

Illustrating critical knowledge (gap) provided by high time resolution water quality data (or lack thereof)

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In Environmental Sciences we...

- ... want to tell the story of how the world functions
- ... make hypotheses
- ... we collect data *partial in space and in time*
- ... infer processes at play, quantify, extrapolate
- ... make conclusions on how the world functions and what we should do about it

A little story

"Troy Marc hard;
... .. forehead. unconscious
floor, face Marc all
... bad feared."

A little story

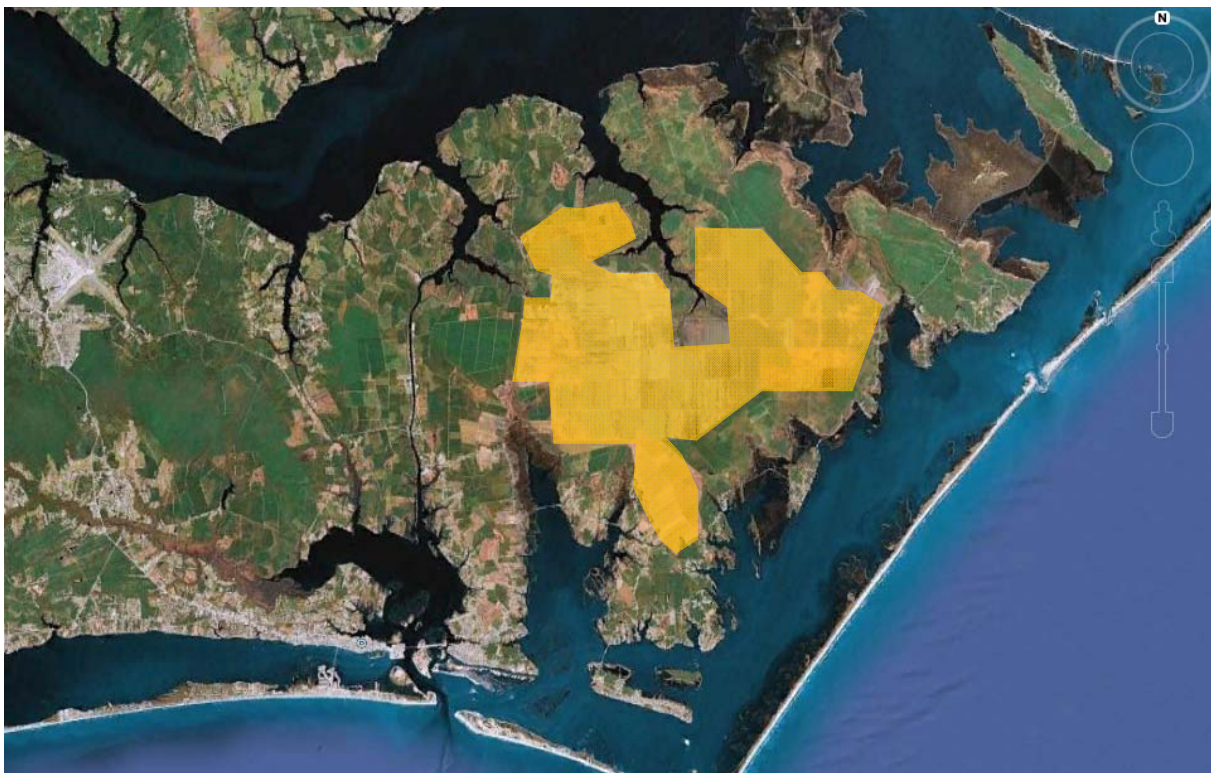
"Marc catch. ball... ; ... missed ...
... .. landed Troy unconscious
... .. smile reassured was
... not feared."

A little story

"Marc and Troy were playing catch. Marc threw the ball hard; Troy missed it and it landed on his forehead. Troy was laying seemingly unconscious on the floor, but the smile on his face quickly reassured Marc that everything was all right and not as bad as he had feared."

Working with natural waters

- Flow, nutrient and pollutant loads intrinsically linked to rainfall pattern
- Rainfall is unpredictable
- There are no two same rainfall events
- Extrapolating from measurements made during a few rainfall events or throughout the year, regardless of rainfall is *RISKY*
- Tidal wetlands may be even more special...





Can tidal marshes be efficient nutrient buffers?

- Of course!
- OK, but...
 - By how much exactly?
 - Exact processes involved?
 - When?
 - Can we optimize their efficiency?
 - ...
- Let us restore marshes!

