SPATIAL AND TEMPORAL VARIABILITY IN WATER QUALITY IN THREE URBANIZED BAYOUS OF THE PENSACOLA BAY SYSTEM

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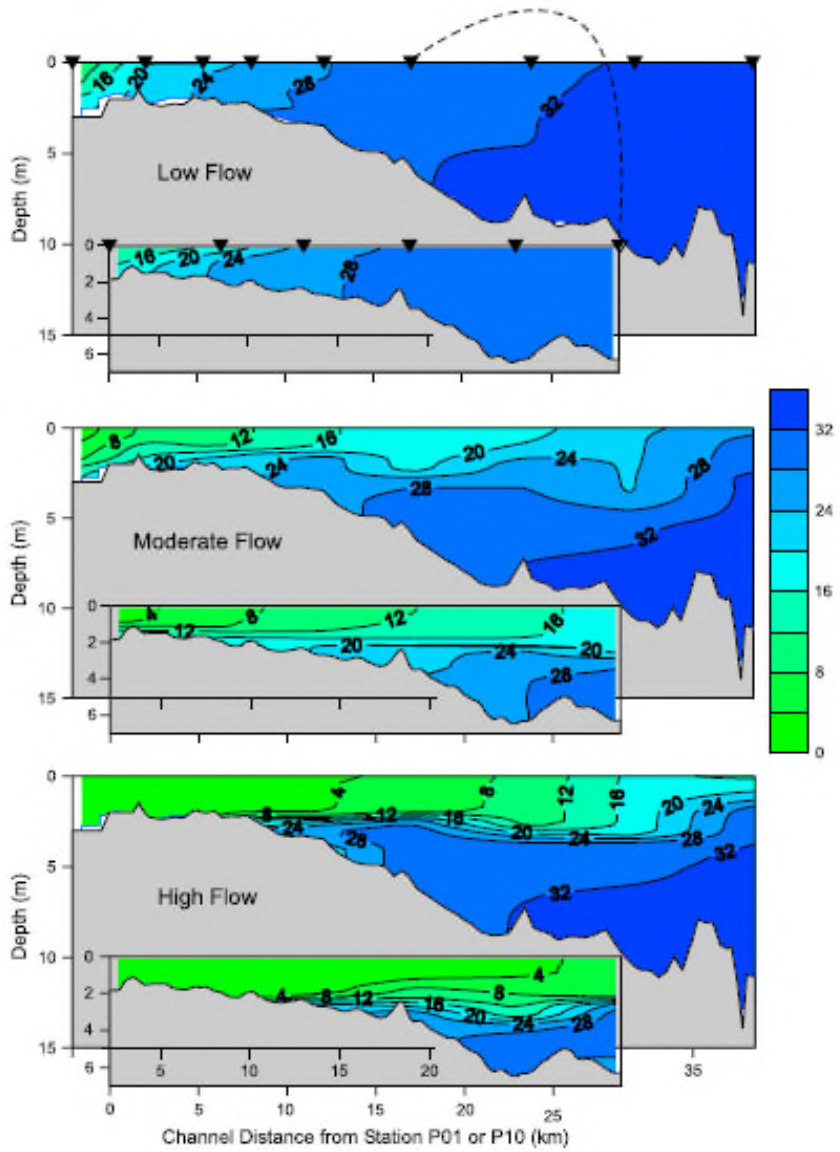
ESTUARIES

- An estuary is the transition zone between river environments and maritime environments
- The mixing of fresh and sea water provides high levels of nutrients in the water column
- This makes estuaries some of the most productive natural habitats in the world

ESTUARINE WATER CIRCULATION

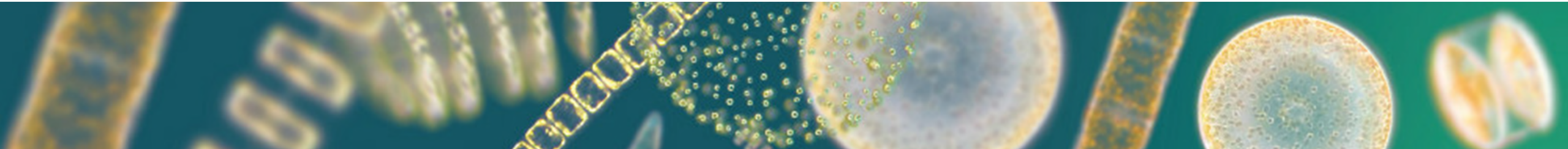
- Flushing Time
- Stratification and vertical mixing
- Gravitational, Tidal, and Wind
- Spatial and temporal variability



