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IBU

SWAMPS

Erhalt von Moorgrünland durch angepasstes Management

EUROPÄISCHE UNION
Europäischer Fonds für regionale Entwicklung

EUROPA FÜR NIEDERSACHSEN

Effects of different water management regimes on the dynamics of phosphate and mineral nitrogen in the ditch systems of a fen and a bog soil under intensive grassland

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Institute for Biology and Environmental Sciences
Soil Science Working Group

SWAMPS-Conference "Water management in organic soils under agriculture", Feb. 19th - 20th 2019

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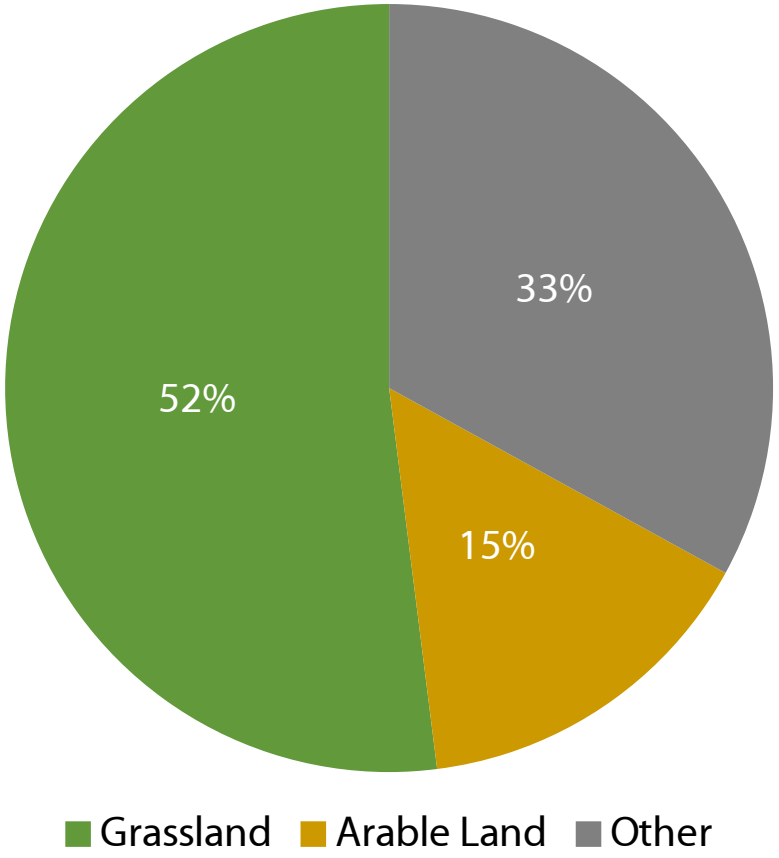
Project "SWAMPS"



Utilization of mires in Lower Saxony, data from Flessa, H. et al. (2012)

Testing measures for the reduction of GHG-emmissions and nutrient loads from intensive grassland on peat soils.

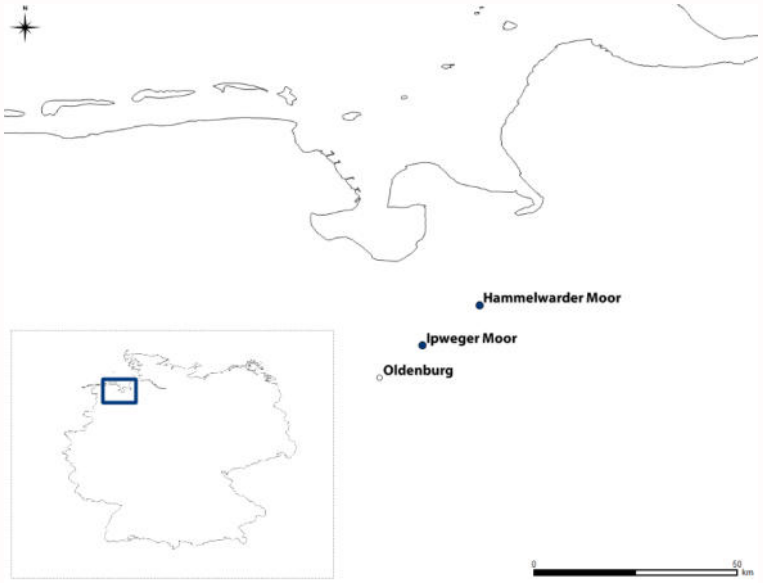
Water management: Effect of submerged drains and ditch blocking

