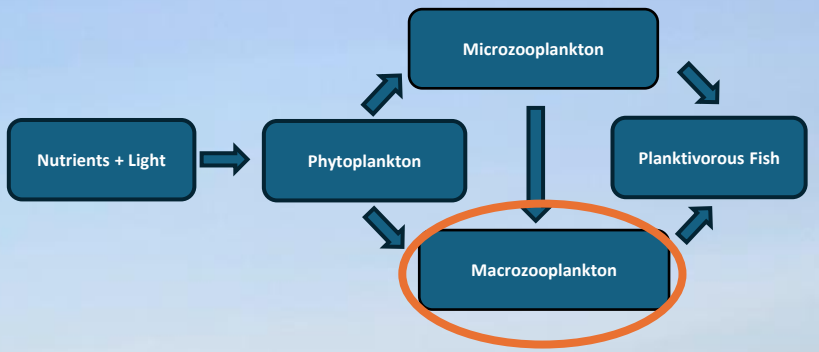
- Rotifers & Nauplii



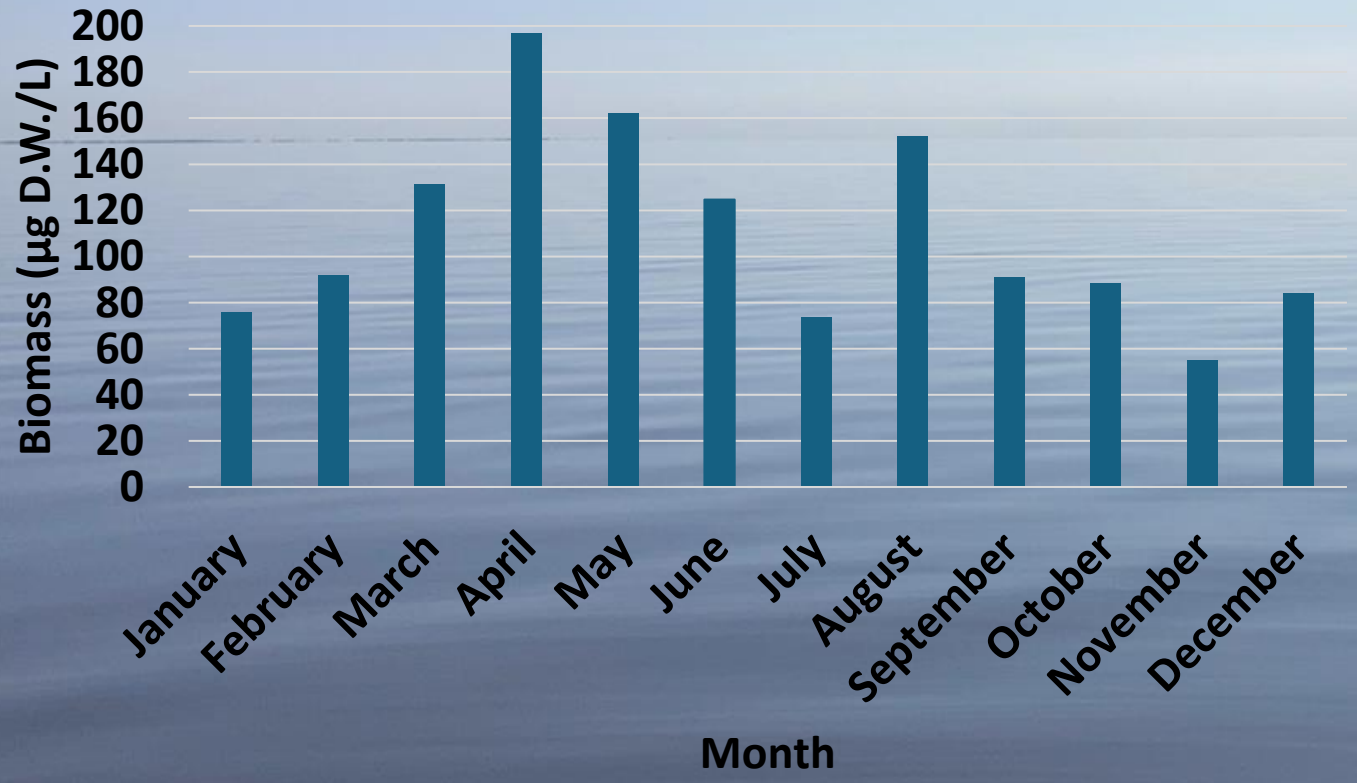