Escambia-Pensacola Transect of Salinity from Hagy and Murrell (2007)

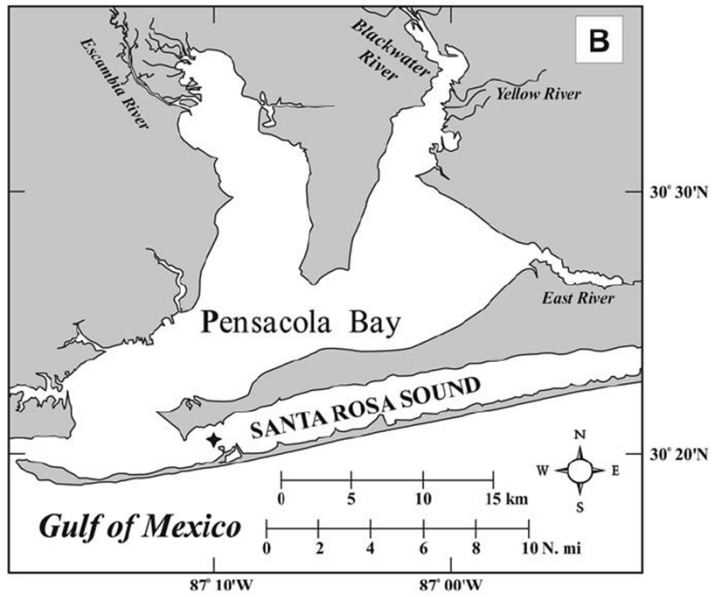
NUTRIENTS AND PHYTOPLANKTON BIOMASS

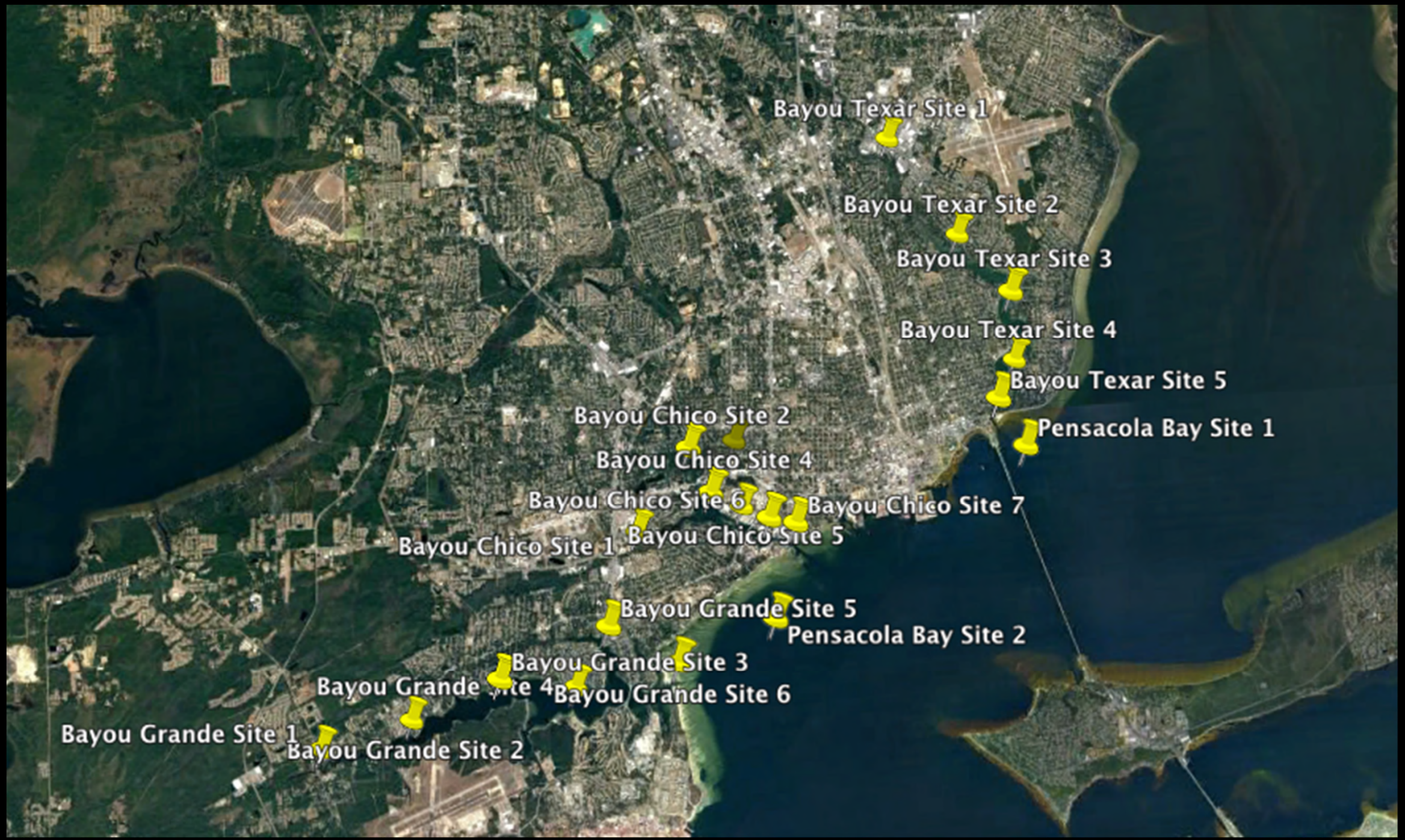
- Nutrients such as nitrate, nitrite, ammonium and, phosphate are important in estuarine environments because they are key indicators of water quality
- Increased nutrients can lead to harmful algal blooms, hypoxia and anoxia, fish and shellfish kills, and can be harmful to human health
- Chlorophyll a is one of the ways of measuring phytoplankton biomass
  - The abundance of healthy animals in an estuary often depends on the amount of phytoplankton and primary productivity taking place.
- Phytoplankton growth and reproduction are limited by factors such as light and nutrients
- In an estuary nutrients and phytoplankton biomass are interconnected