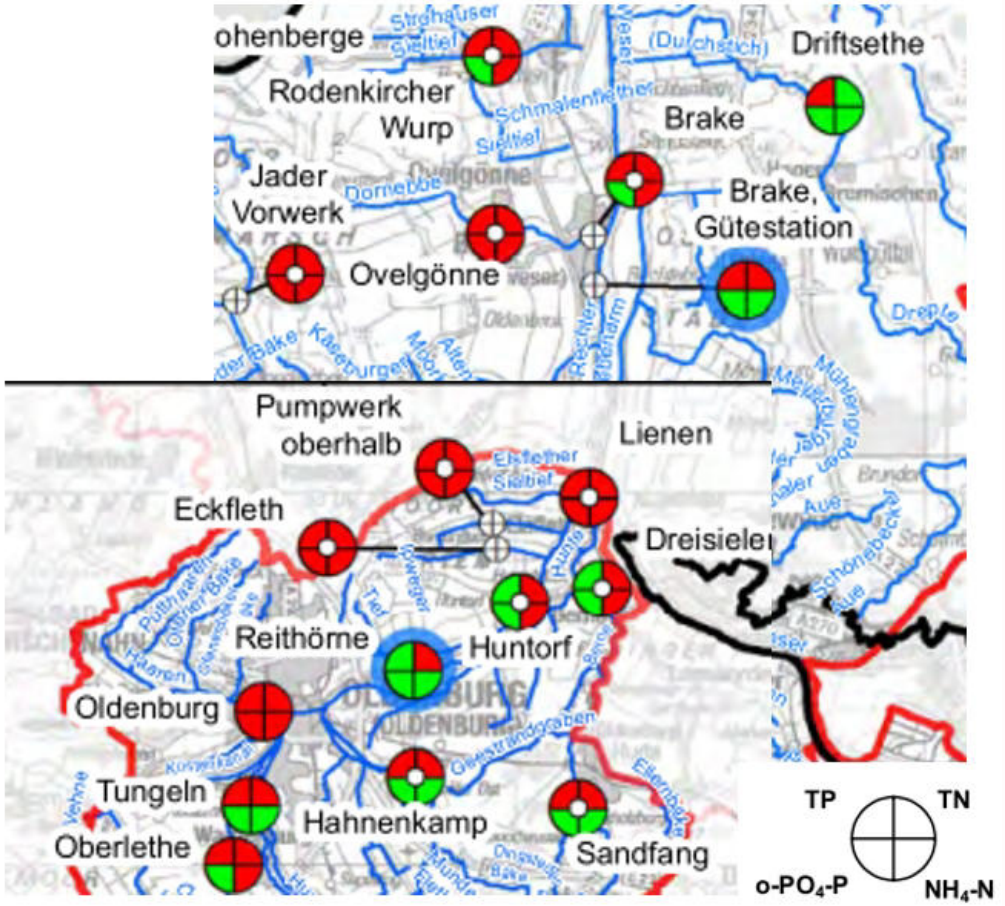
Shifting focus to nutrients:
For every 10 t ha-1 a-1 gaseous C lost 500 kg ha-1 a-1 N and 10 kg ha-1 a-1 Phosphate [not considering enrichment from fertilization!]

Nutrient Loading of Streams

- in 2010 around 70-80 % of the nitrogen loads and around 50 % of phosphorous loads reached the surface waters via the mainly agriculturual fed pathways groundwater, drainage, run-off and erosion (BMUB 2016)

- Ambitious aims for reduction regarding phosphorous and especially nitrogen compounds (obligation to EU)





Evaluation of nutrient contents in water bodies according to limits for total -P and -N as well as orthophosphate-P and ammonium-N (Orientation values from" Rahmenkonzeption Monitoring und Ziele des Bund/Länder-Meßprogramms"), source: NLWKN