Macrozooplankton



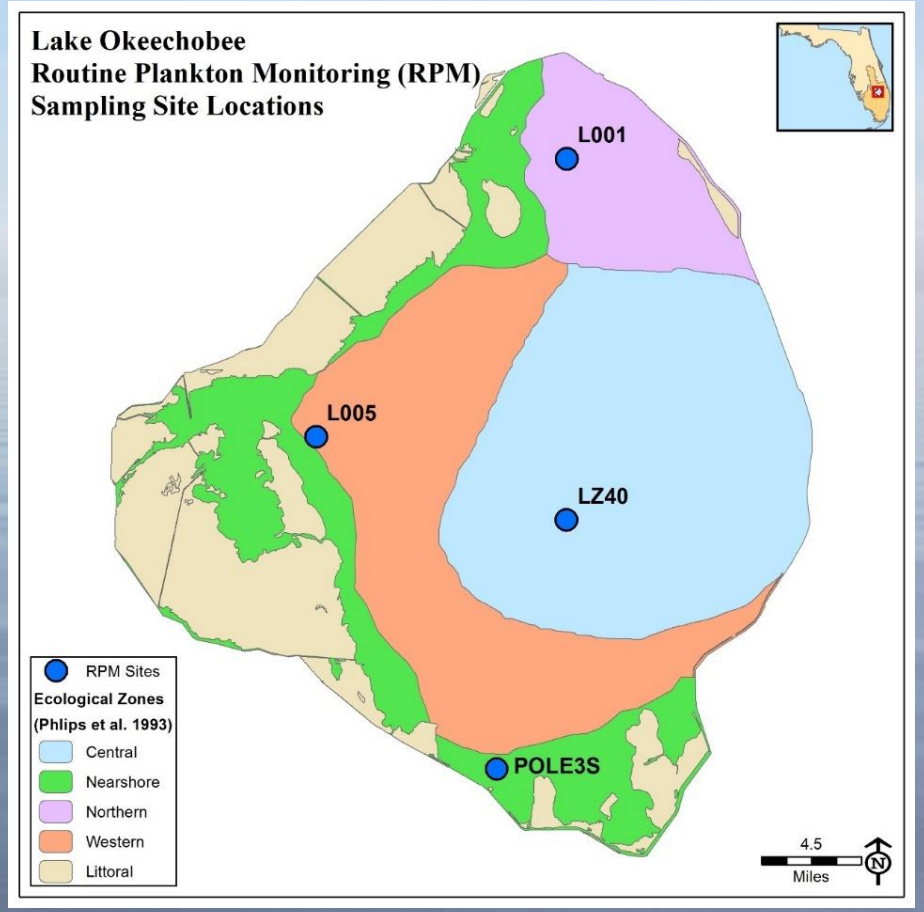
Average Monthly Macrozooplankton Biomass