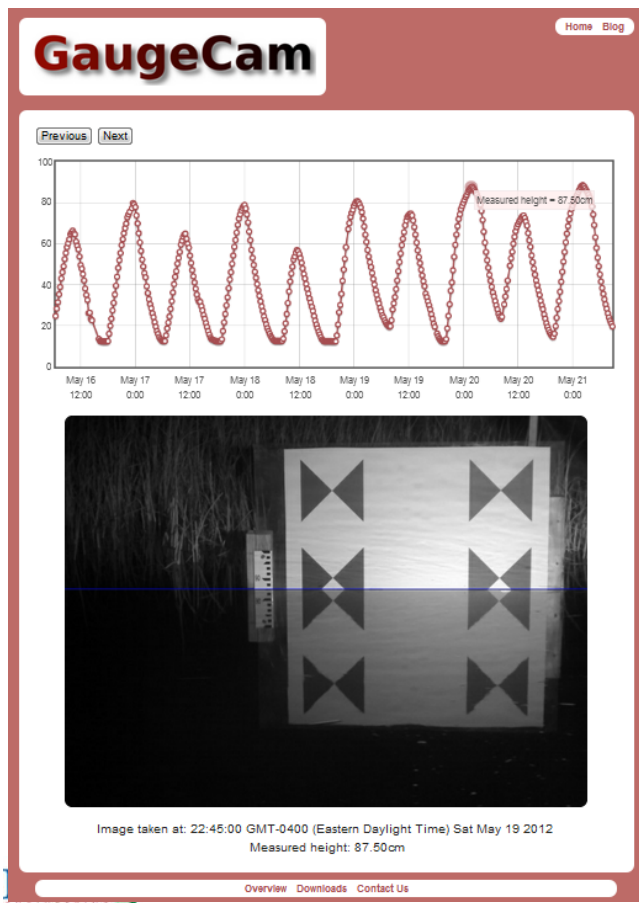
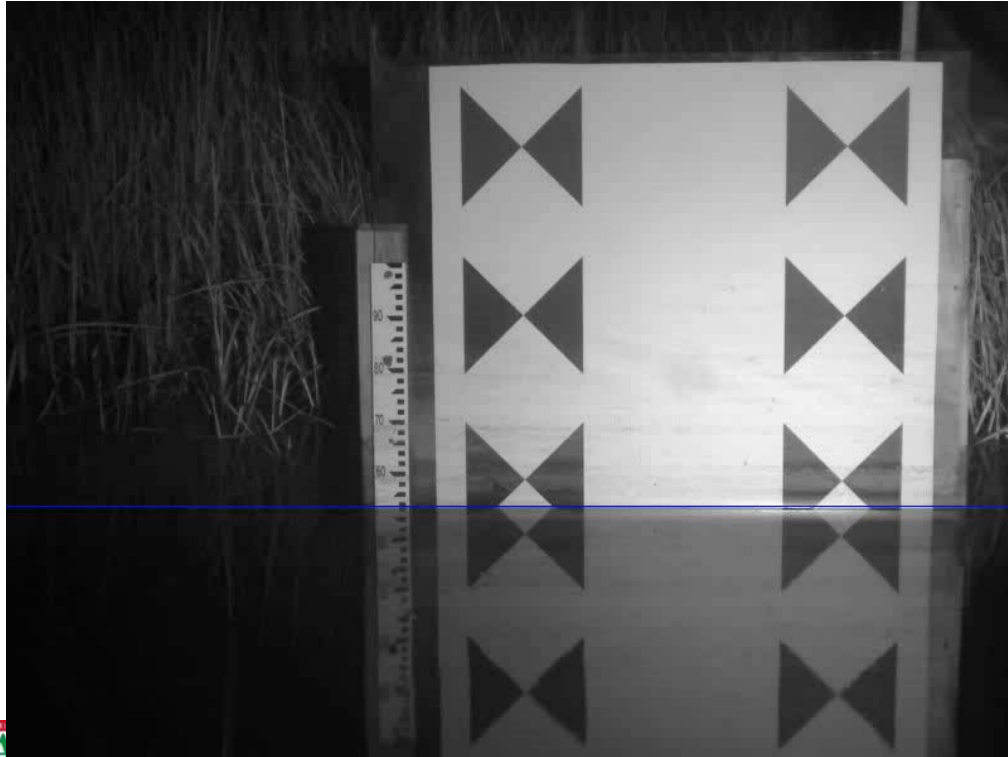
Construction



Restoration



Perpetually changing world...