PENSACOLA, FLORIDA

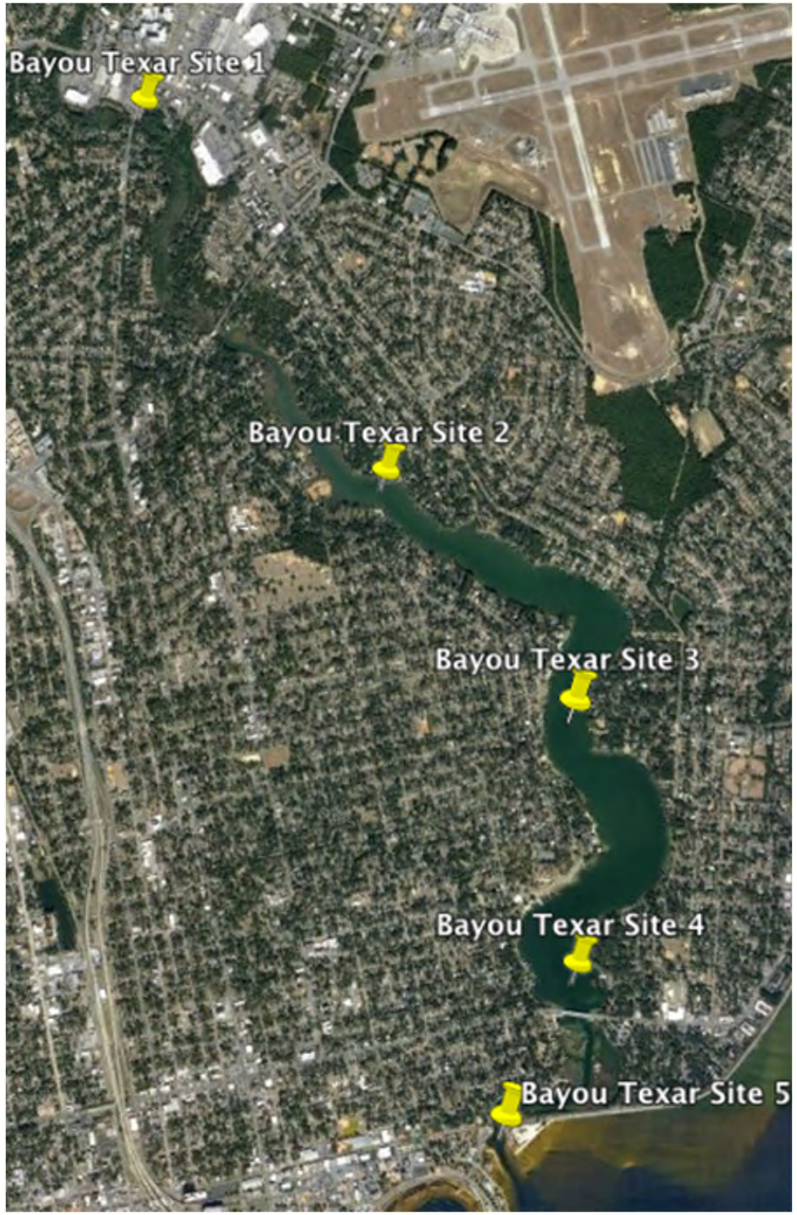
- My research is based in Pensacola, Florida in three urbanized Bayous of the Pensacola Bay System
- I am doing a year long study on the spatial and temporal variability in water quality between three Bayous
- Three Bayous were chosen because they are all within the Pensacola Bay System and have different watershed characteristics
- This study gives us biogeochemistry data on the three Bayous that have been studied at various levels and helps us understand the area in greater depth




