



# **Water Quality in the College Creek Watershed**

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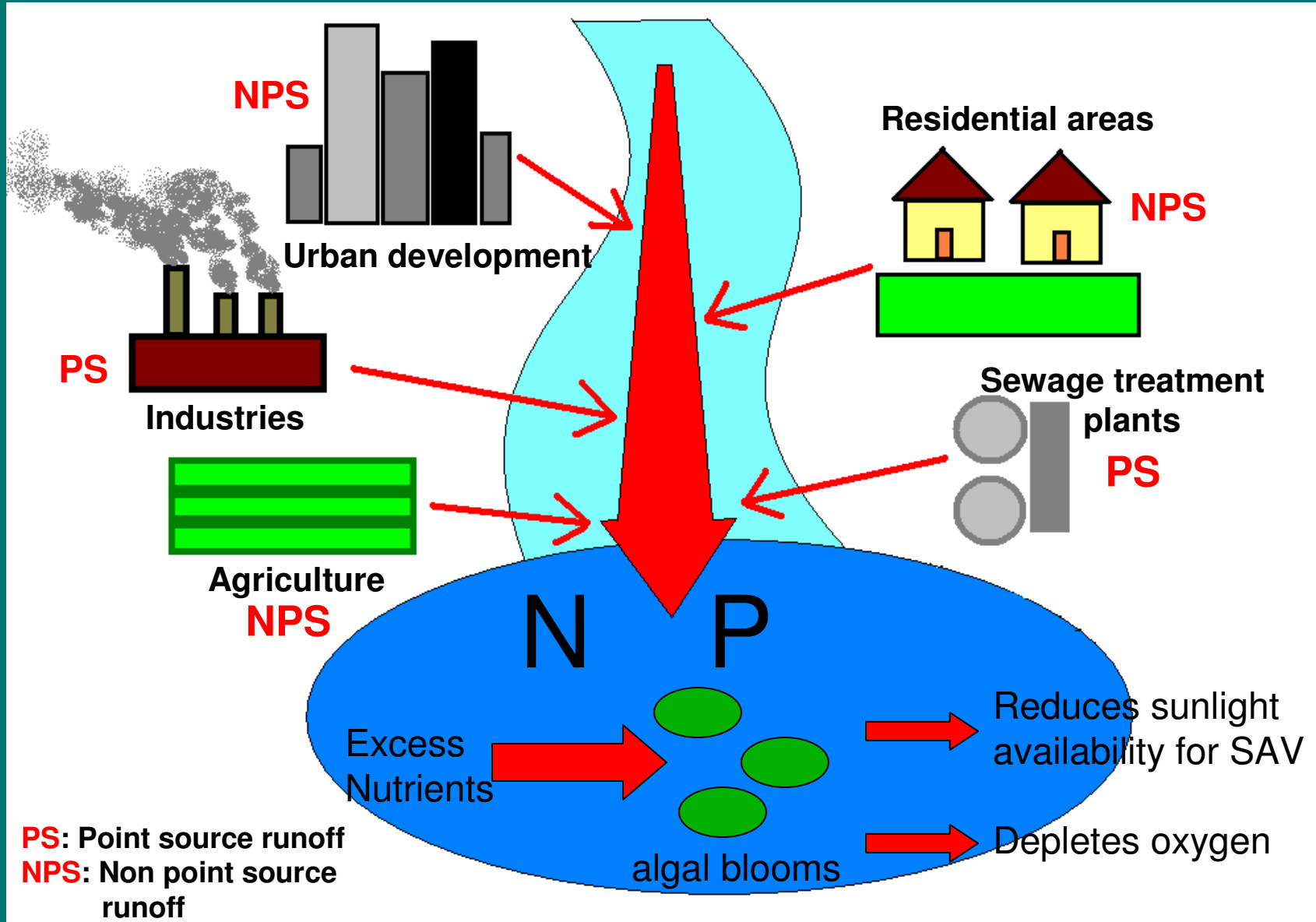
**College of William & Mary**

