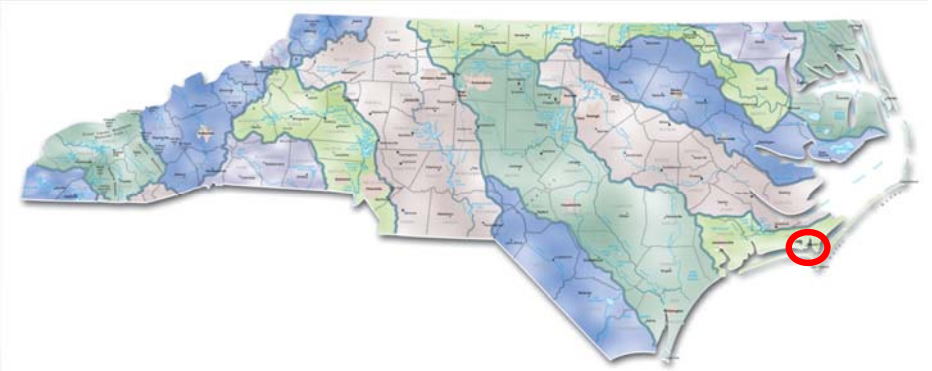
Continuously monitoring flow, carbon, and nitrogen in a restored North Carolina salt marsh

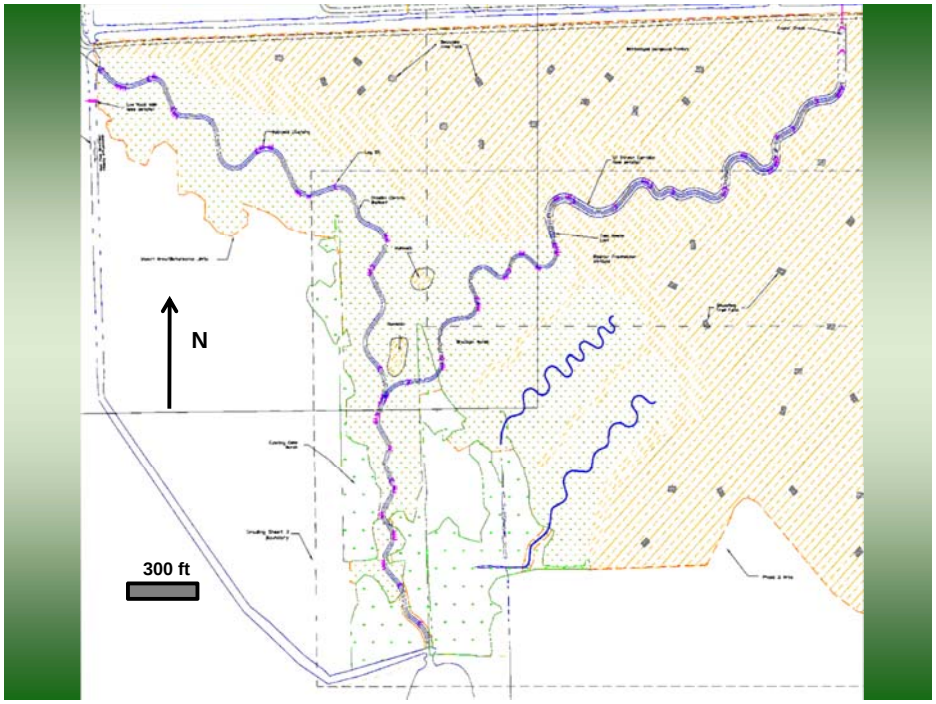
J. Randall Etheridge, Michael R. Burchell II, François Birgand

Site Location



Restoration Goals

- Improve water quality in the North River
- Restore habitat
- Provide design guidance for future salt marsh projects in coastal North Carolina



Construction

Restoration

Research Objectives

- Quantify the ability of a restored salt marsh to dissipate excess nutrients
- Quantify the timing and kinetics of nutrient dissipation and/or release
- Correlate the dissipation and/or release of nutrients to the type of organic matter