Bayou Texar Site 1
Bayou Texar Site 2
Bayou Texar Site 3
Bayou Texar Site 4
Bayou Texar Site 5
Pensacola Bay Site 1
Bayou Chico Site 2
Bayou Chico Site 4
Bayou Chico Site 6
Bayou Chico Site 7
Bayou Chico Site 5
Bayou Chico Site 1
Bayou Grande Site 5
Pensacola Bay Site 2
Bayou Grande Site 3
Bayou Grande Site 4
Bayou Grande Site 6
Bayou Grande Site 1
Bayou Grande Site 2

BAYOU TEXAR

- Sole tributary - Carpenters Creek
- Has been studied the most extensively out of the three Bayous because of importance to the local community
- Salinity ranges from 5 to 20
- Surface area of 157 hectares
- Watershed area of 4,452 hectares
- Increased urban development in the past 50 years
- Major commercial sites/ superfund sites within watershed



BAYOU CHICO

- Northwest side of the 'T' has freshwater input from Jackson's Branch Creek
- Northeast side of the 'T' has freshwater input from the un-named northeast branch tributary
- West branch has freshwater input from Jones Creek
- Surface area of 87 hectares
- Watershed area of 2,683 hectares
- Upper Bayou is mainly residential
- Lower Bayou is mainly light industry and commercial

BAYOU GRANDE

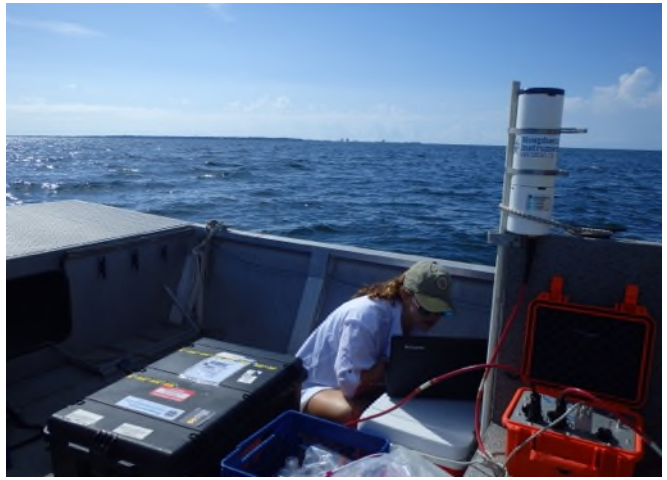
- Least developed of the three systems
- Surface area of 384 hectares
- Watershed area of 4,428 hectares
- North shoreline are older residential homes
- South shoreline is home to NAS, Pensacola and further upstream the bayou is relatively undeveloped

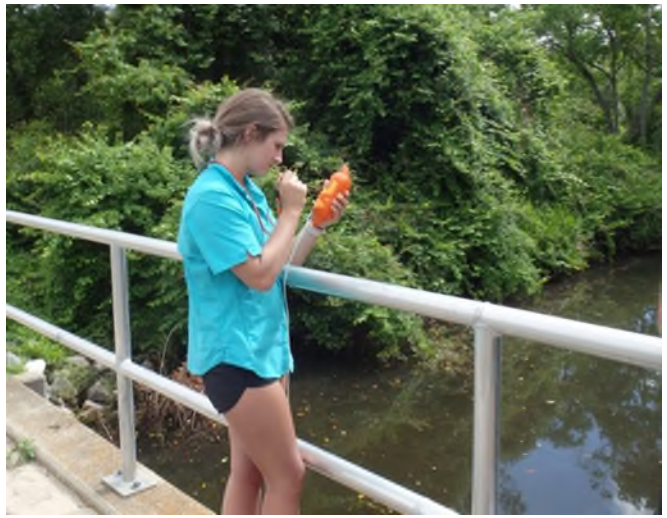
METHODS

- 20 sites being sampled bimonthly from May 2018 to March 2019 for seasonal comparison
- Sampled on the outgoing or slack tide
- Sampling occurring from both bridges/side of the bayou and from the boat due to time and space constraints
  - Sampling 5 sites from bridges/side of bayou
    - Collecting surface water samples
  - Sampling 15 sites from boat
    - Two boat days- Bayou Texar (5 sites) then Bayou Grande and Bayou Chico (10 sites)
    - Surface and benthic water samples