**Funded by the Virginia Environmental Endowment**

# Presentation Overview

- **Background**
- **Methods**
- **Results & Discussion**
- **Summary**

# Nutrient Pollution



# College Creek Watershed

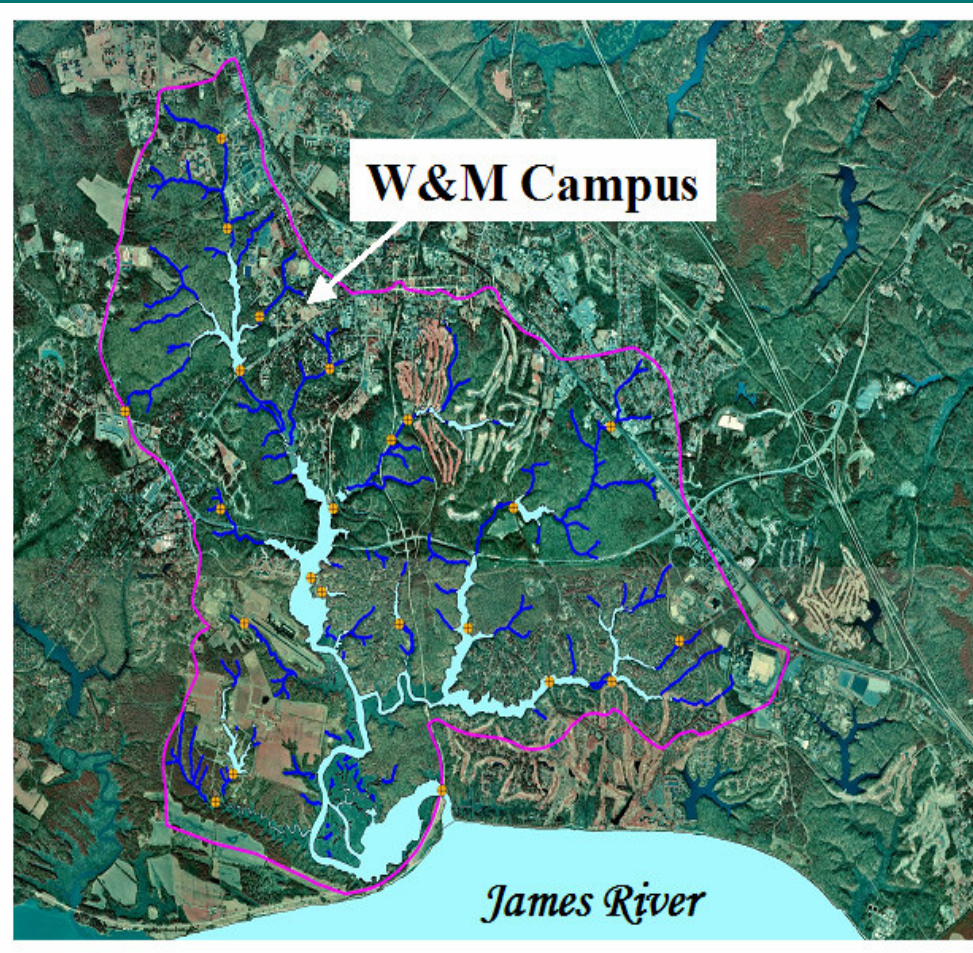


Image courtesy of Tim Russell

- 13.7 sq mile basin
- College Creek  
↓  
James River  
↓  
Chesapeake Bay
- College Creek Alliance (CCA) established 2003

# CCA Goals

- 1) Survey and document the water quality of the College Creek watershed.
- 2) Identify areas of impaired water quality.
- 3) Increase citizen accountability for land use by encouraging involvement in data collection.
- 4) Increase citizens' knowledge of the CC watershed.
- 5) Influence decisions regarding watershed by working with planning groups.

