A fast and inexpensive tool for wetland restoration to estimate internal eutrophication (P, N)

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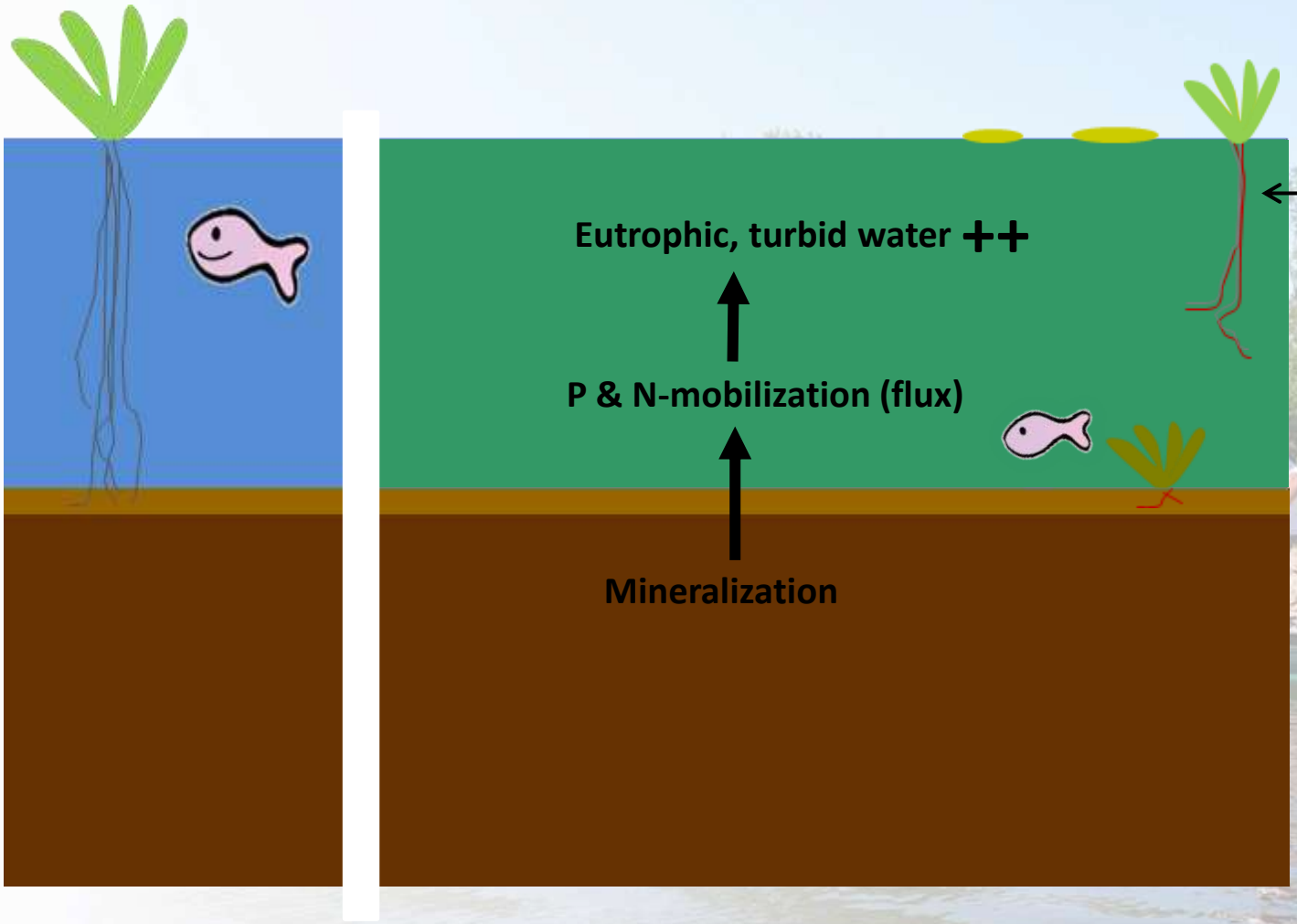
1. Introduction



1. Introduction

Commitment 2015: European Water Framework Directive

Poor water quality → Decreasing biodiversity
→ Algae blooms

- Main goal of this research is to find an easy measurable tool to estimate the internal mobilization of nutrients (P and N), at different temperatures
- Is it possible to use field **concentrations** to estimate nutrient **fluxes**?