A Spatial Scale

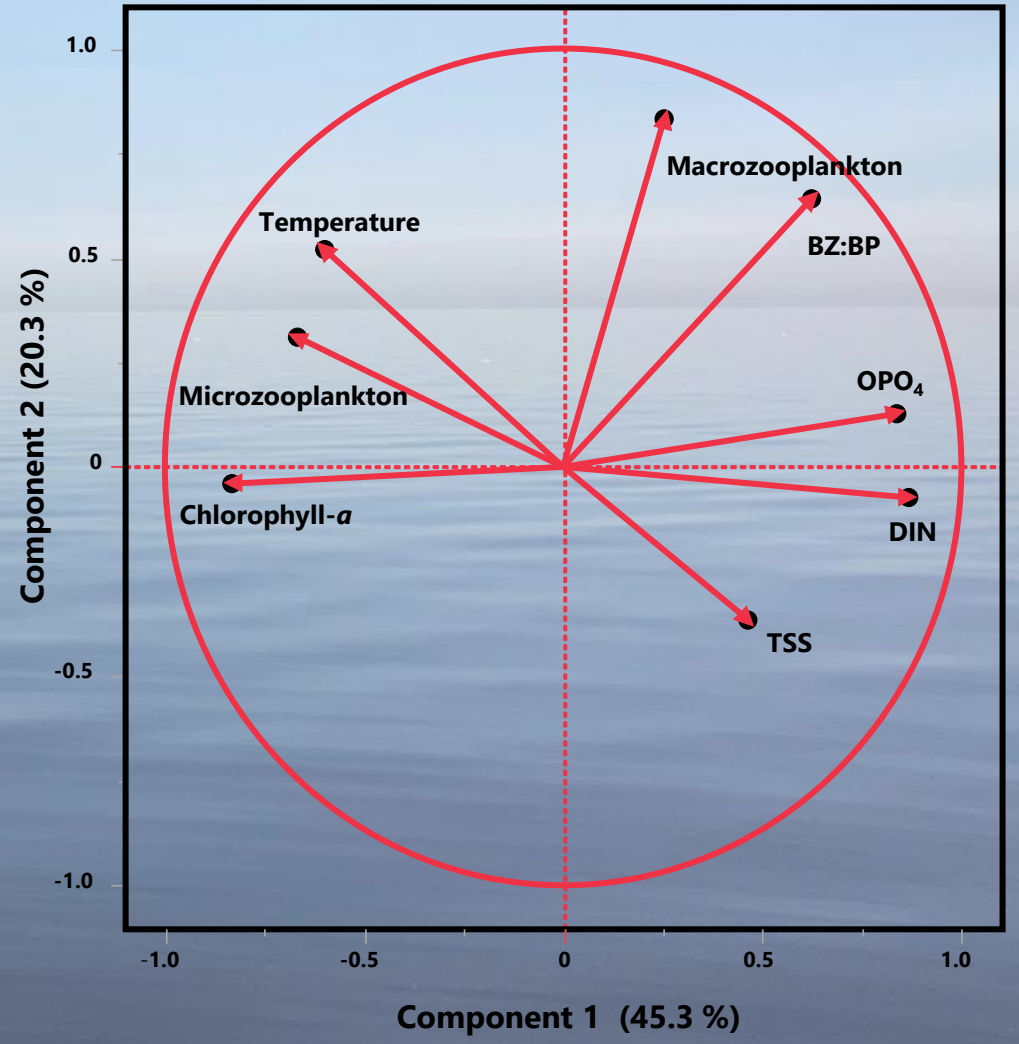
Microzooplankton

Macrozooplankton

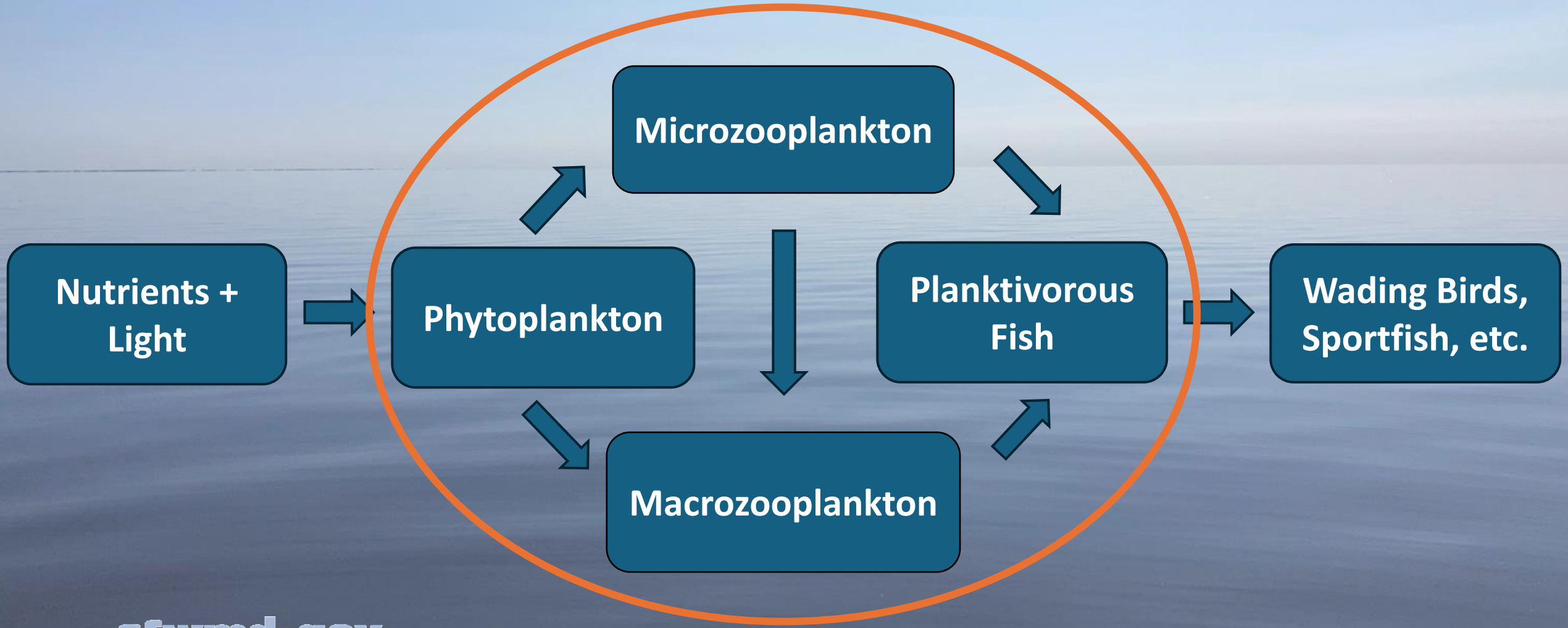


Who Influences Who?

- Confounding Variables → Principal Components Analysis
- Biomass of Zooplankton (BZ) : Biomass of Phytoplankton (BP)
  - Low → smaller zooplankton communities, higher trophic state
  - High → larger-bodied zooplankton communities, lower trophic state
- Water Quality Variables
  - Dissolved Inorganic Nitrogen (DIN), Soluble Reactive Phosphorus (OPO_4), Temperature, and Total Suspended Solids (TSS)