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Method

- Continuous nutrient mass balance between inlet and outlet
- Sediment-water interface process kinetics experiments
- Qualify nature of organic matter using fluorescence measurements

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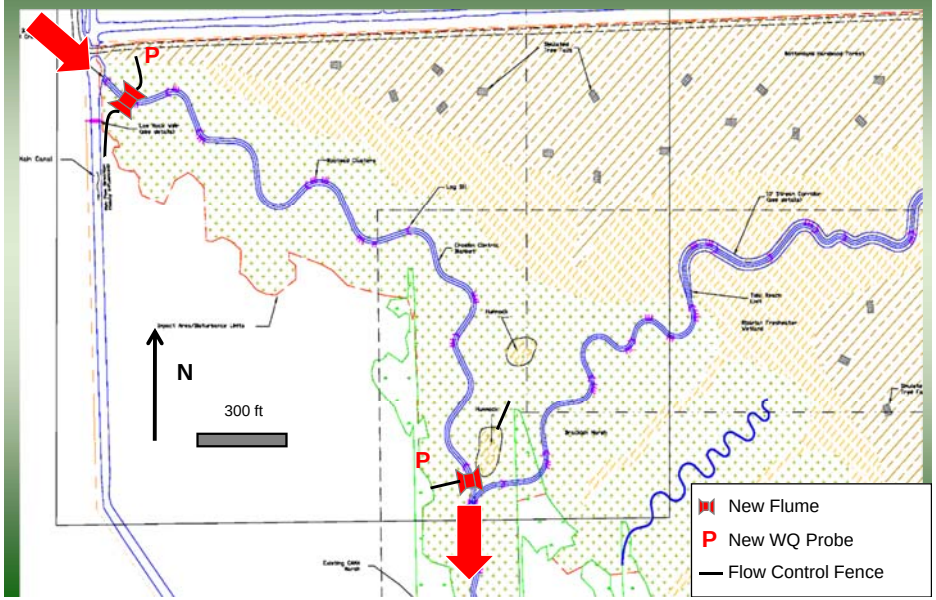
Upstream/Downstream Monitoring



Flow Monitoring in a Tidal Stream

- Cannot use normal rating curve due to bi-directional flow
- Flumes serve as a constant cross section – cross section area measurement creates the most error in flow monitoring

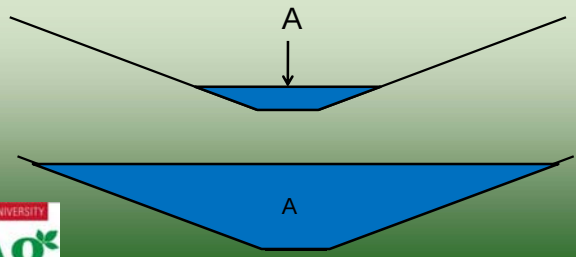
Downstream flume at high tide

Downstream flume between tides

Flow Calculations

Q = V x A

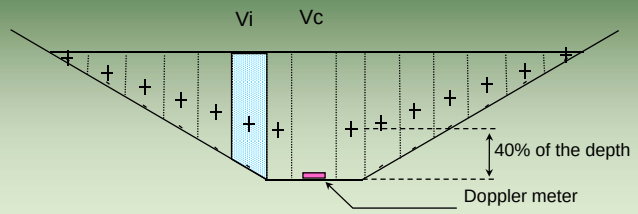
- Q: flow
- V: velocity
- A: cross-section area

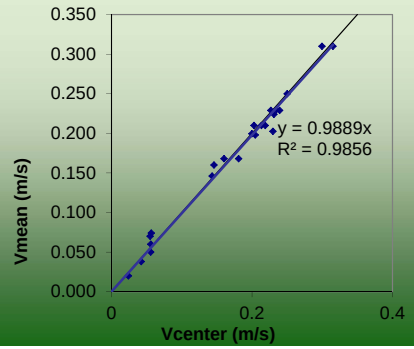


Continuous Flow Monitoring

- Doppler velocity meter records velocity and water depth in flume
- Average velocity and water depth recorded every 15 minutes
- Use manual stream gaging to relate Doppler velocity to actual flow in the flume