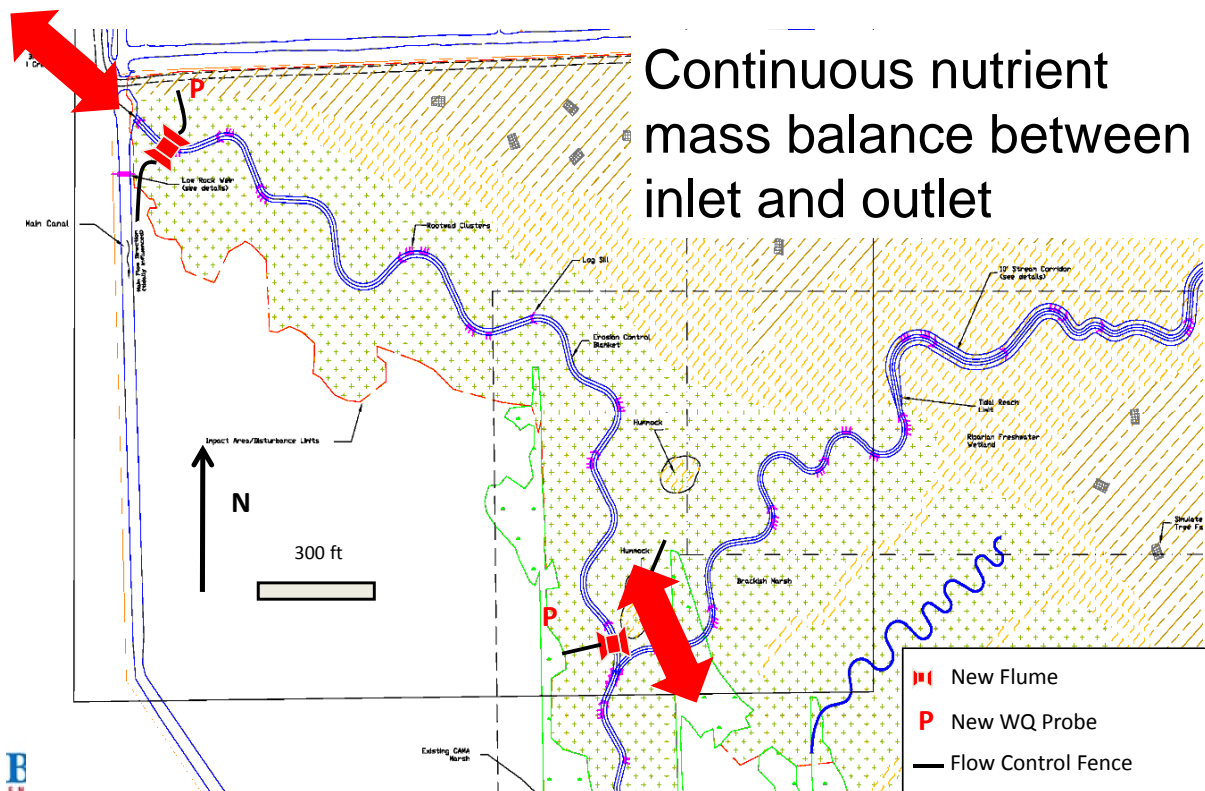


www.gaugecam.com

Research Questions

- How much nitrogen is retained or released by a restored salt marsh?
- Are there seasonal, daily, or tidal trends in nutrient release or retention?
- Is there a relationship between nutrient retention or release and the type of organic matter present in the stream?