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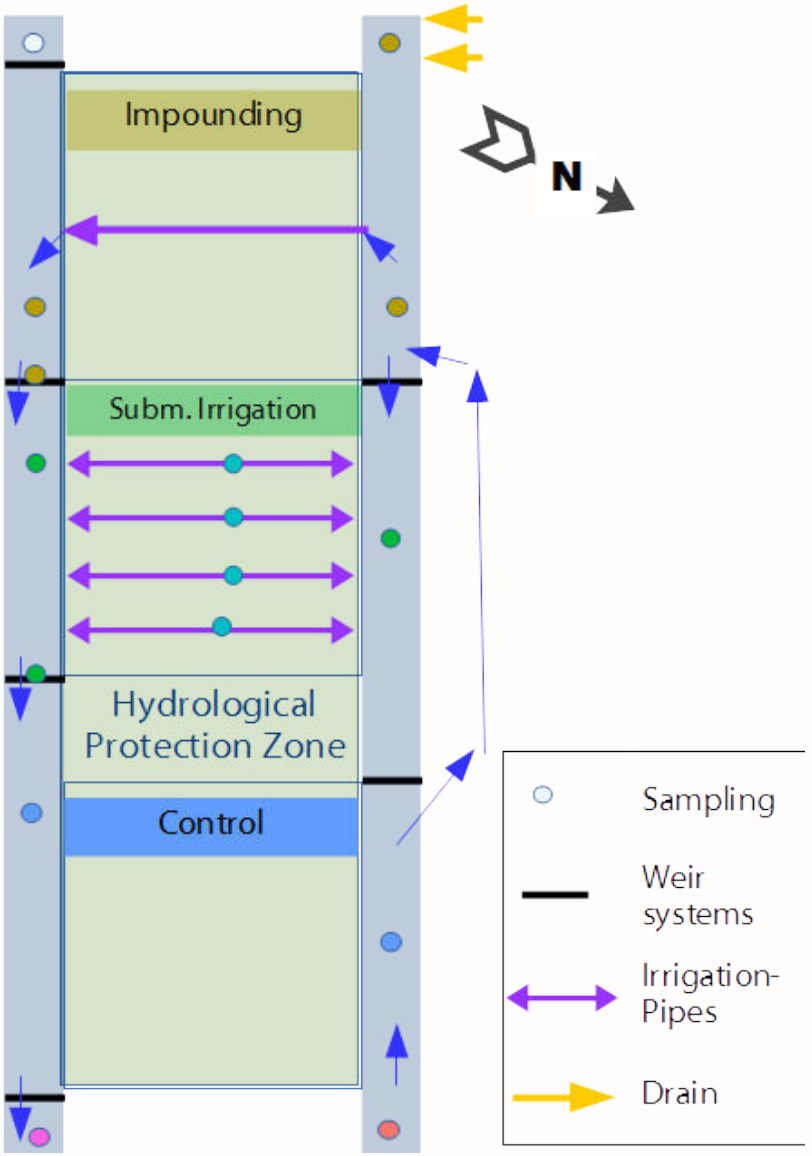
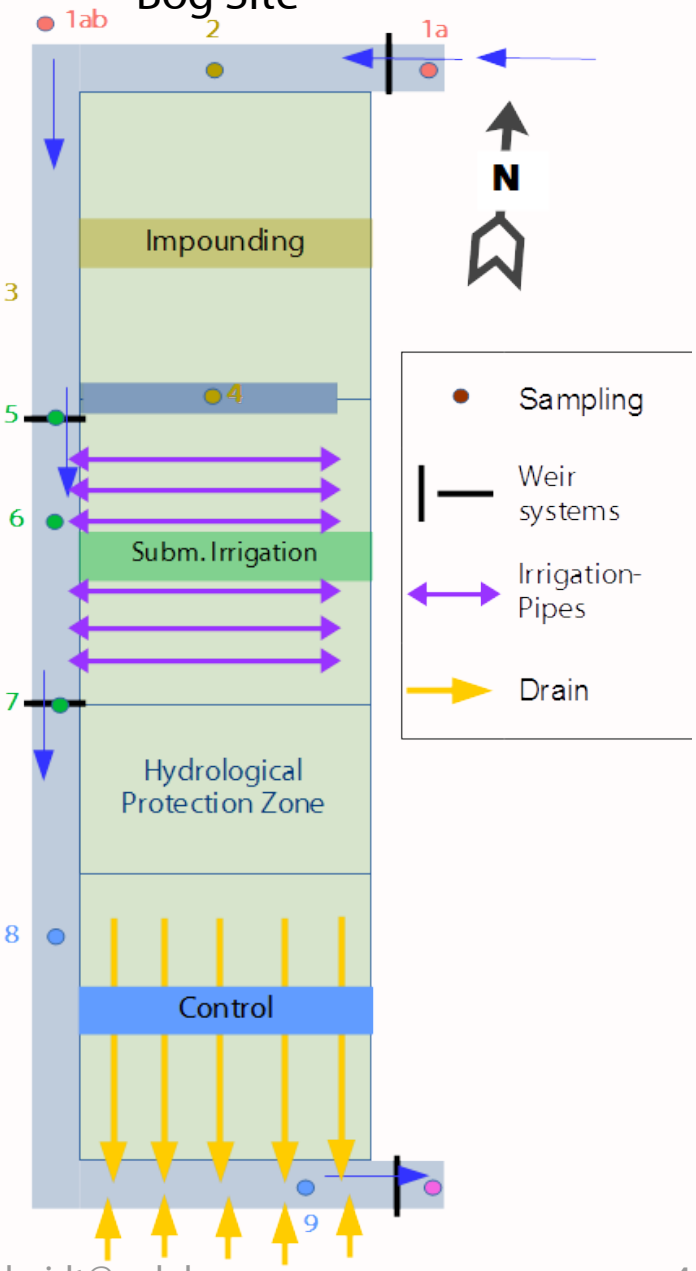
Experimental Setup