# Methods

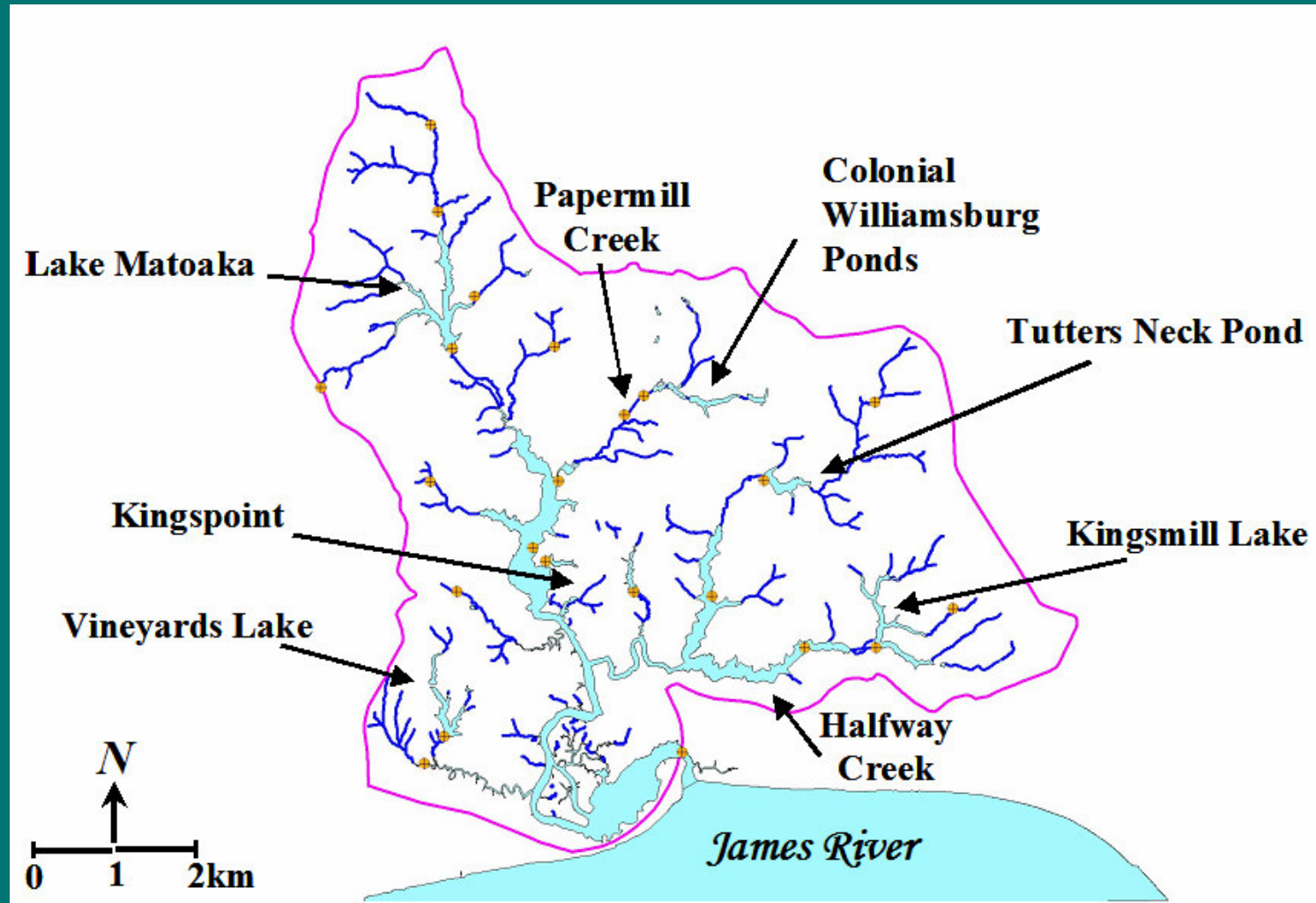


Image courtesy of Tim Russell

Quarterly sampling in 23 stations

# Types of Water



Image courtesy of Tim Russell  
Kingspoint Pond

## A) PONDS

## B) STREAMS

College Creek

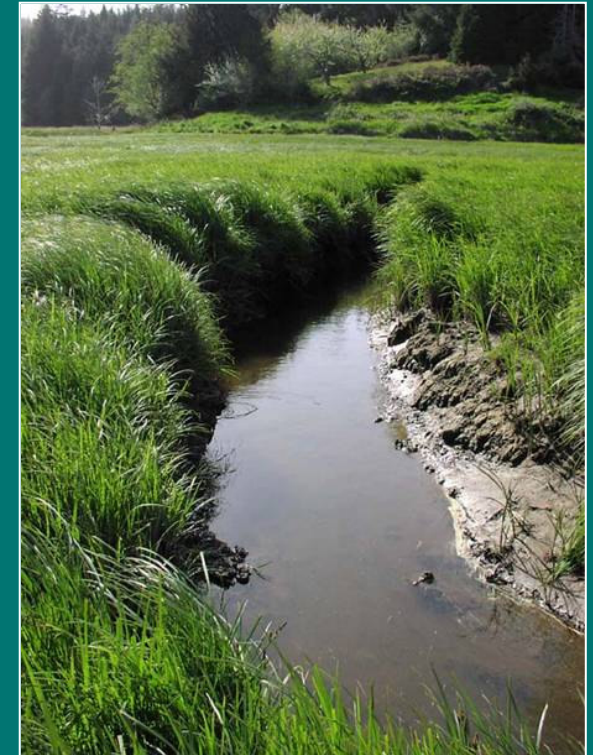


Image source: <http://www.csc.noaa.gov>