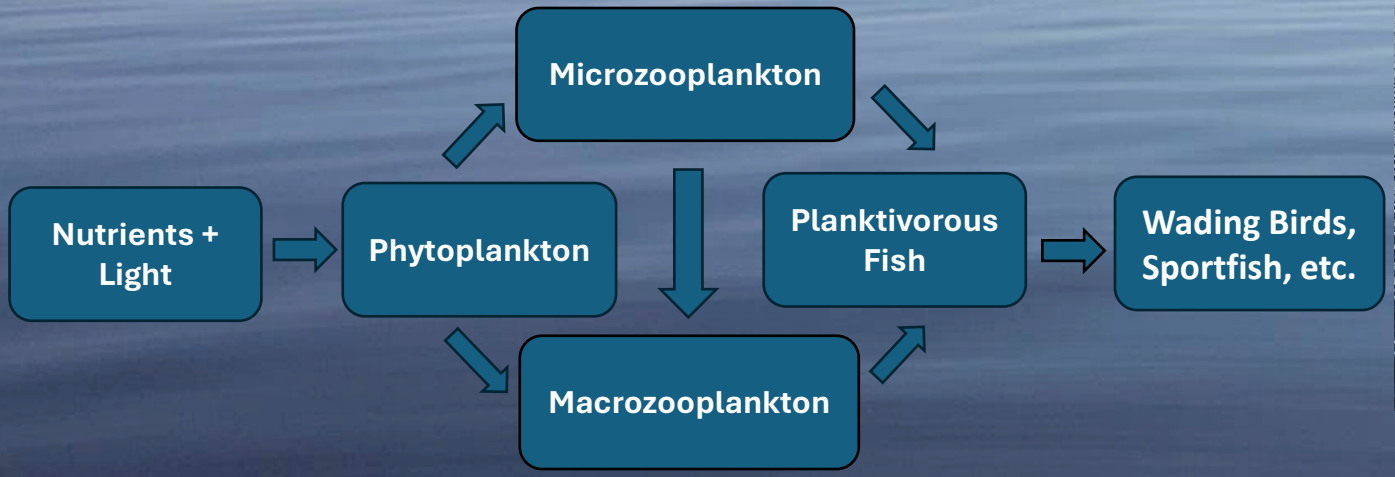


Back to the Questions at Hand…



What's Next?

- Mesocosm project to isolate effects of planktivorous fish on the relationship between zooplankton and phytoplankton
- Nutrient component included to quantify which force(s) are most affecting this relationship



Thank You!

- Global Ecology Research Group Lab at the University of Florida
- South Florida Water Management District
- Florida Chapter of The Wildlife Society

Global Ecology Research Group

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