Fen Site

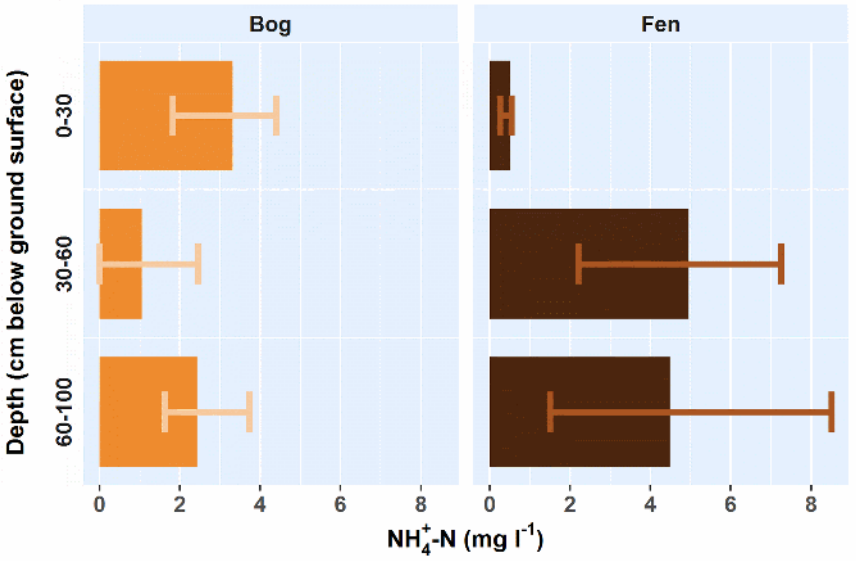


Bog Site

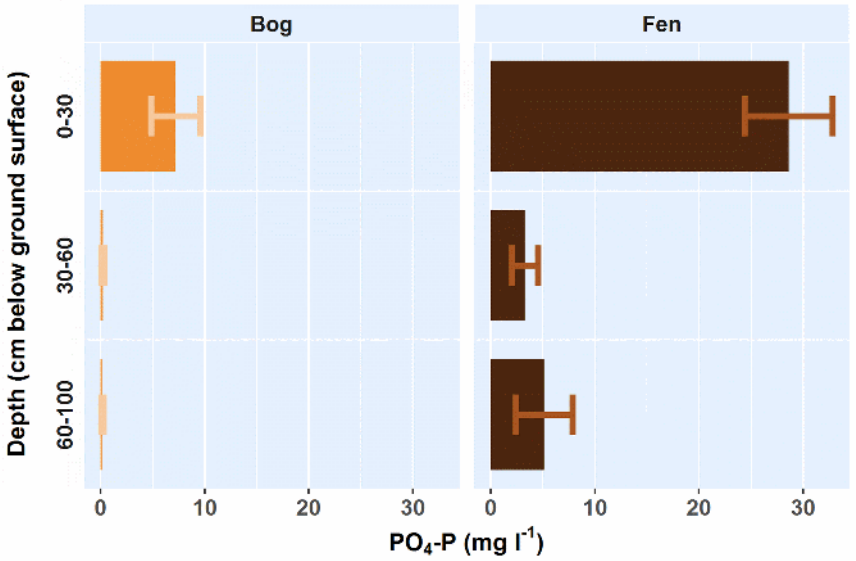


Nutrients in Experimental Sites

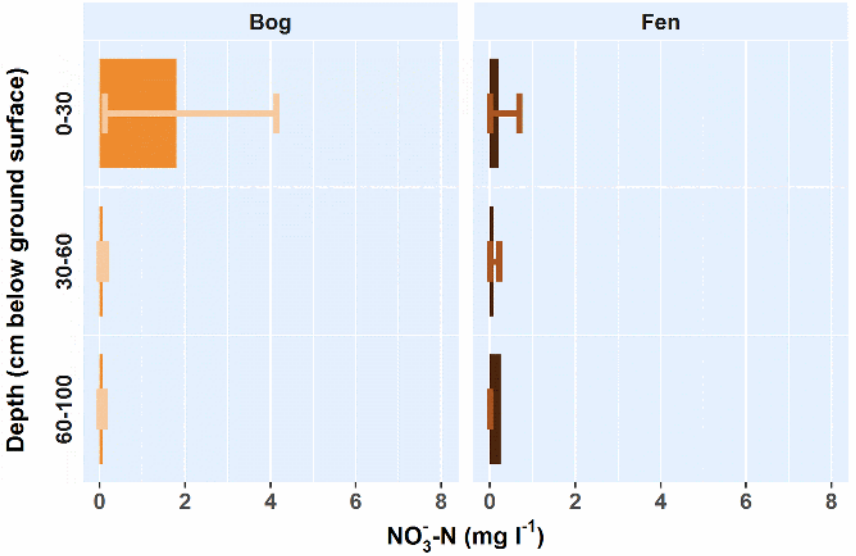