## C) TIDAL CREEKS

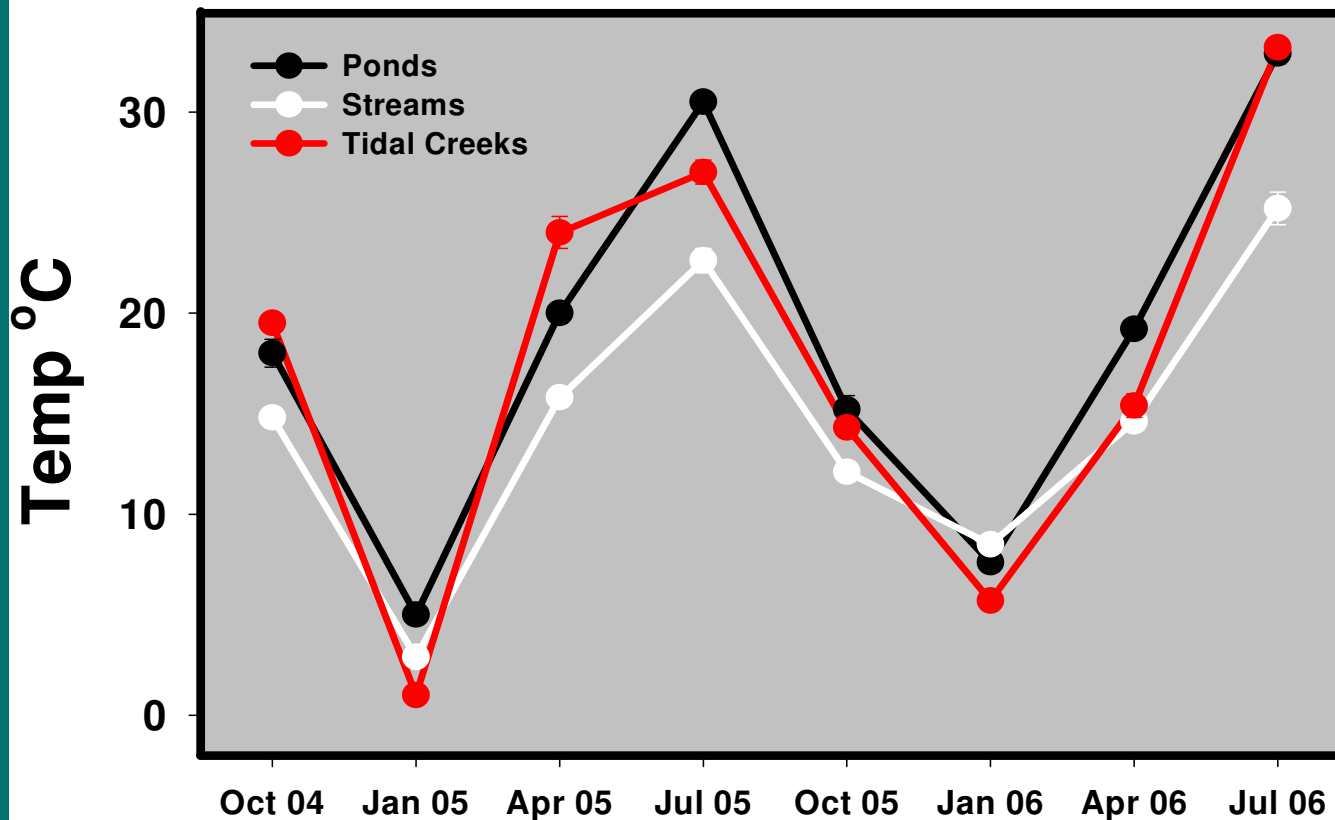
# Tests

- Nutrients: DIP, total PP,  $\text{NO}_3^- + \text{NO}_2^-$ ,  $\text{NH}_4^+$
- Conductivity
- Salinity
- Dissolved Oxygen
- % Saturation of Oxygen
- Fecal coliform bacteria
- pH
- Total suspended solids
- Turbidity