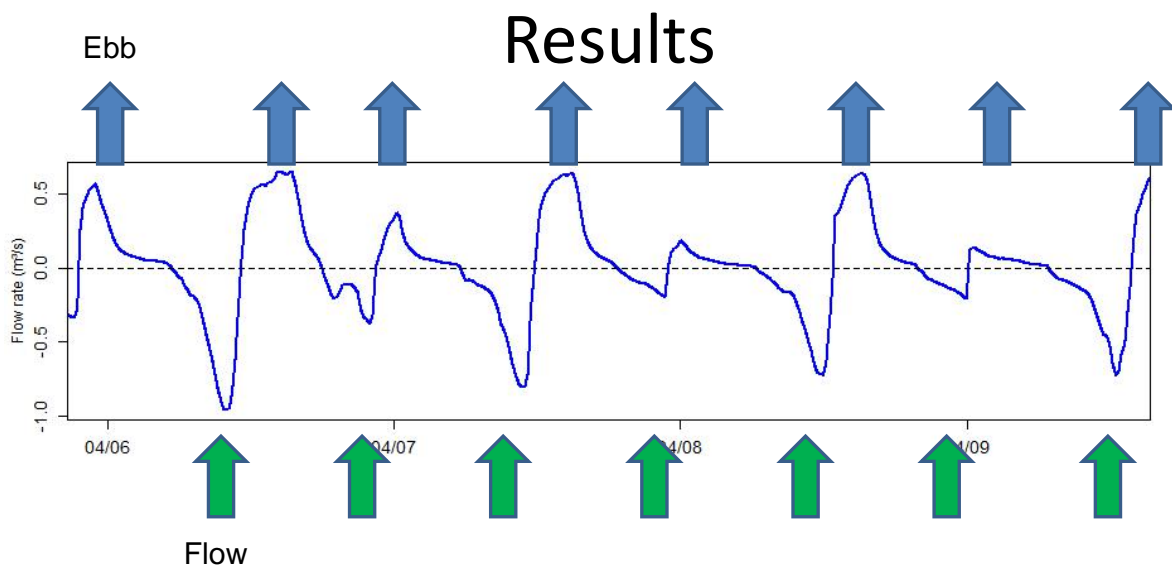
Methods



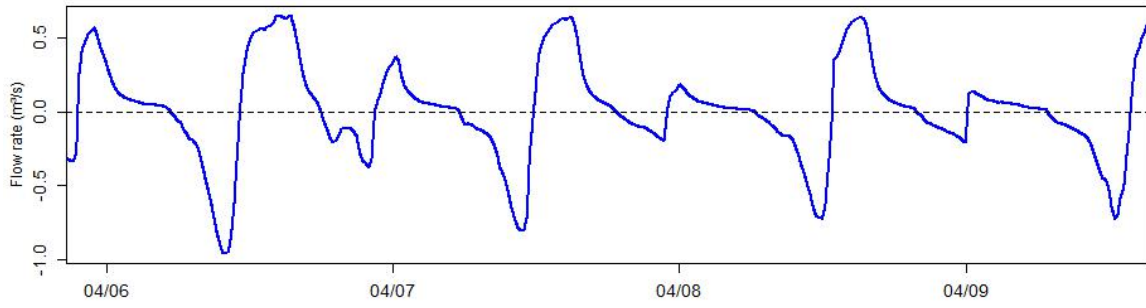
Monitoring: 15 min data

- Flow

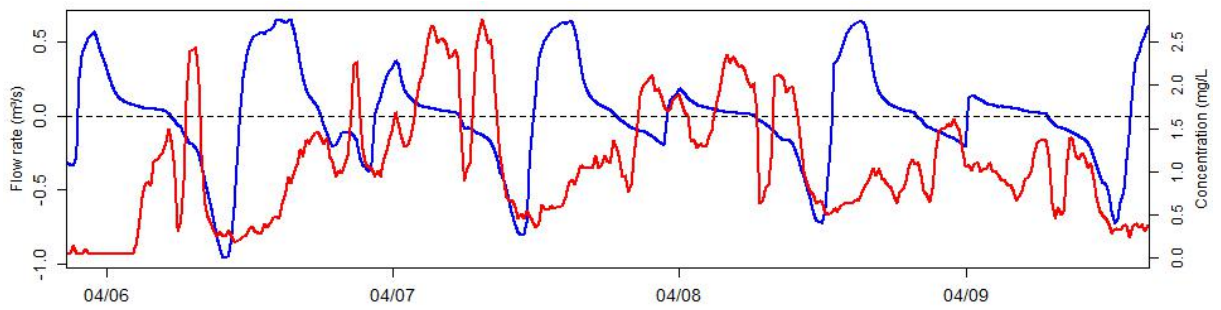
- Water quality