Flow Calibration

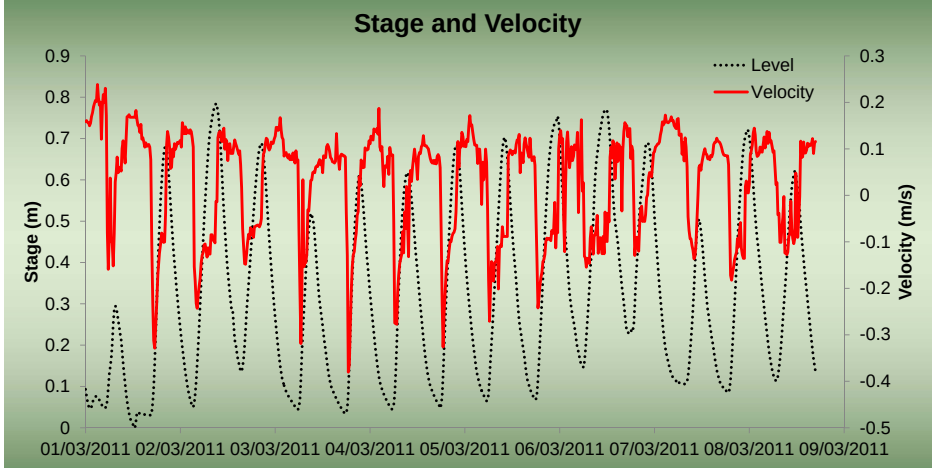




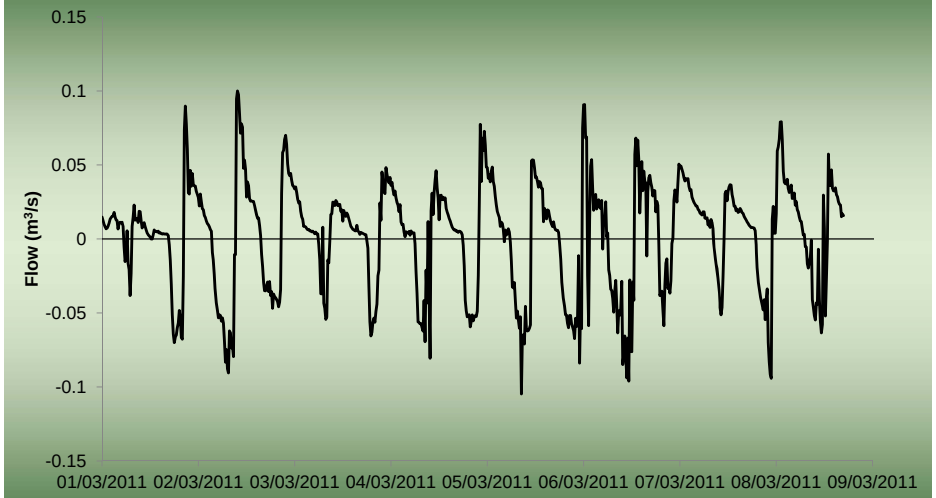
Flow Monitoring in a Tidal Stream

- One challenge presented in the marsh: high tide or water level above the flumes
- Solution: direct flow through the flume using impermeable fence