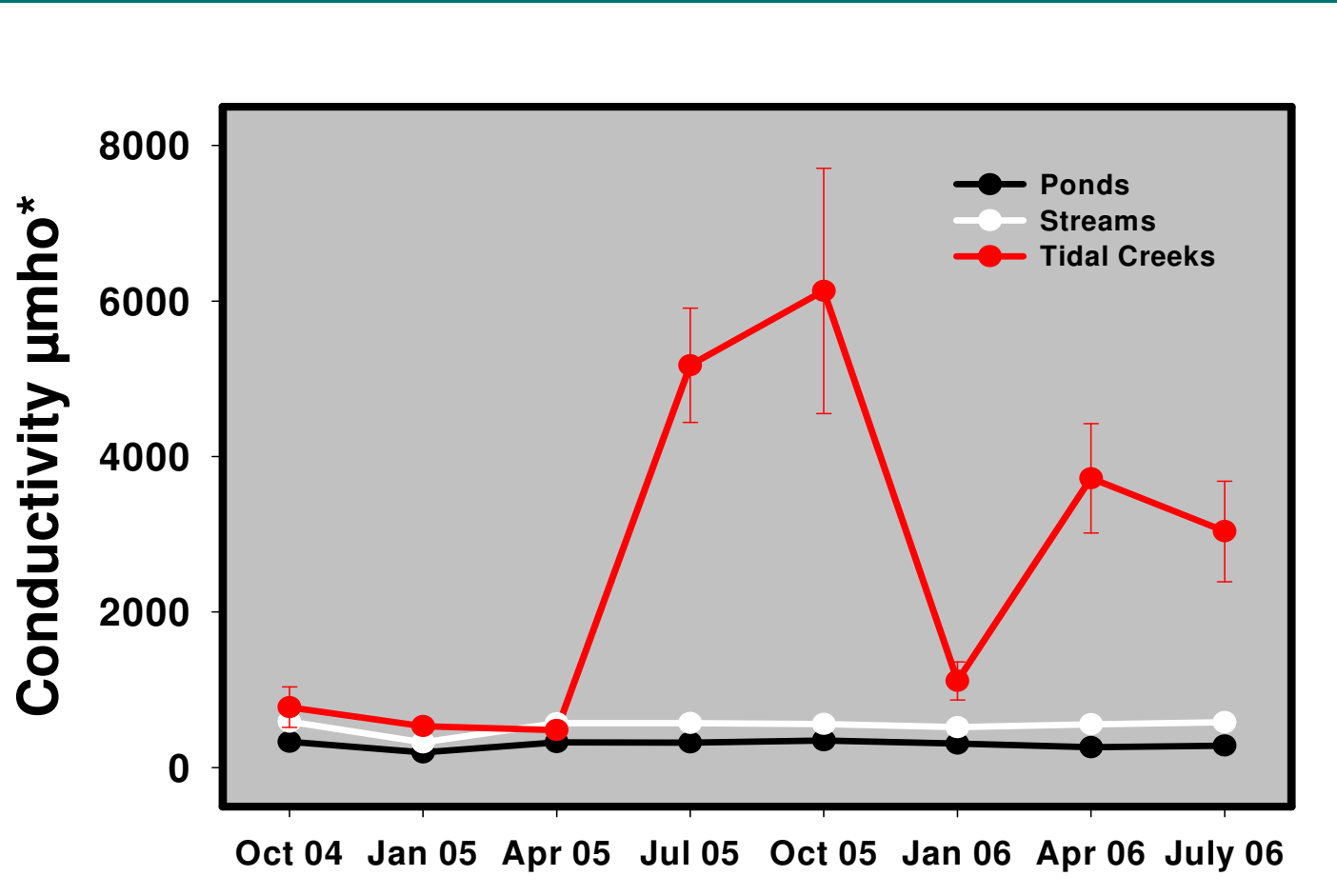
# Results

## Temperature



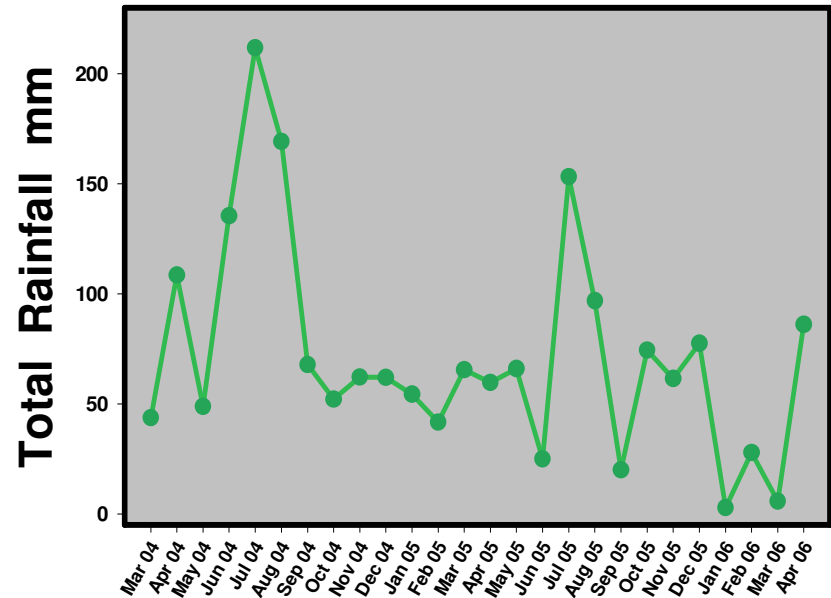
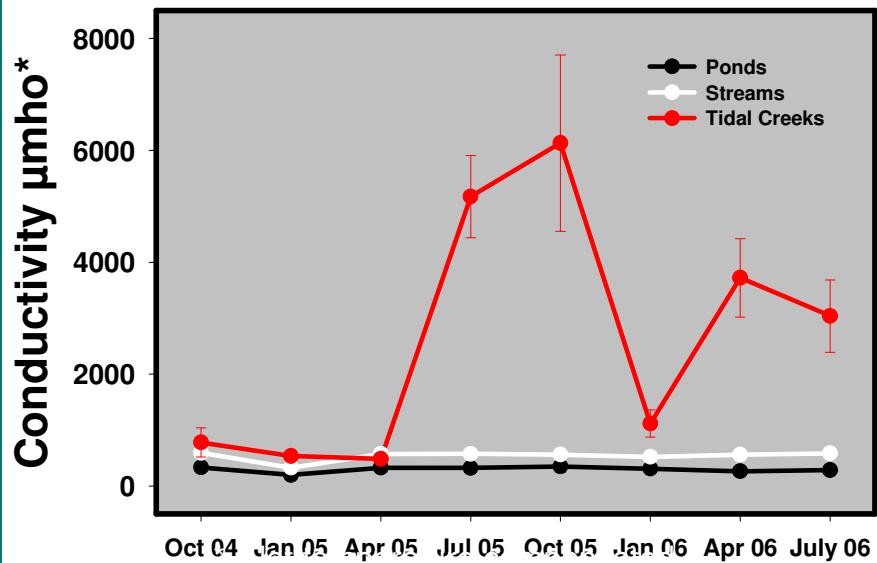
- Seasonal fluctuations.
- Streams are generally cooler than ponds or tidal creeks.

# Conductivity



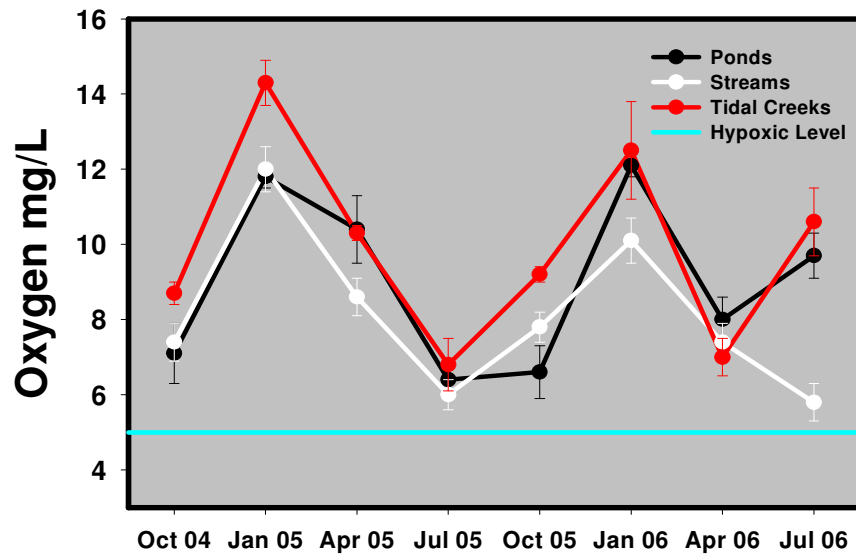
\*Not temperature compensated

- Conductivity is the measure of the amount of dissolved solids.
- Tidal creeks have the highest conductivity.