Results



Results

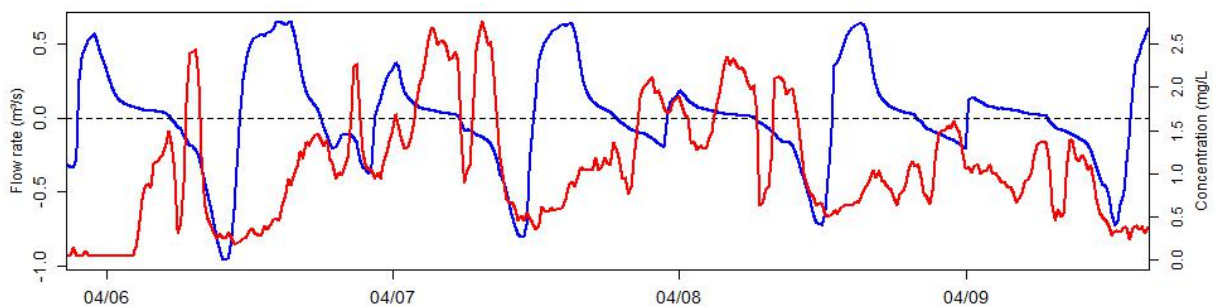


Mass Balance

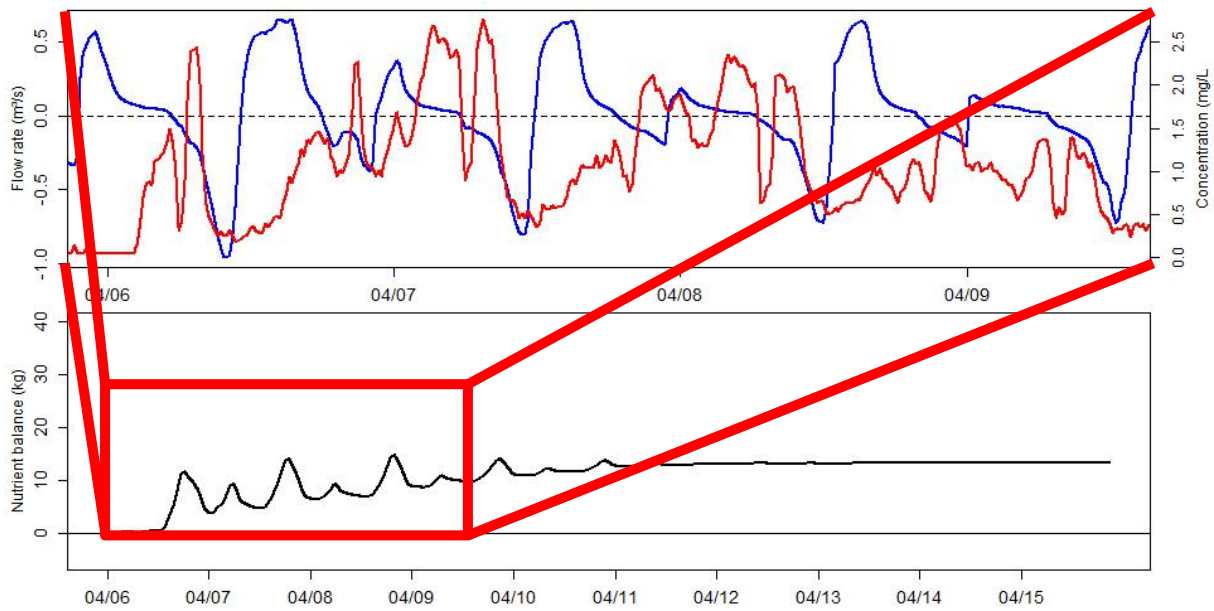


Positive Mass Balance = Retention
Negative Mass Balance = Release