2. Methods

- 29 research locations in The Netherlands in 2010 and 2011

- Wide variety of lakes, ponds, ditches

2. Methods (field concentrations)

At each location:
- Top layer sediment (threefold)
- Surface water
- Pore water samples sediment
- 12 Intact sediment cores



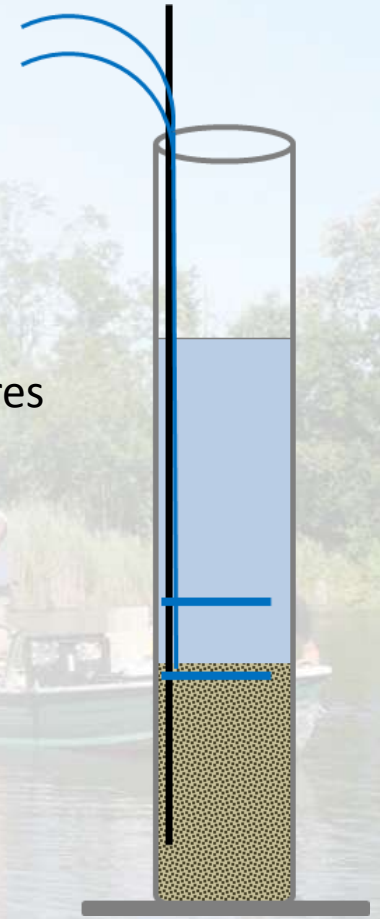
In the lab:
- Surface and pore water samples: pH, alkalinity, CO_2, Fe, S, P, PO_4, NO_3, NH_4
- Sediment samples: 50 different parameters including total concentrations, P-fractions and other extractions

2. Methods (internal fluxes)

Main experiment: Intact sediment cores, collecting pore water and surface water during eight weeks to measure:

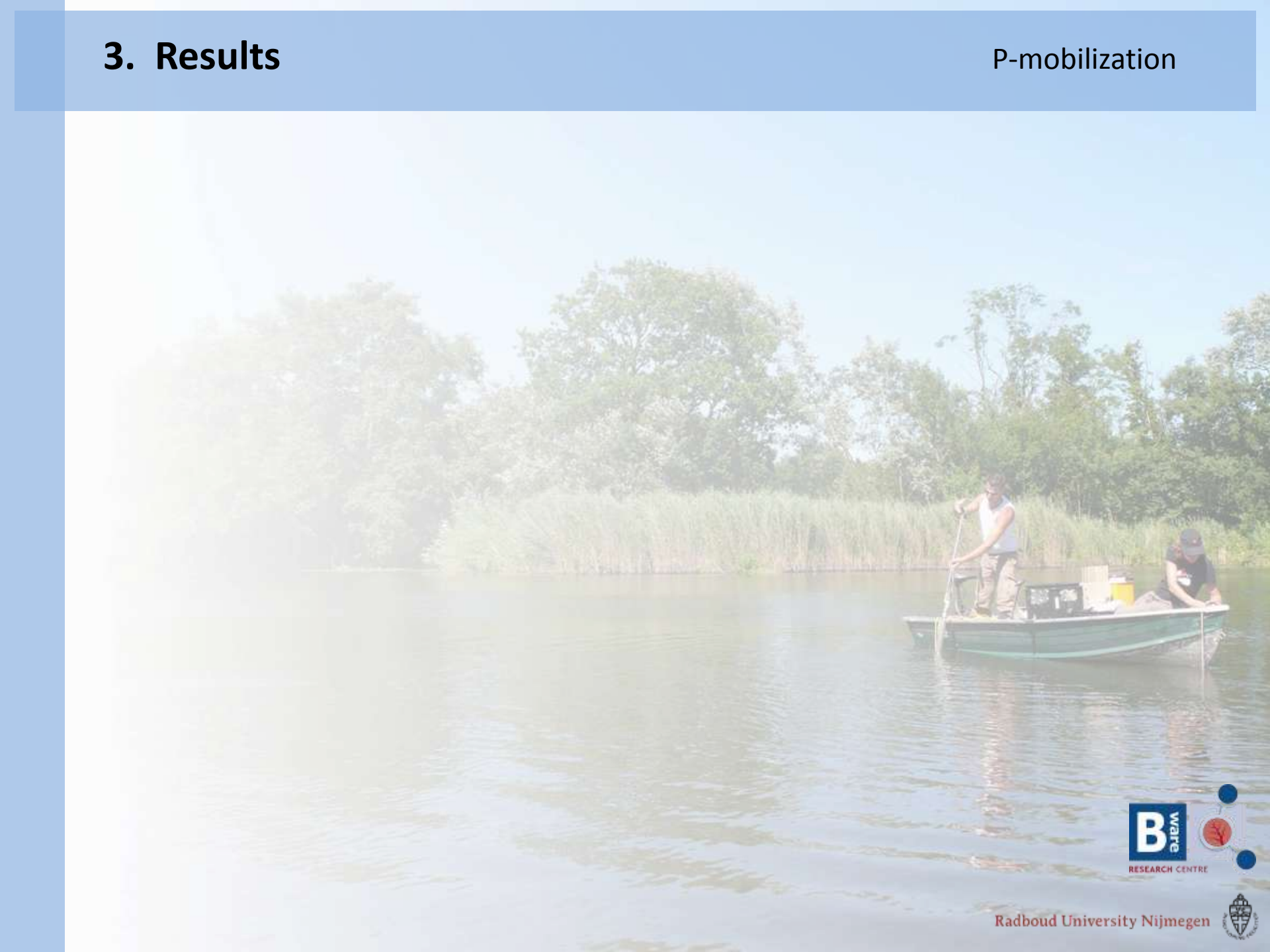
- P-mobilization rates
- N-mobilization rates
- Decomposition rates

Additional experiment: P-mobilization rates at five