# Seasonal dynamics of brownification mitigation in constructed wetlands

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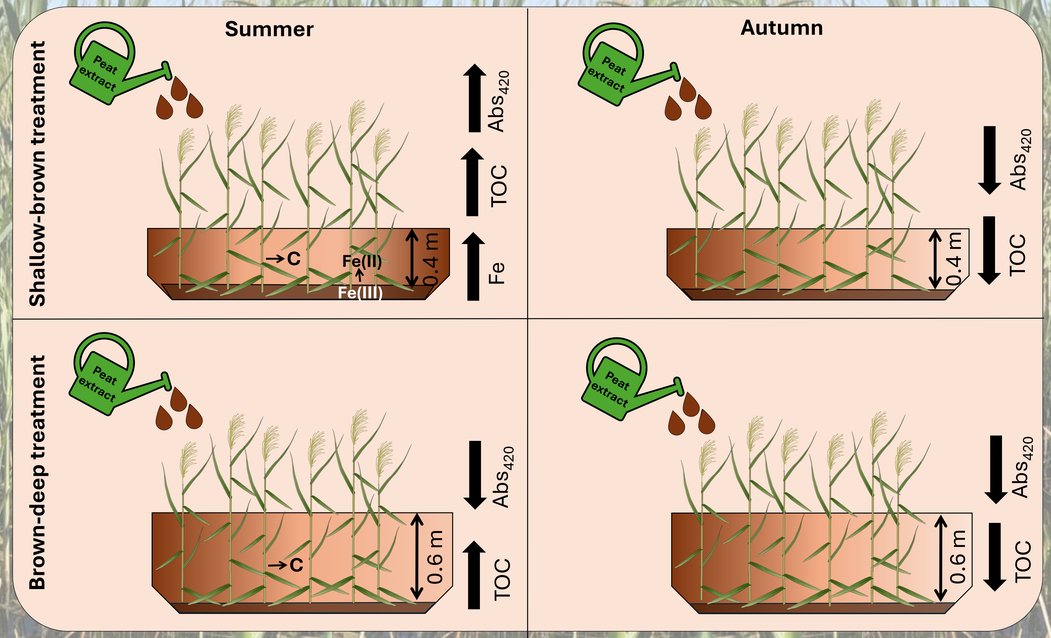
## Background

- Freshwaters in the boreal zone are getting darker → **Brownification**
- Brownification is related to increasing total organic carbon (TOC) concentrations
- Problem for drinking water production

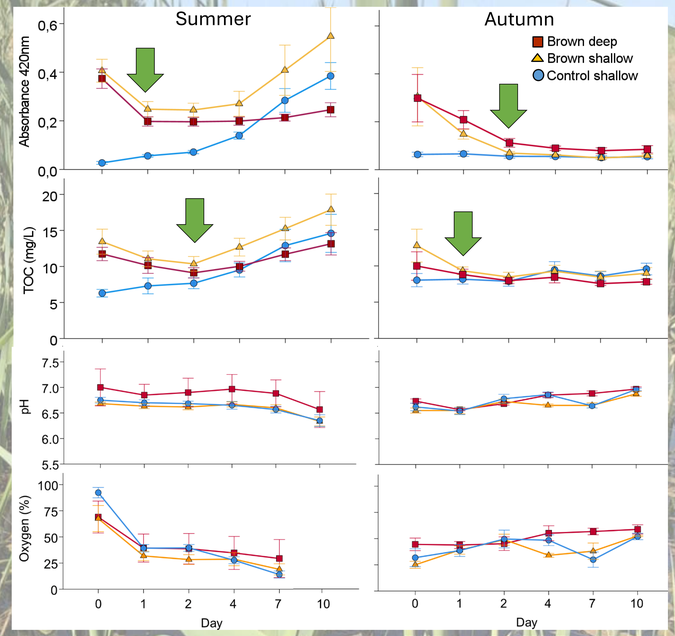
**Aim:** Optimize wetlands to remedy brownification and reduce TOC while retaining nitrogen removal

**Questions:**

1) What is the best retention time for increasing water clarity and degrading TOC?
2) Are deep (0.6 m) or shallow (0.4 m) wetlands better at increasing water clarity and degrading TOC?
3) Does optimal wetland depth depend on season?




## Results




Optimal retention time depends on depth and season

**Optimal retention time (days)**

| | Summer | Autumn |
|---|---|---|
| Abs420 | 1 | 3 |
| TOC | 2 | 1 |

**Conclusion**

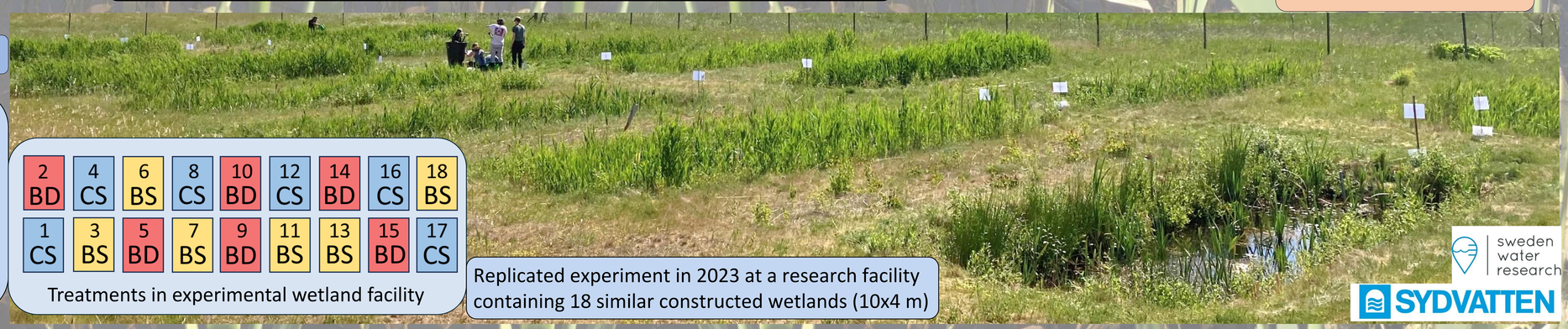
**Deep wetlands (0.6 m) work better regardless of season**

## Study design and methods

- Treatments: **brown-deep**, brown-shallow and control-shallow
- **Extracted peat** → increase water colour and total organic carbon (TOC) concentration
- **Changes in absorbance** and **TOC** measured over 11 days in both June and November

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 BD | 4 CS | 6 BS | 8 CS | 10 BD | 12 CS | 14 BD | 16 CS | 18 BS |
| 1 CS | 3 BS | 5 BD | 7 BS | 9 BD | 11 BS | 13 BS | 15 BD | 17 CS |

Treatments in experimental wetland facility



Replicated experiment in 2023 at a research facility containing 18 similar constructed wetlands (10x4 m)