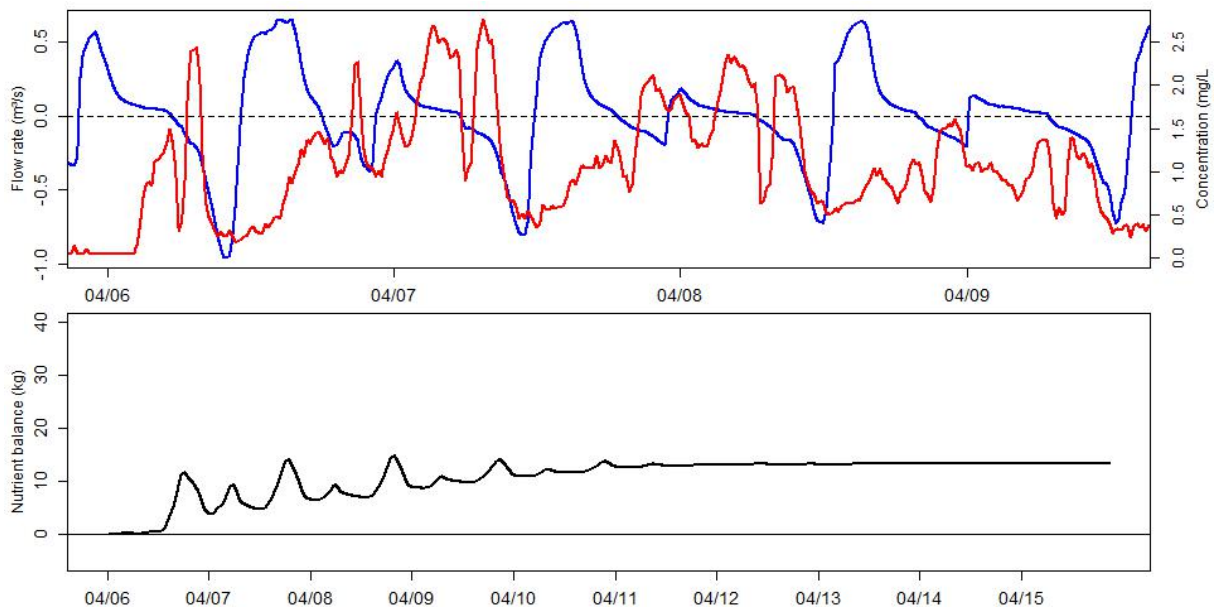
Results



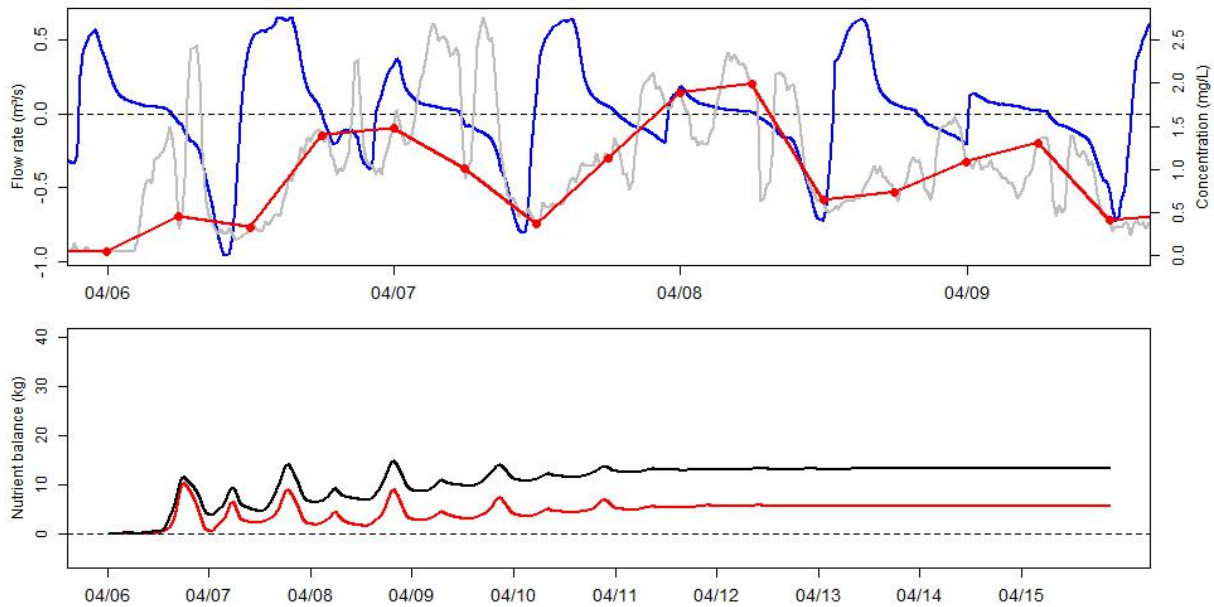
Results



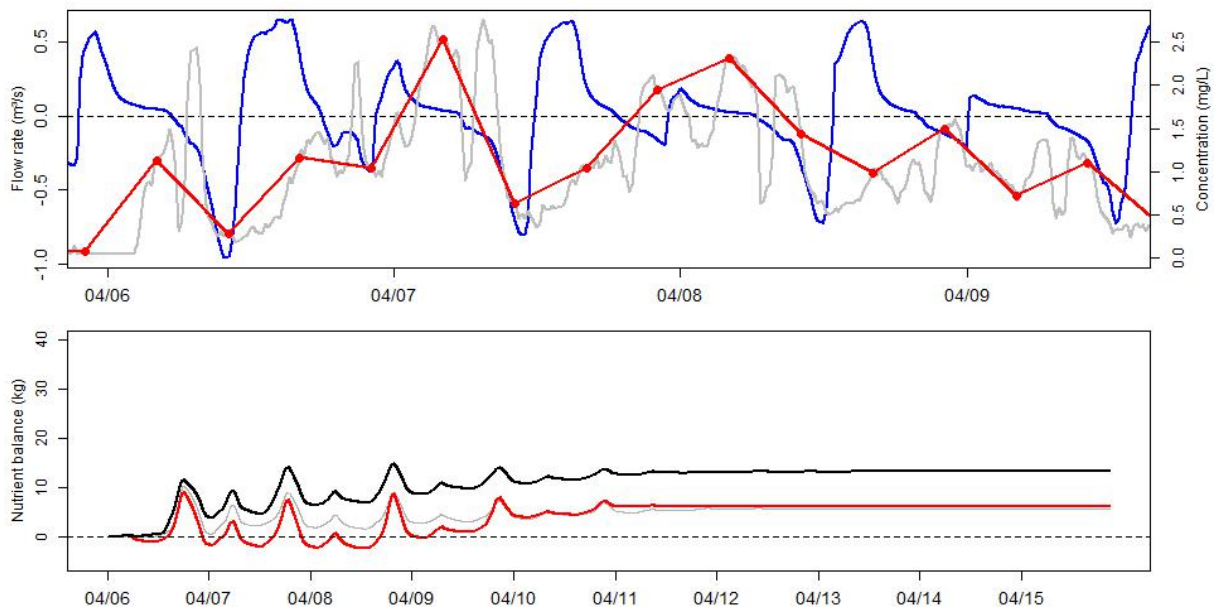
What if we had sampled *every 6hrs* ?