Soil Ammonium



Soil Phosphate

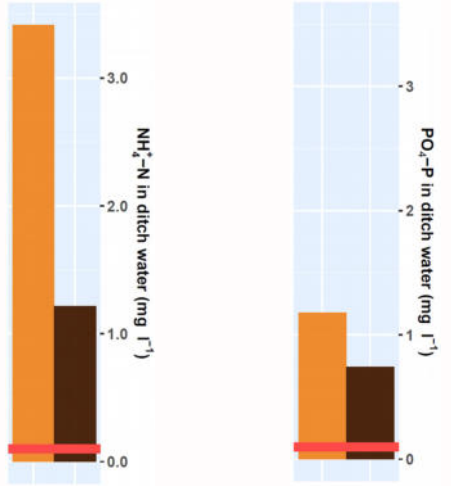


Soil Nitrate



Initial situation
May 2016

Ditch Water Ammonium and Phosphate



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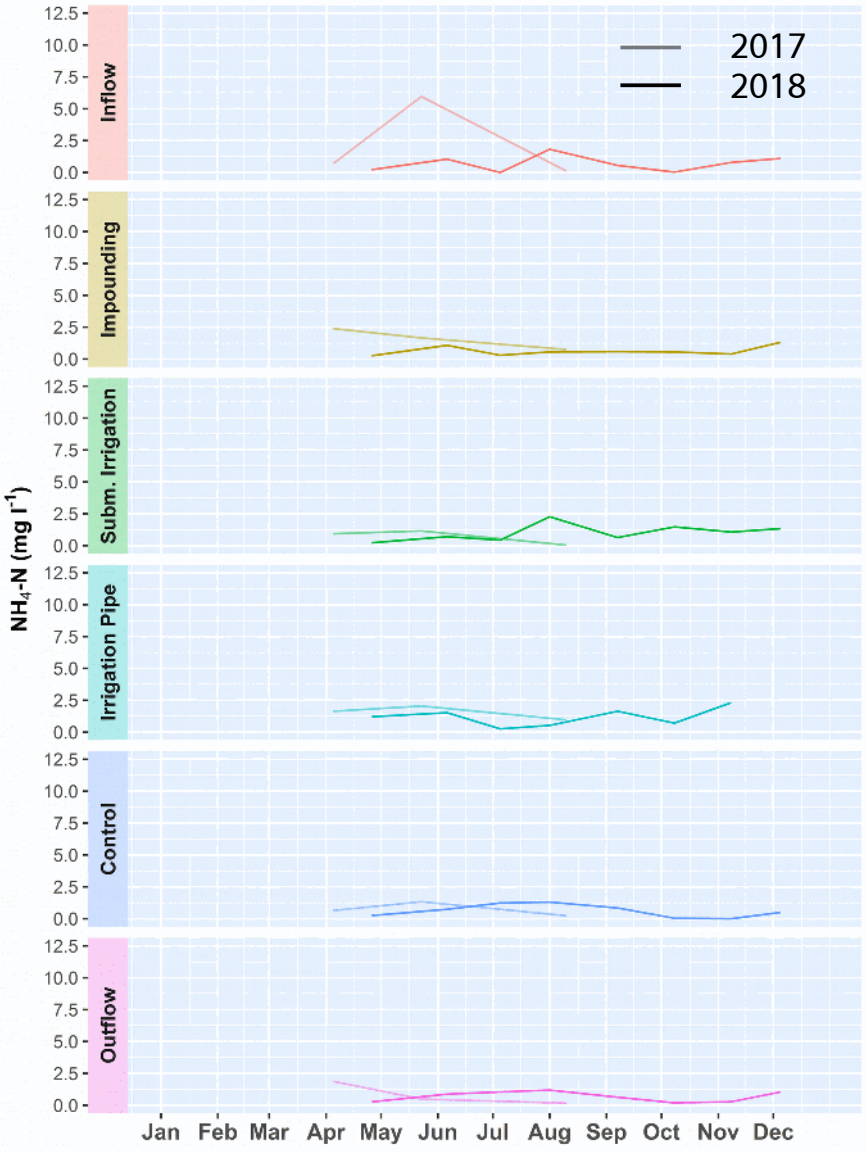
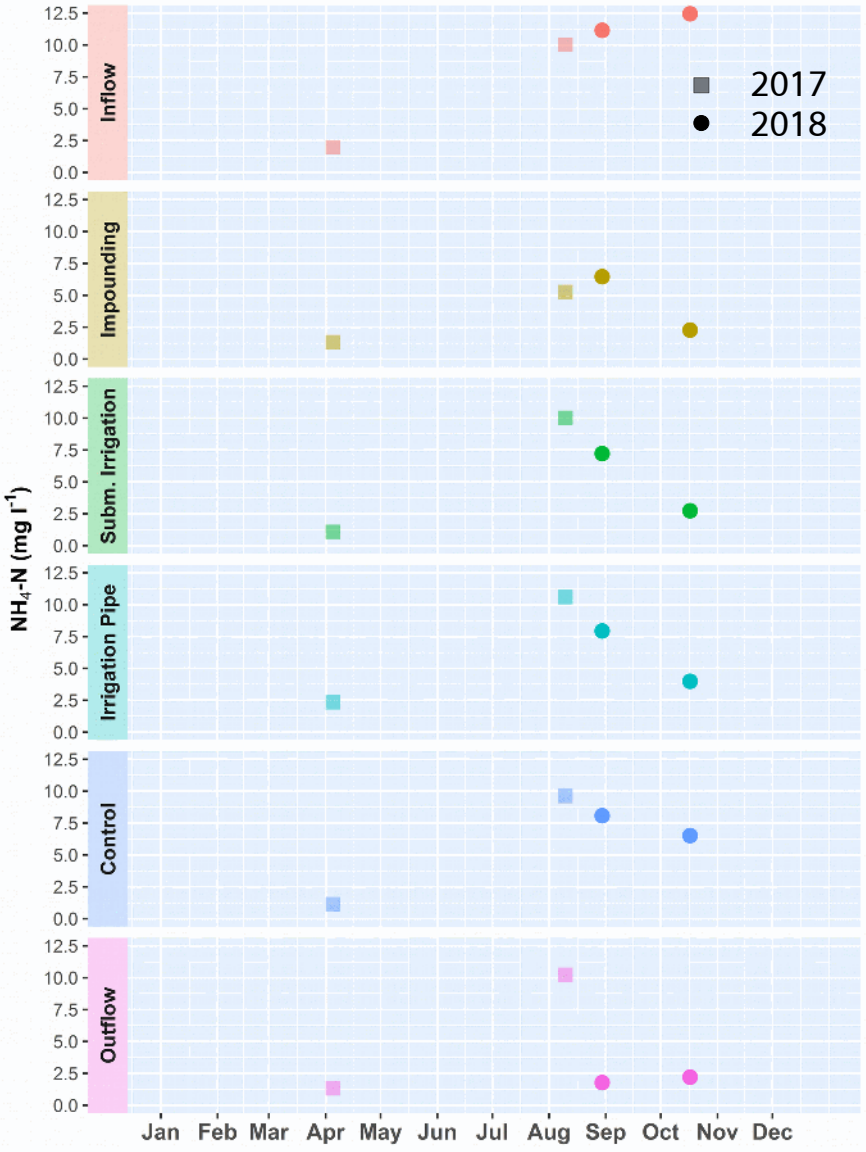
Nmin: Ammonium