FIELD SAMPLING

- Light Attenuation using the radiometer
- Water Quality Data using the YSI at the surface and bottom
  - Temperature, conductivity, dissolved oxygen (% and mg/L), and pH
- Castaway CTD logging the runs using data from the downwards cast
  - Conductivity, Temperature, Depth
- Surface and bottom water filtered for nutrient analysis (3 x 20mL vials of filtered water)
- Surface and bottom water filtered for chlorophyll a analysis (3 x filters of 60mL)
- Surface and bottom water acidified for total nutrient analysis

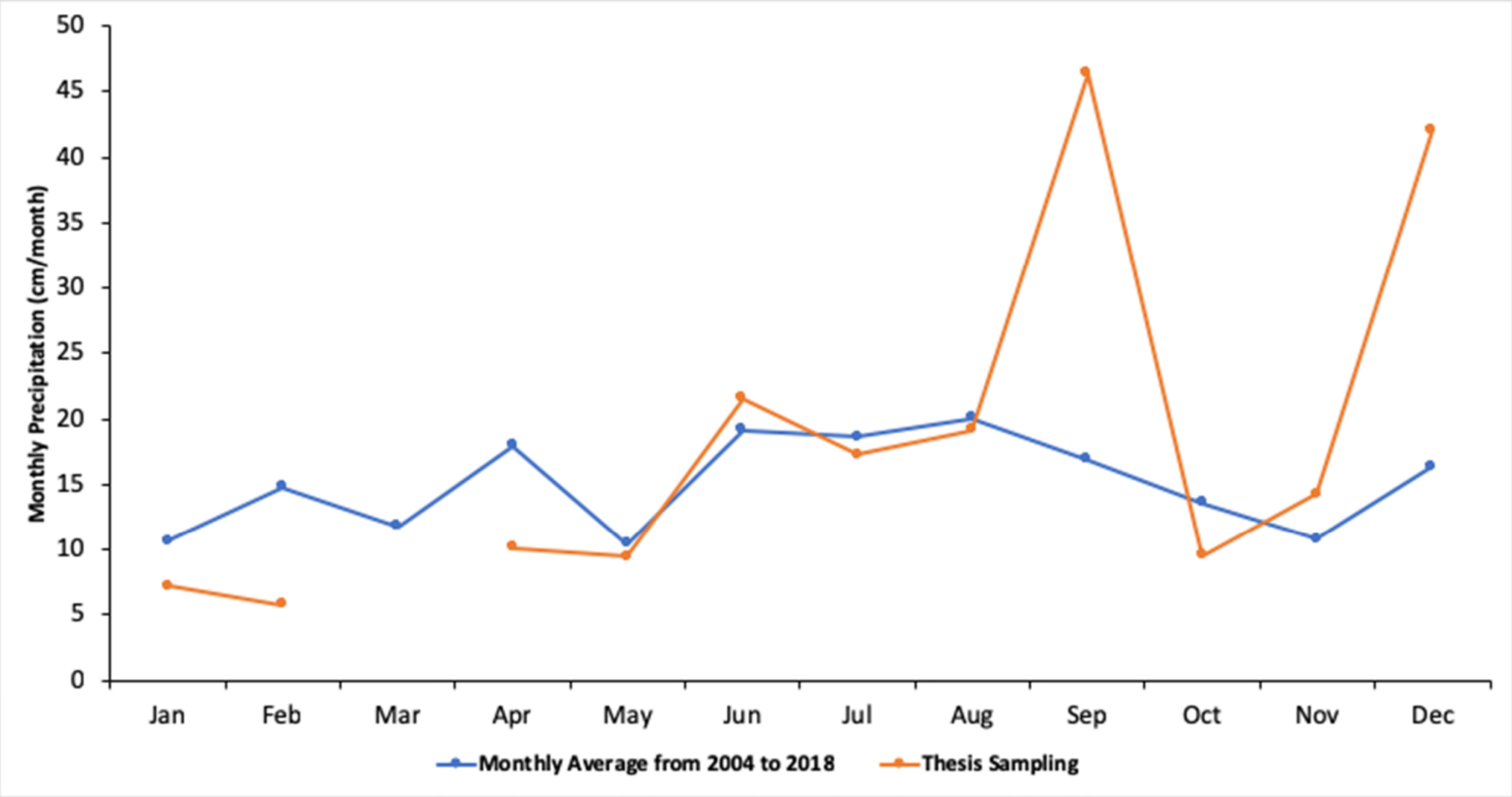


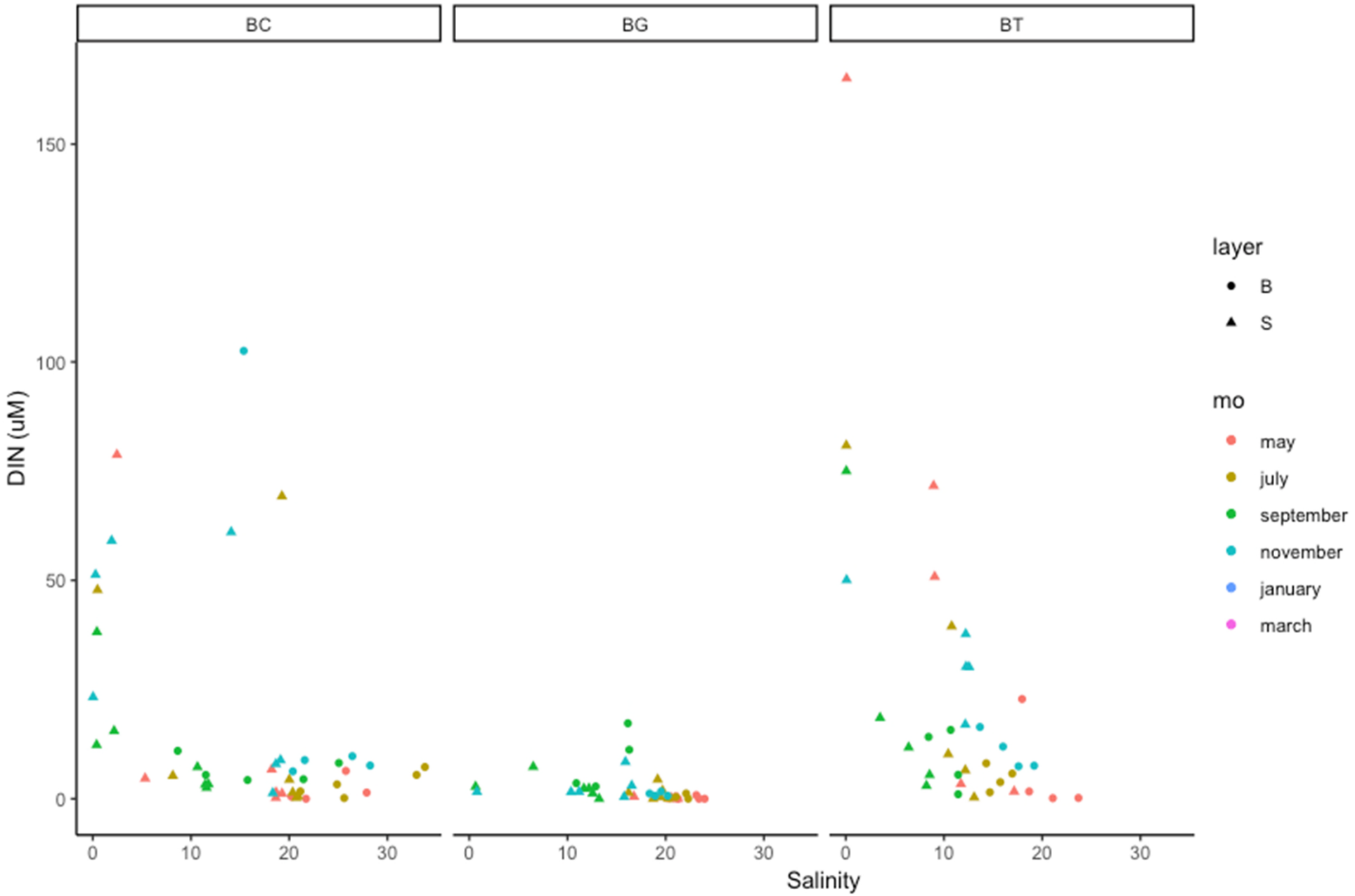


LABORATORY ANALYSES

- Nitrate, nitrite, ammonium, dissolved inorganic phosphate, dissolved silicates for surface and bottom water at each site
- Total kjeldhal nitrogen and total phosphorous
- Chlorophyll a for surface and bottom water at each site
- YSI, Castaway, and Radiometer data downloaded and analyzed for water quality parameters
- Freshwater flow model for each Bayou