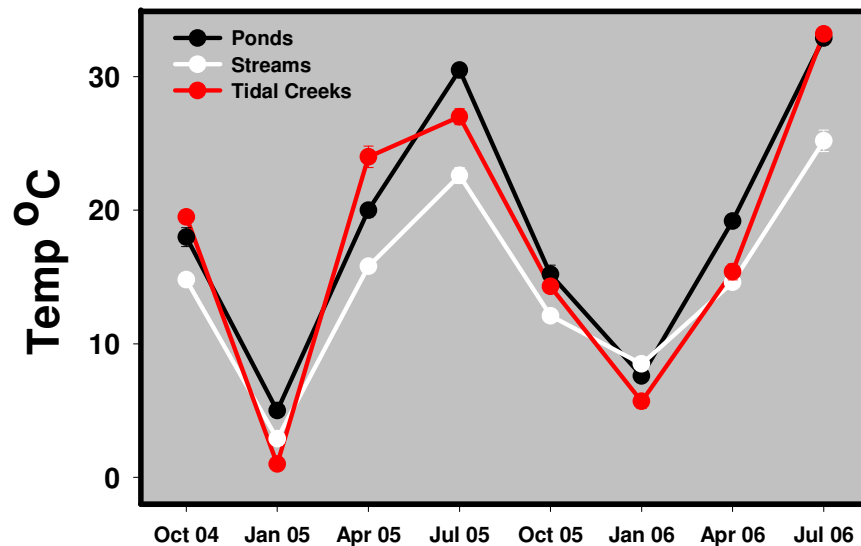


- Tidal creeks decrease conductivity in response to increased freshwater runoff from rain.

# Dissolved Oxygen

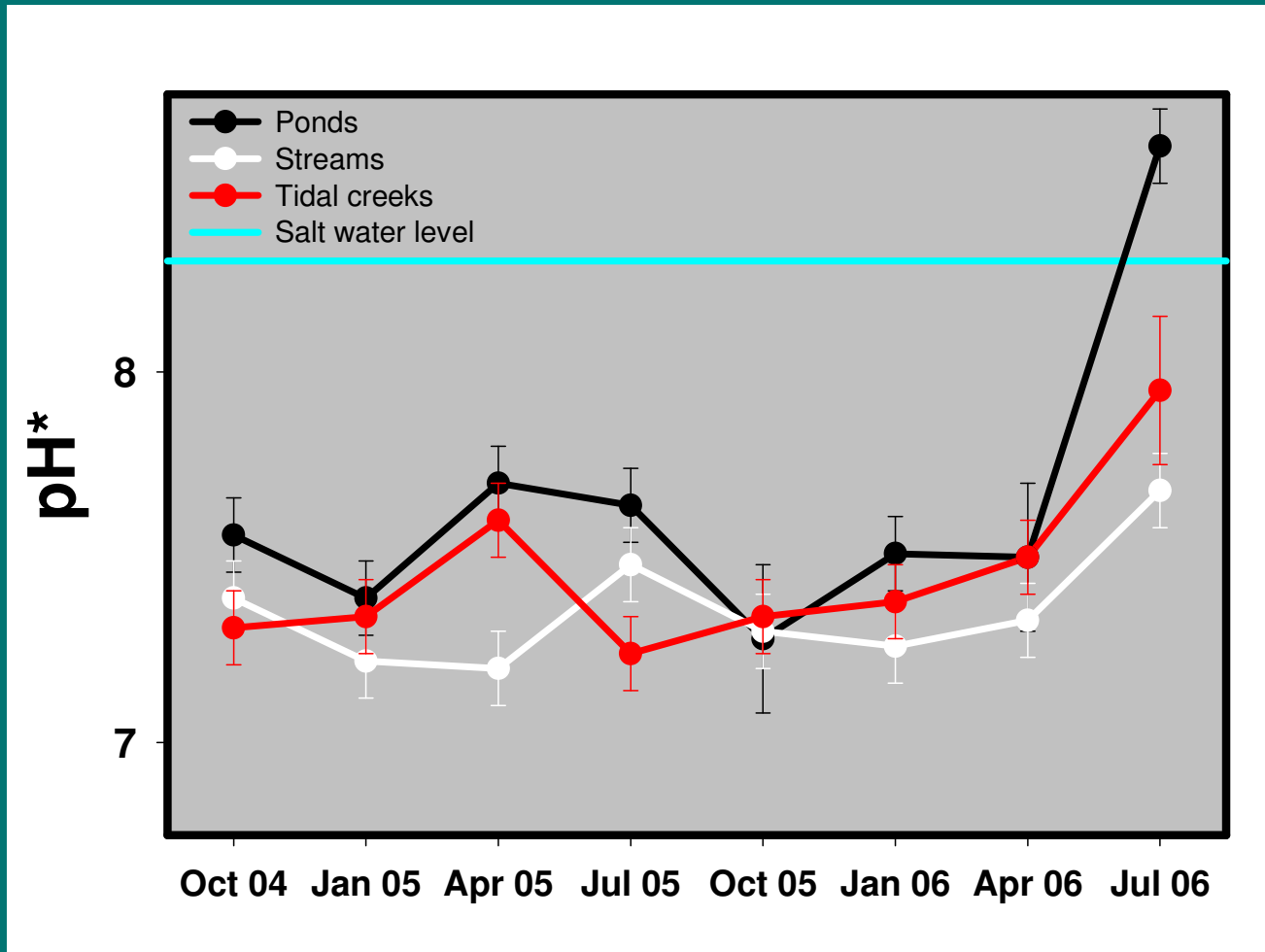


➤ DO levels decrease as temperature increases.



➤ July 2006 DO levels in streams approach hypoxic levels while pond and tidal creeks exceed expected levels.