Downstream Flume



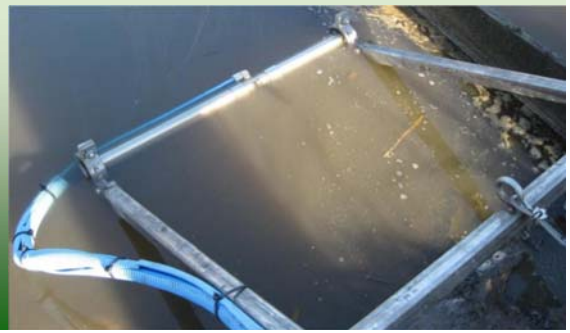
Downstream Flume Flow



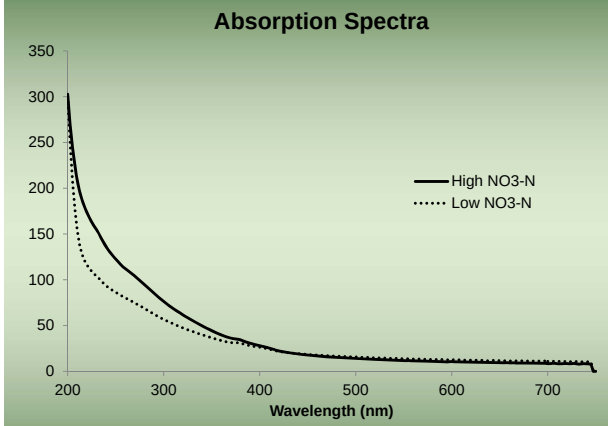
Continuous Water Quality Monitoring

- Monitored using UV-visual spectrophotometer placed in the stream
- Absorption spectrum and parameters measured every 15 minutes

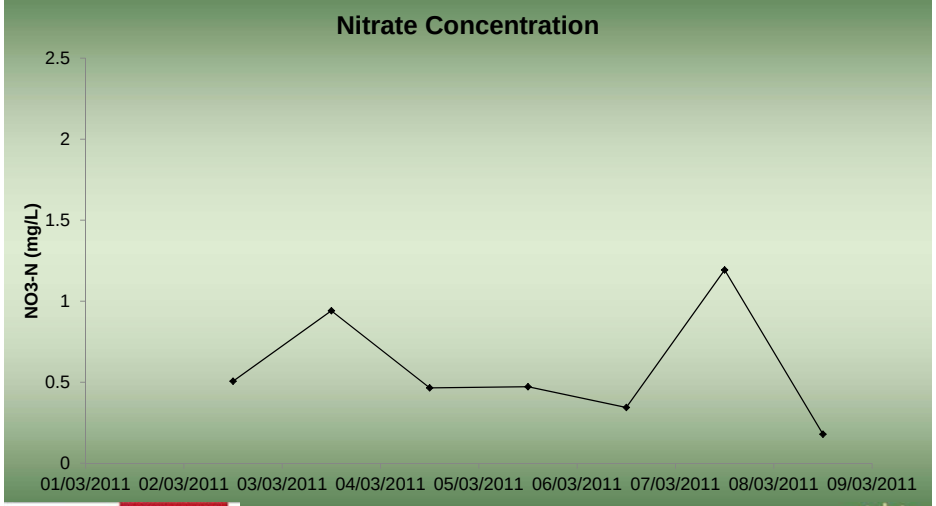
Parameter	Max (mg/L)	Resolution (±mg/L)
NO_3^-N	70	0.1
TOC	150	0.2
DOC	90	0.2