PRECIPITATION

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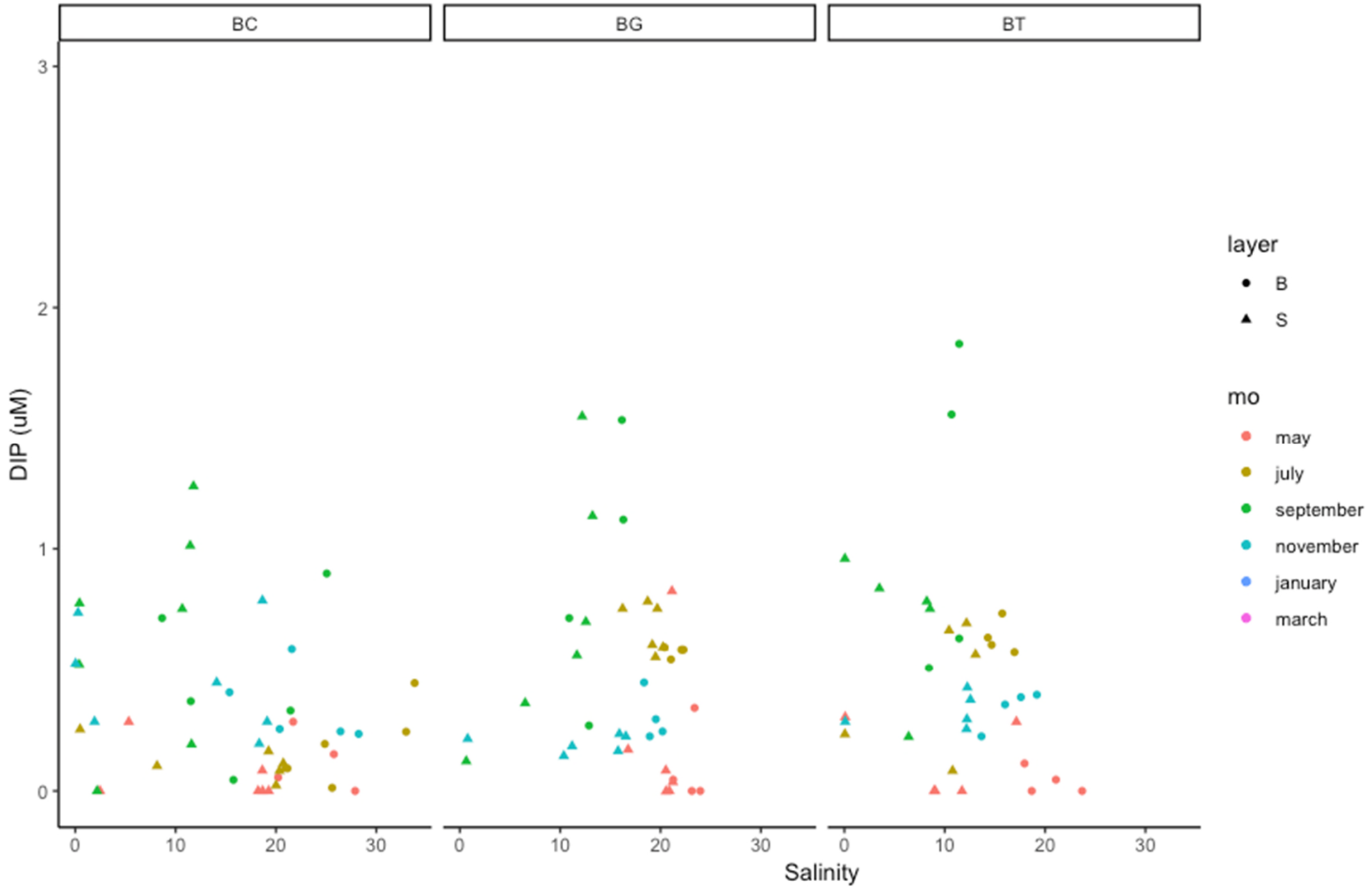
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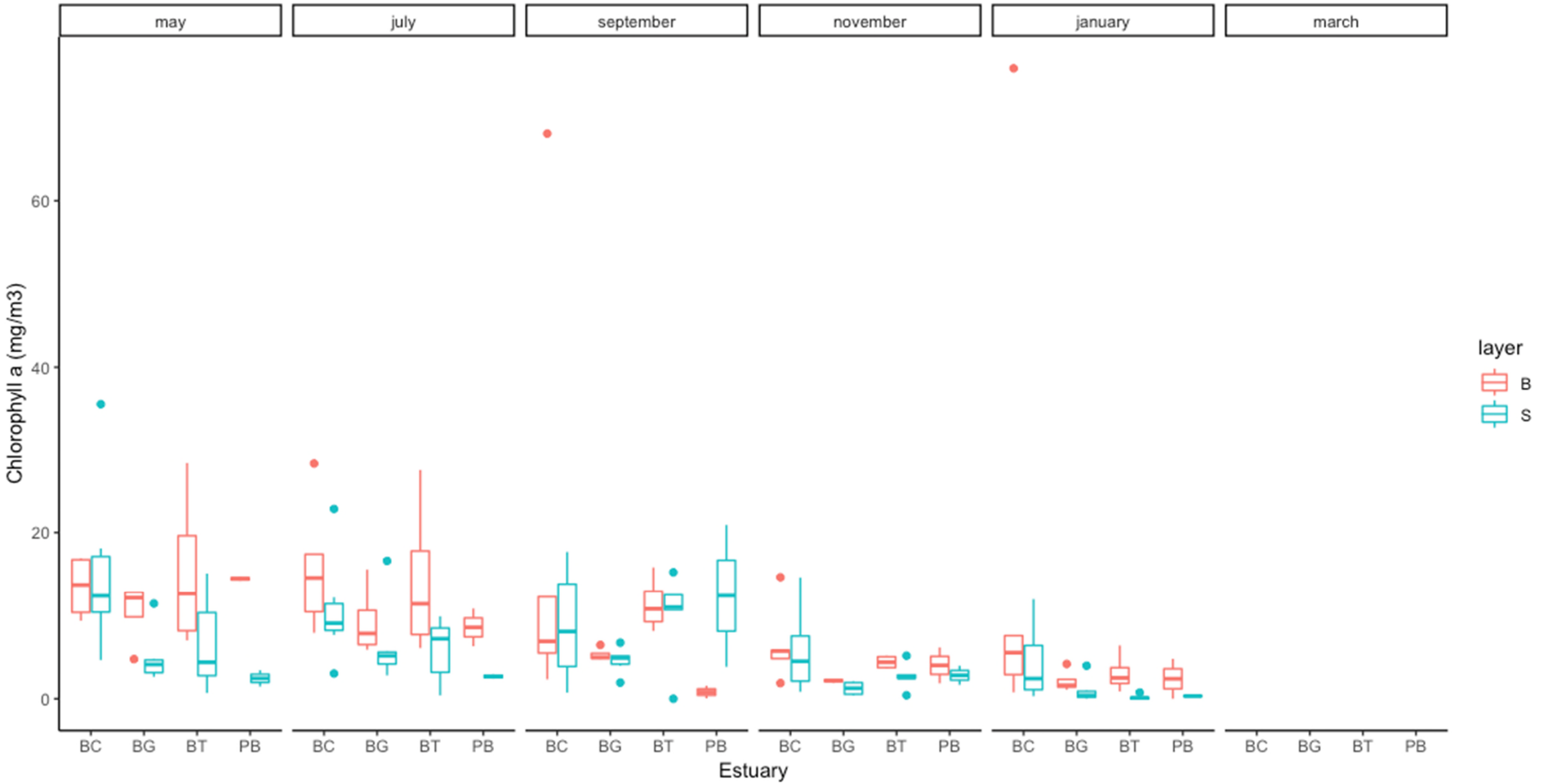
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Chlorophyll a (mg/m3)
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Estuary
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S

CURRENT CONCLUSIONS

- Precipitation has been around the monthly average except for September and December which were higher
- Bayou Grande has the lowest concentrations of dissolved inorganic nitrogen
- Bayous Chico has high levels of dissolved inorganic nitrogen that show signs of inputs
- Bayou Texar has high levels of dissolved inorganic nitrogen that shows signs of conservative mixing
- Dissolved inorganic phosphorous concentrations are low in all three Bayous
- Chlorophyll is generally higher on the bottom and has much higher levels in Bayous Texar and Chico
- Seasonally the Bayous show decreased chlorophyll concentrations in the winter months
- Spatially, Bayou Grande has better water quality than Bayous Texar and Chico

FURTHER WORK

- Finished my last field sampling last week
- Run assays on my the samples collected this month

- Nutrient and light limitation on chlorophyll
- Data Visualization

- Freshwater flow model
- Simple one box models for each Bayou

- Compare nutrient data with historical data

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QUESTIONS