Bog



Fen



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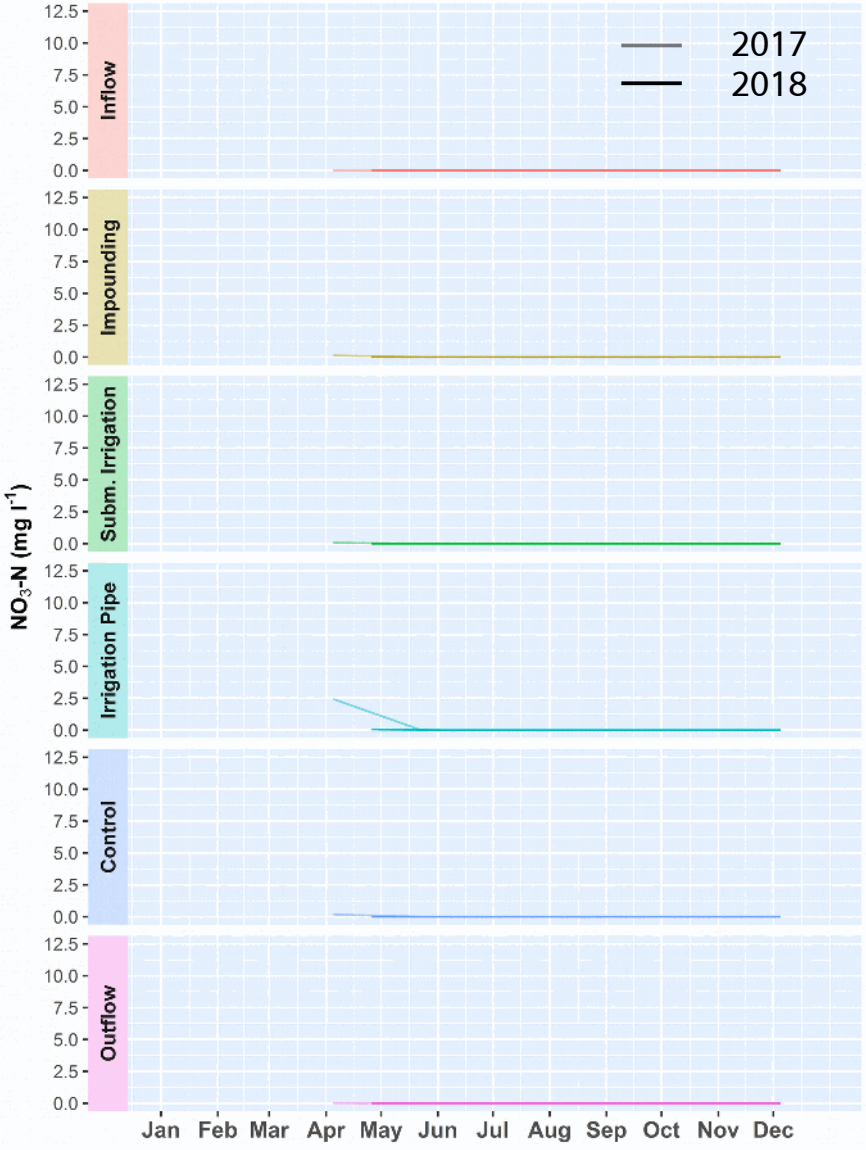
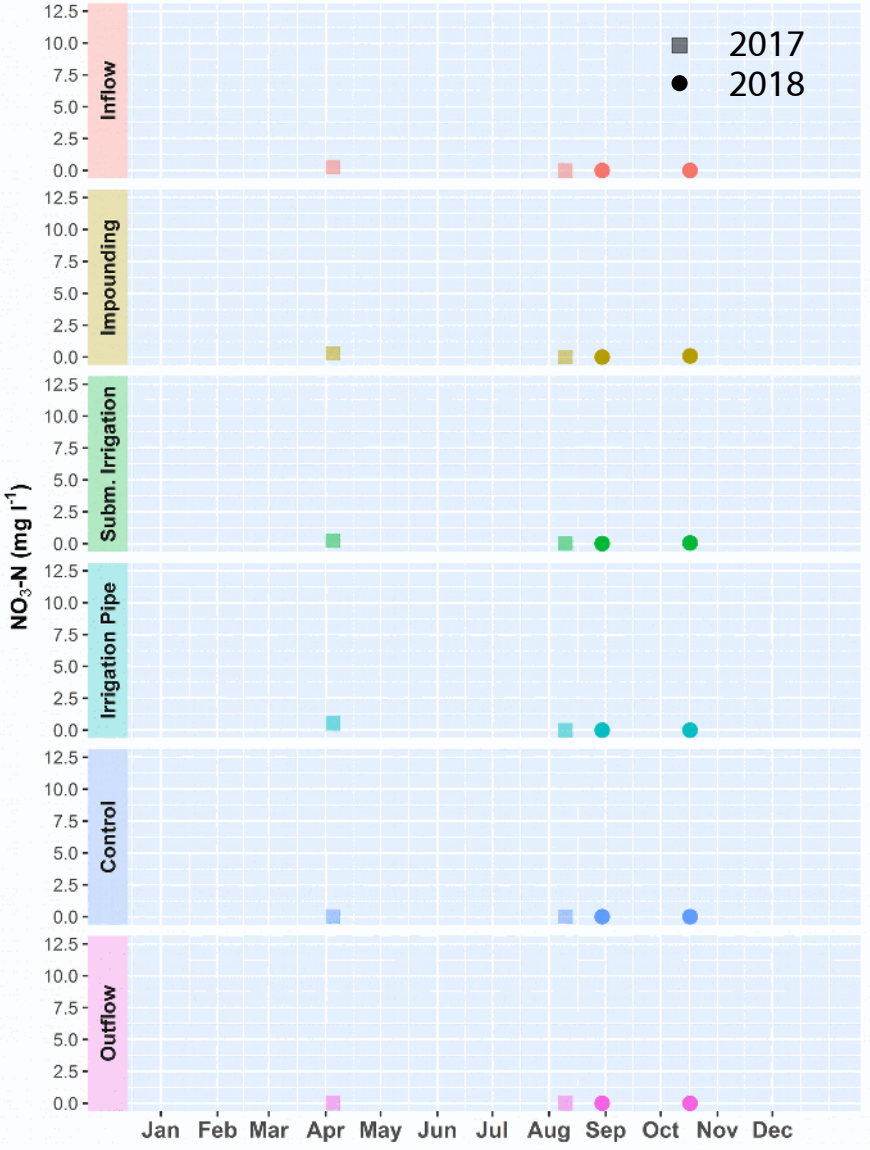
Nmin: Nitrate