different temperatures



3. Results

P-mobilization



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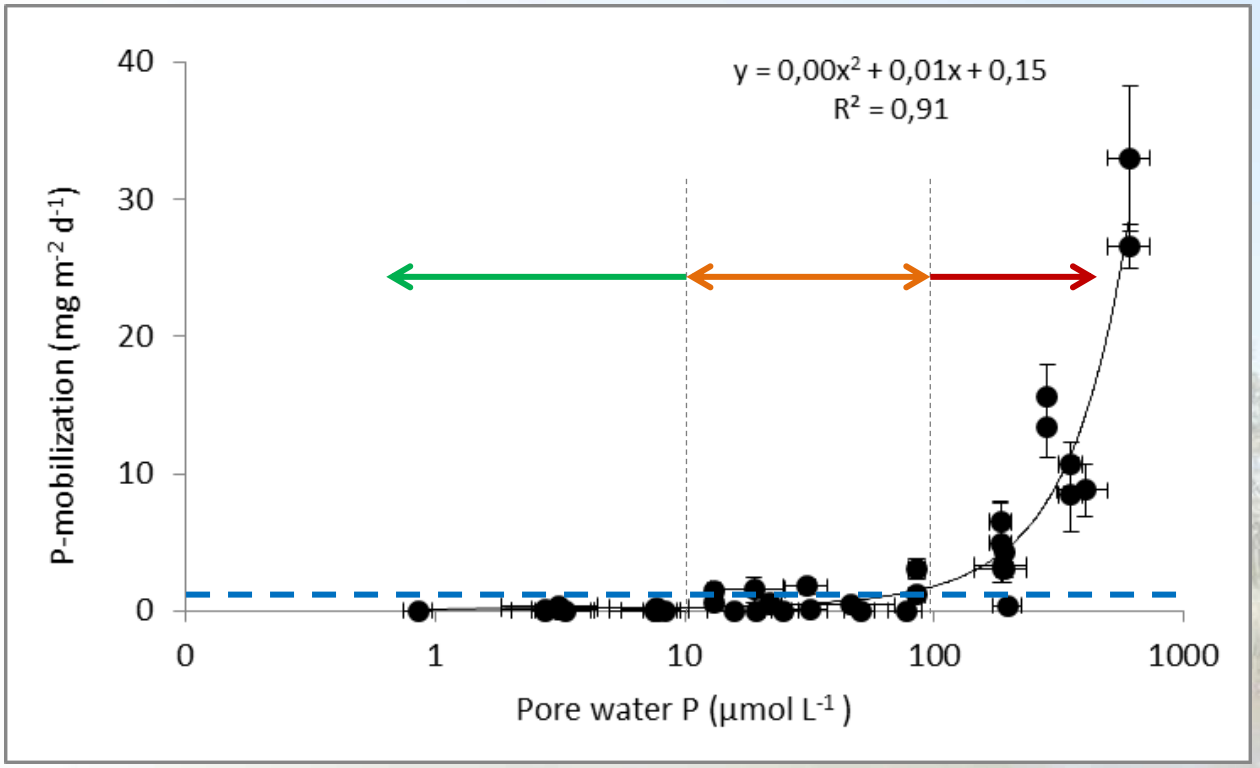
3. Results