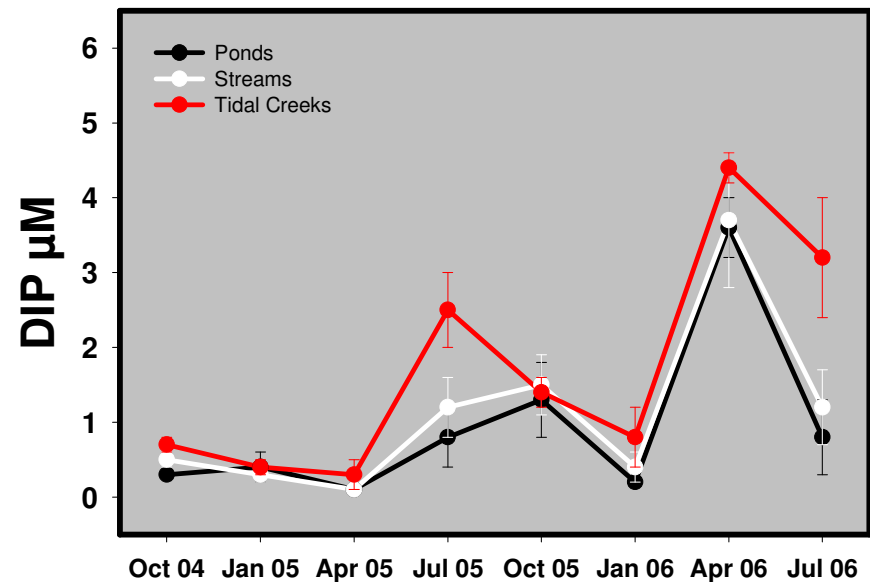
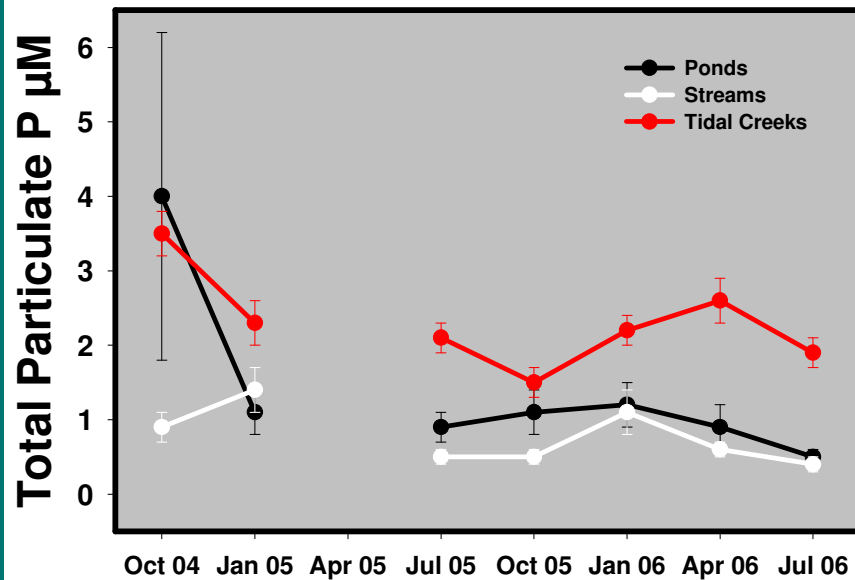
# pH



\*Not temperature corrected

- Basic water found in all 3 water types.

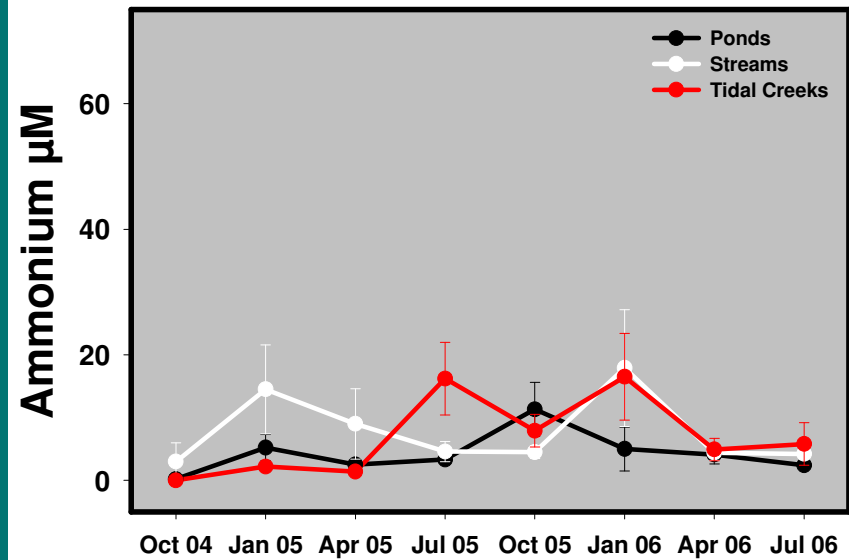
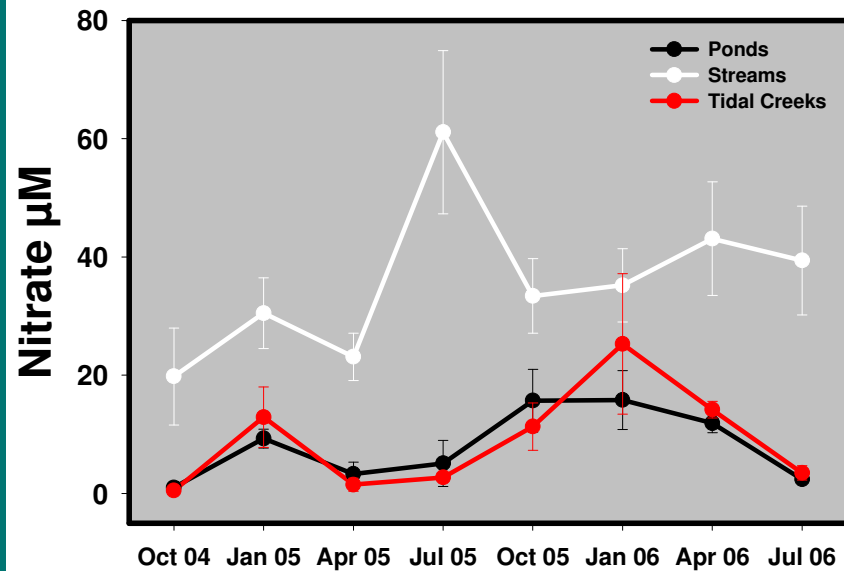
# Phosphorus