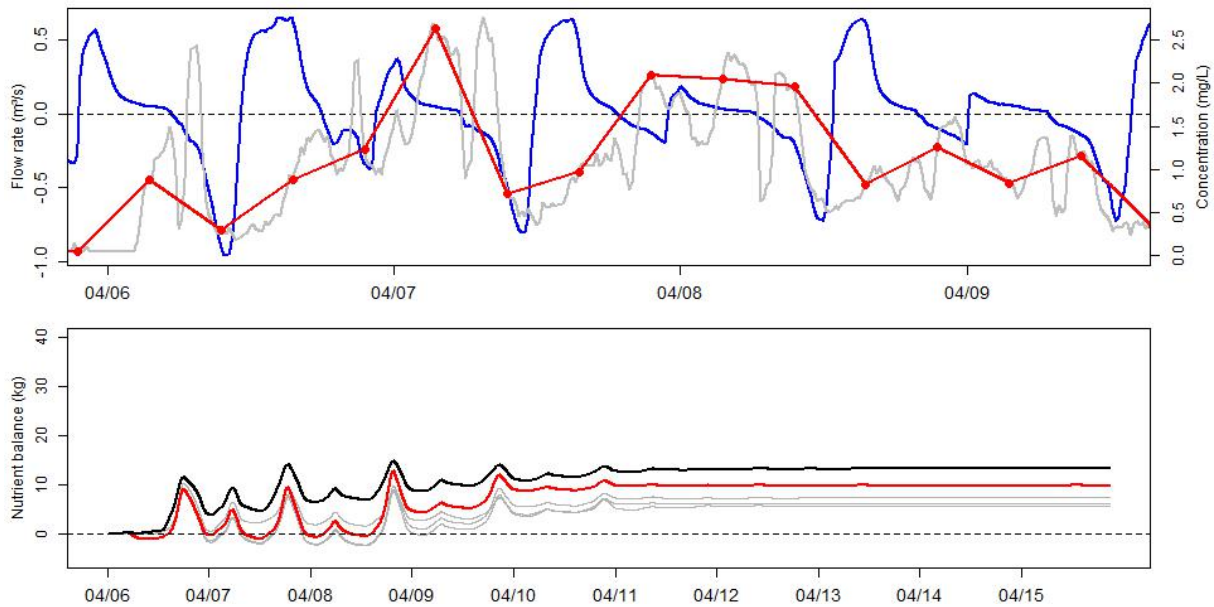
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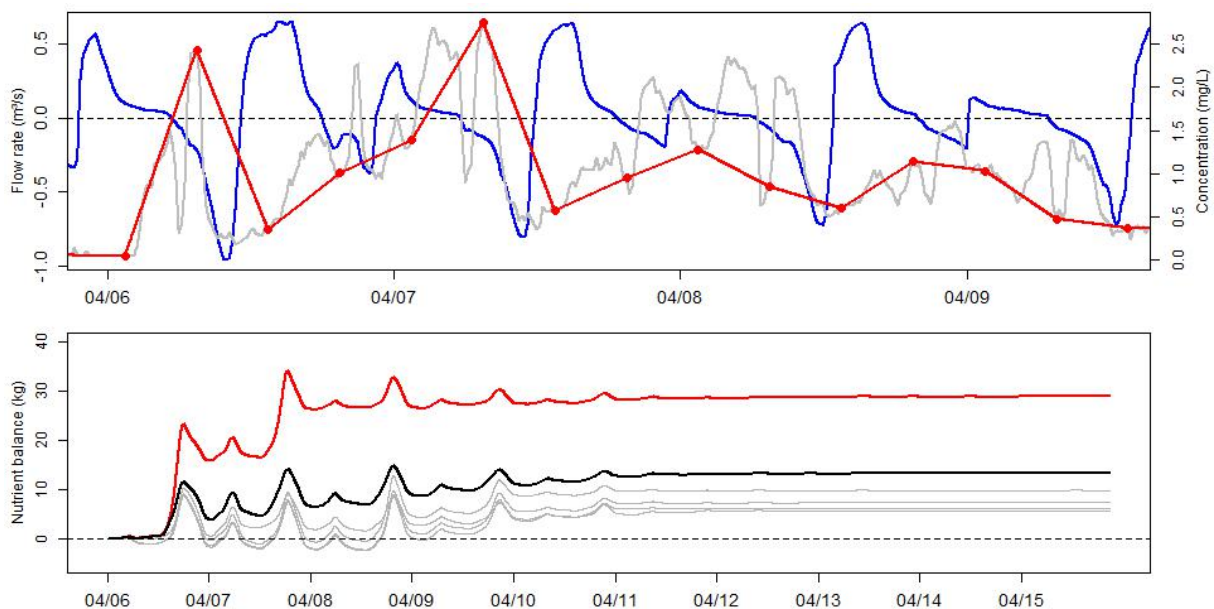
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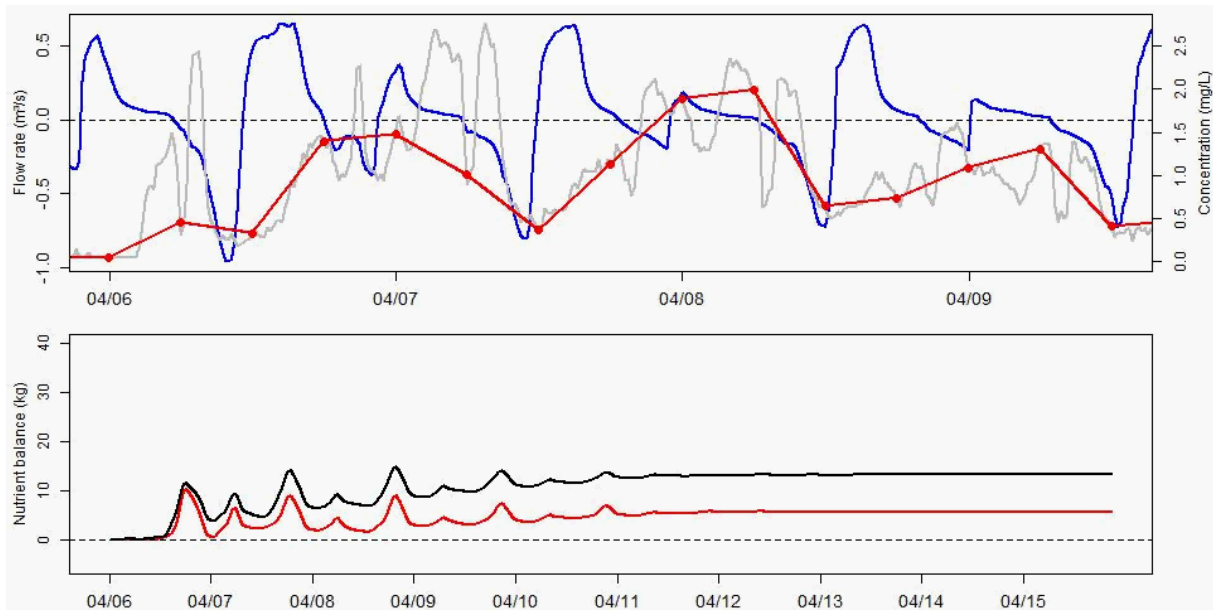
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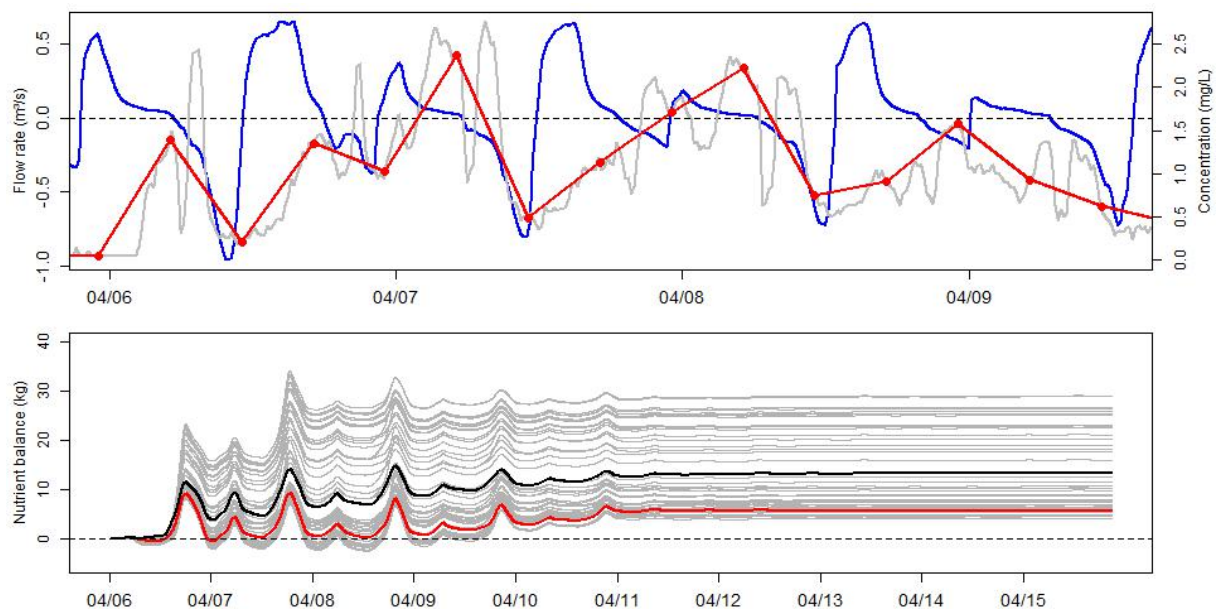
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Sampling 'infrequently' would have changed our conclusions...

- Could have concluded wrongly on the nitrate dynamics in the marsh
- Would have possibly under- or overestimated by -70% to +130% the nitrate retention
- And never know about it...

Lots of challenges...!

- Measure frequently but over long time periods is key!
- It is difficult to do...
- Requires many different types of skills, including electronics and controls,
- Requires lots of maintenance, statistical skills, lots of patience too...

Continuous data: necessary but...

- A lot more work and money
- Reliability of measurements uncertain
- A lot of data to handle

- ***BUT***

- Fundamental in the field of hydrology, water quality and Ecological Engineering

Partial stories halt scientific progress...

"Troy Marc hard;
... .. forehead. unconscious
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Thank you for your attention!

Questions?

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