P-mobilization



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Threshold-value

< 10 µmol L^{-1} **P-mobilization low**

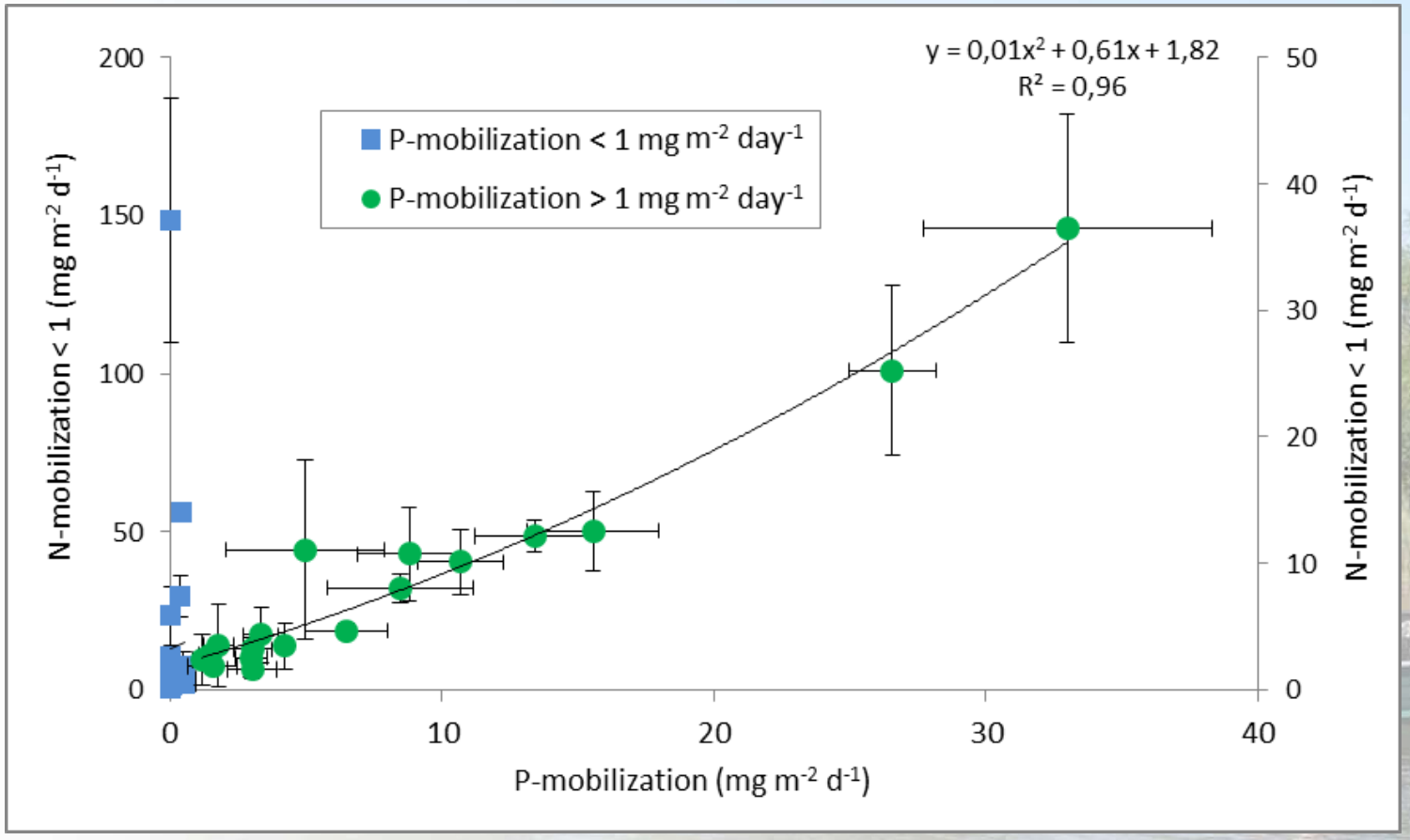
10 – 100 µmol L^{-1} **P-mobilization 0 - 3 mg m^{-2} day^{-1}**