April 2005 data not available.

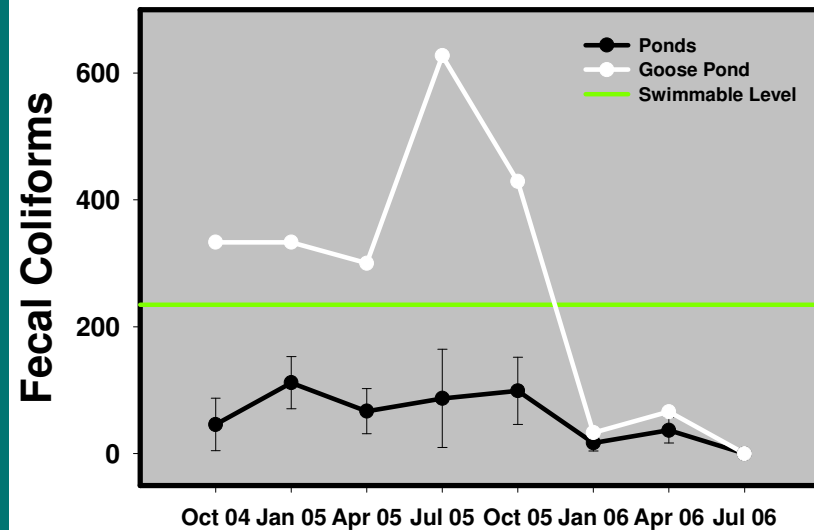
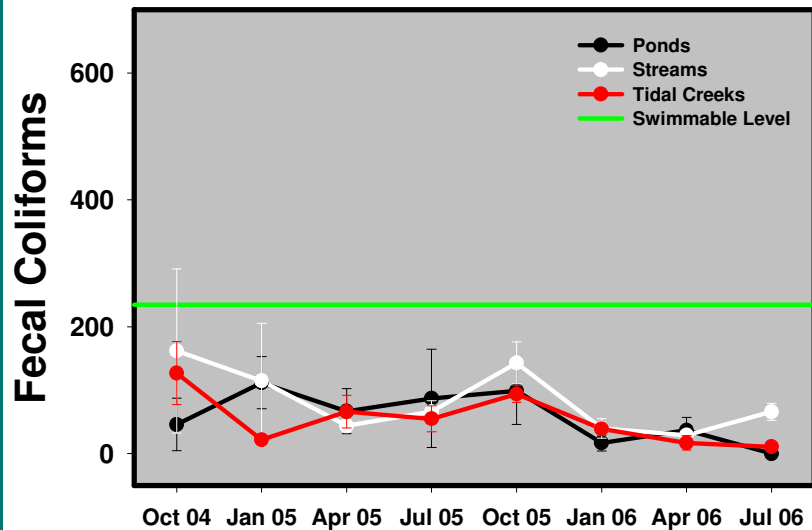
- P is highest in tidal creeks.
- P levels increasing

# Nitrogen



- $\text{NO}_3^-$  most common form of N.
- Streams have the highest [N].
- Increasing  $\text{NO}_3^-$  in streams.

# Fecal Coliforms



- Fecal coliforms are indicator bacteria that flag the presence of harmful bacteria.
- Decreasing trend

# Summary Points

- Ponds, streams and tidal creeks have seasonal **temperature fluctuations**.
- **Tidal creeks** have **higher conductivity** than ponds or streams.
- Conductivity in tidal creeks influenced by **freshwater runoff**
- **DO** content in ponds, streams and tidal creeks are a **response to temperature**.
- DO in **streams** approaching **hypoxic levels**
- **P** levels **increasing**
- **Nitrate** is the **main form** of N discharging into waters.
- **Streams** have the **highest [N]**.
- **[NO<sub>3</sub><sup>-</sup>]** increasing in streams
- **Fecal coliform** bacteria **decreasing**

# Acknowledgements

- Advisor: Dr. Randolph Chambers
- Virginia Environmental Endowment
  - Zack Hayden
- Everyone at the Keck Lab and all the REU Students for their support and encouragement

# Online Sources

- <http://www.cbf.org>
- <http://www.chesapeakebay.net>
- <http://www.epa.gov>
- <http://www.nrcs.usda.gov>
- <http://www.protectedwithpride.org>
- <http://www.wm.edu/environment/CCA/CCA.html>