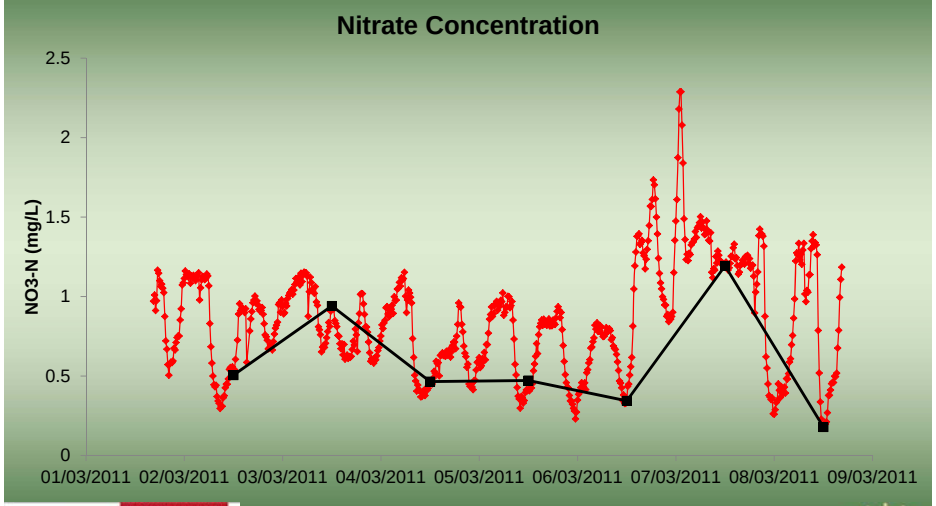
Continuous Water Quality Monitoring



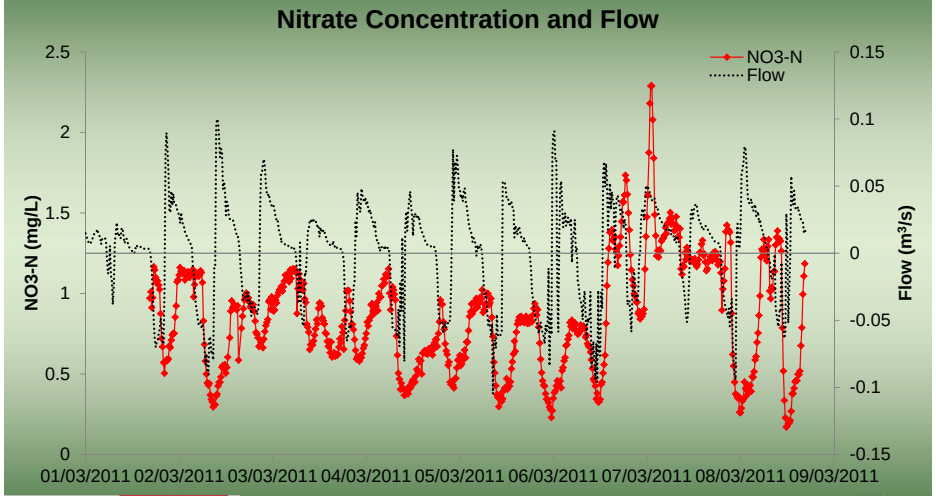
Downstream Flume – Daily Sample



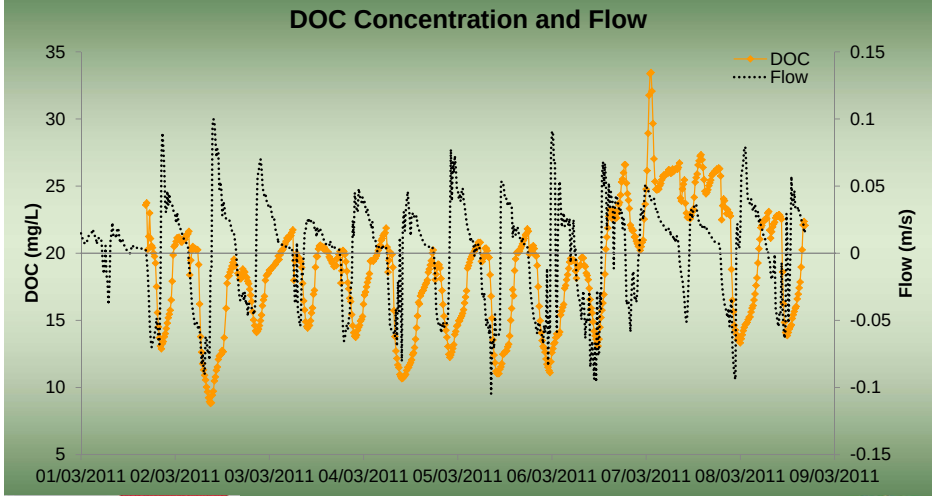
Downstream Flume – 15 minute sample interval



Downstream Flume



Downstream Flume



Challenges of Continuous Water Quality Monitoring

- Calibration
- Preventing/reducing window fouling
- Solar power

Future Research

- Continuously monitor:
  - pH
  - Conductivity/Salinity
  - Dissolved Oxygen
  - DOM Fluorescence

Future Research

For more information on our future work with organic matter see this poster:

Mikan et al., Chromophoric Dissolved and Particulate Organic Matter Cycling Through a Tidally Influenced Restored Marsh Ecosystem in Eastern North Carolina

Acknowledgements

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