> 100 µmol L^{-1} **P-mobilization high**

- Pore water P is the best parameter to predict phosphorus mobilization
- Total sediment P did not show a good correlation

3. Results

N-mobilization



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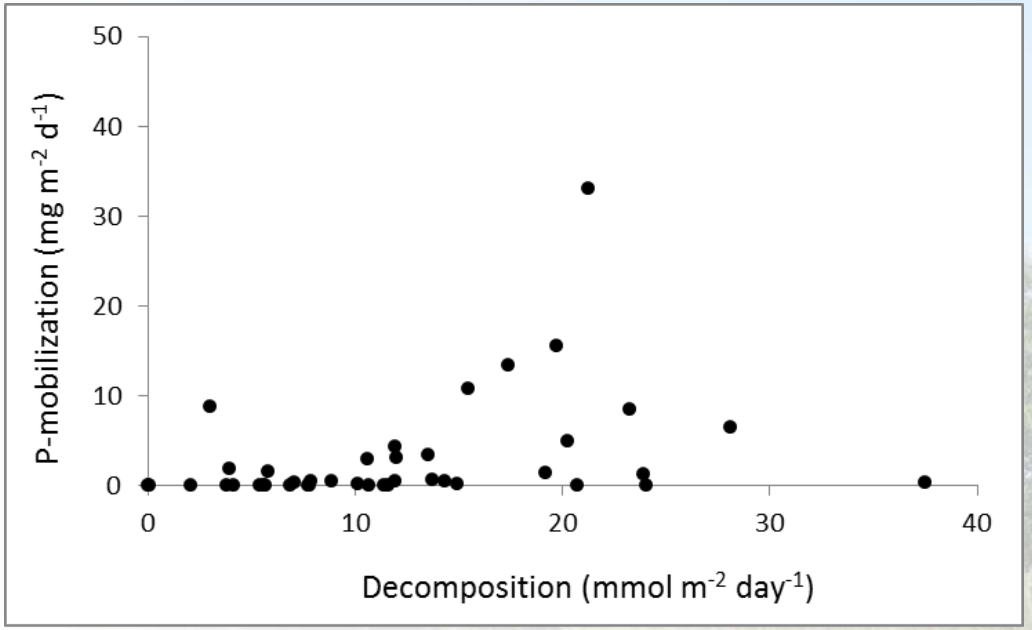
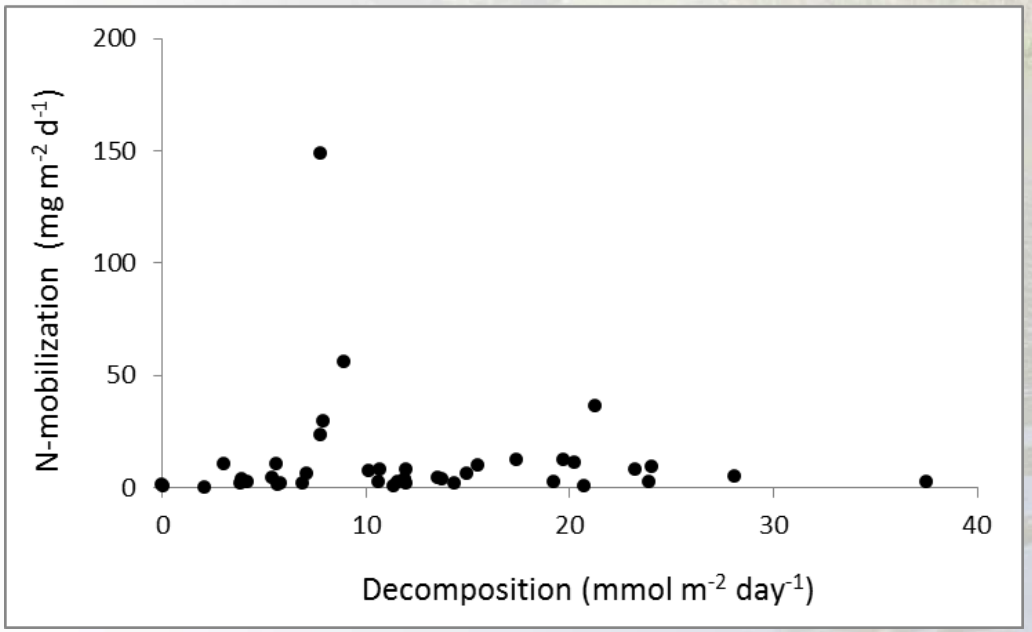
- When P-mobilization > 1 mg/m^2/day, N-mobilization can be estimated

3. Results

Decomposition





Decomposition of the sediment did not correlate with P- or N-mobilization

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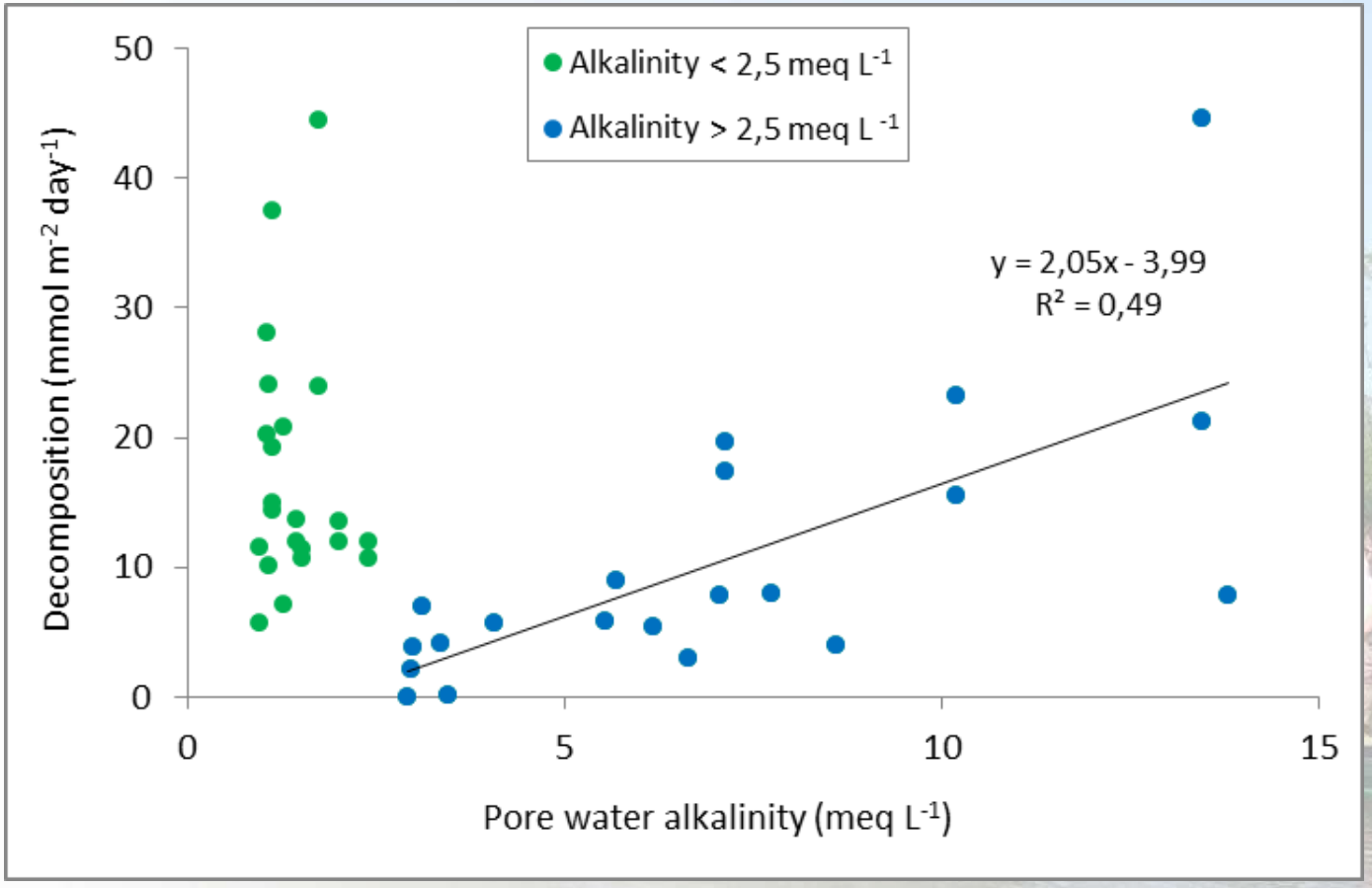
3. Results

Decomposition



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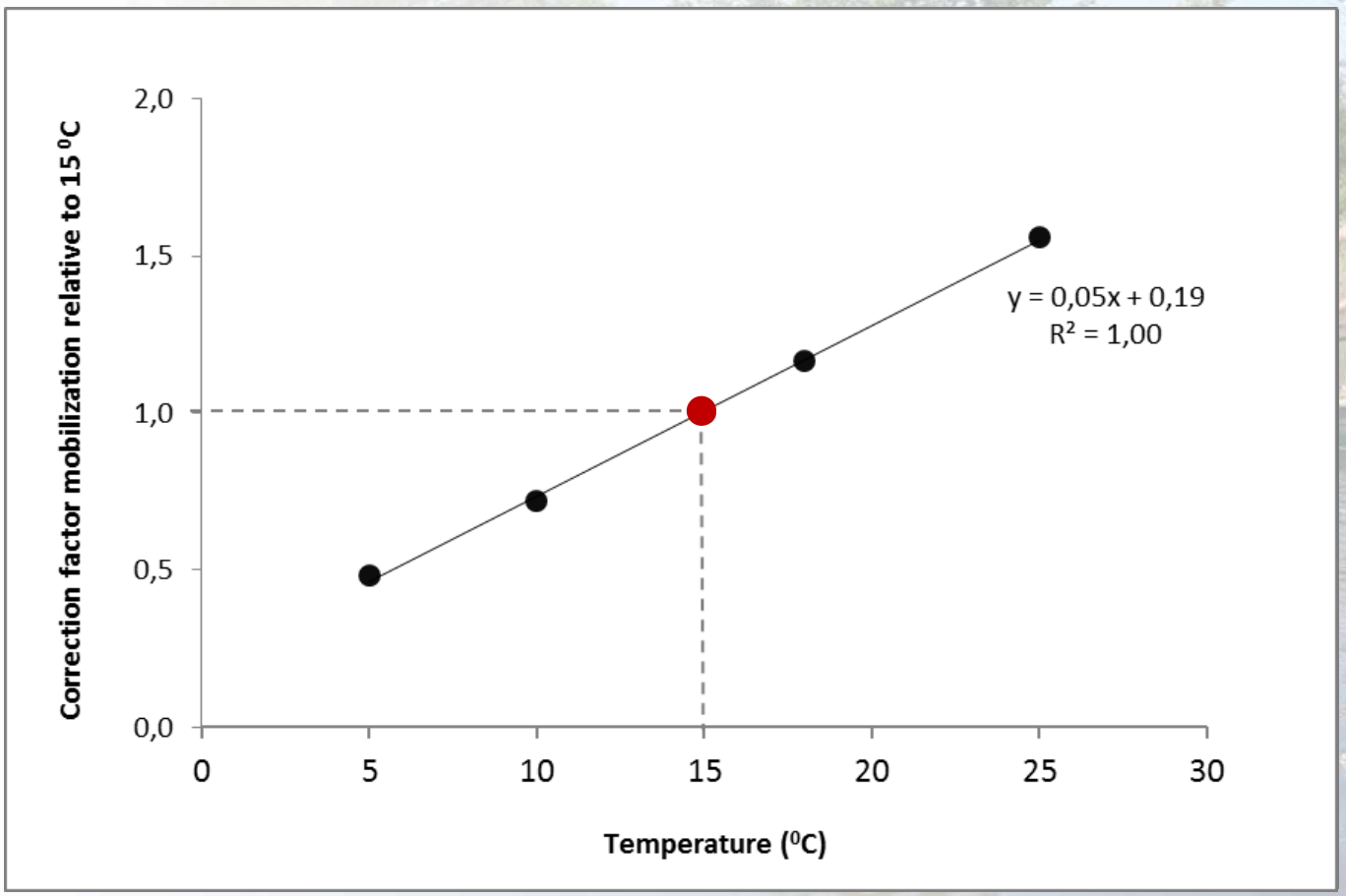
Pore water alkalinity explains for 50% the decomposition rates, only > 2,5 meq L^{-1}

3. Results

Temperature

- **Additional experiment**: five temperatures: 4° / 10 ° / 15 ° / 20 ° / 25 °C
- Three locations: different pore water P concentrations
- The average mobilization for each location was standardized to 15 °C

Correction factor = (0.05 * Temperature) + 0.19



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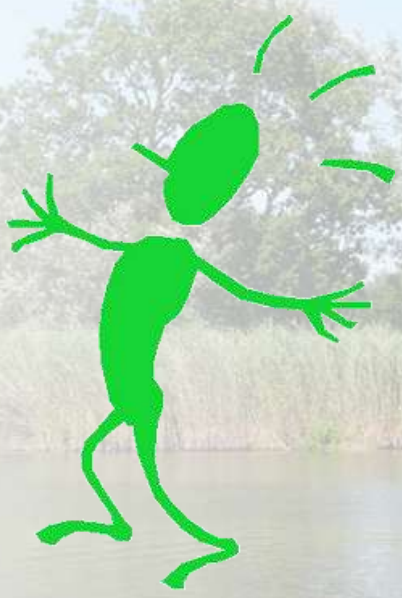
4. Conclusion

- Essential to estimate the **relative impact of the sediment** on water quality.
- **Pore water P** analysis is an accurate tool to **predict internal nutrient mobilization** at different temperatures.
- Essential to choose between restoration measures: decision support system.

5. Questions?



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