Bog



Fen



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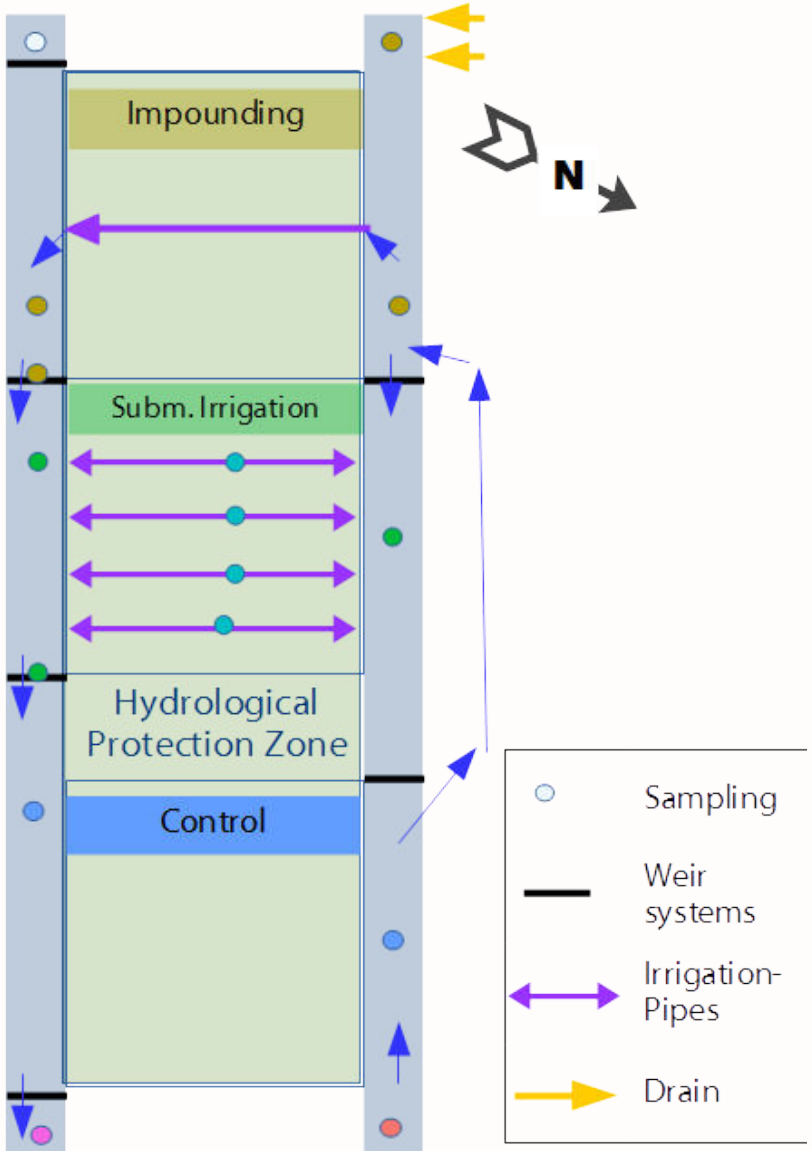
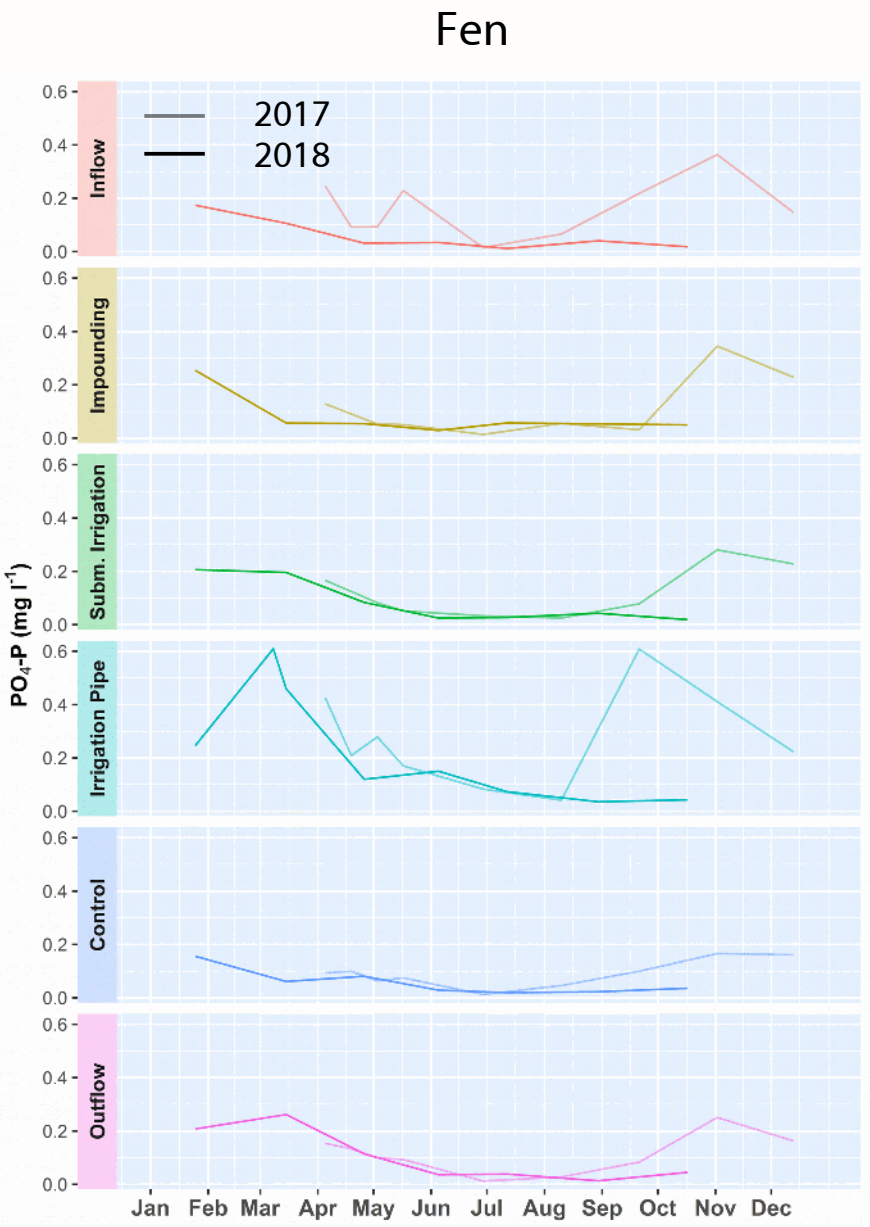
PO_4 in Fen Ditch Water 2017 vs. 2018





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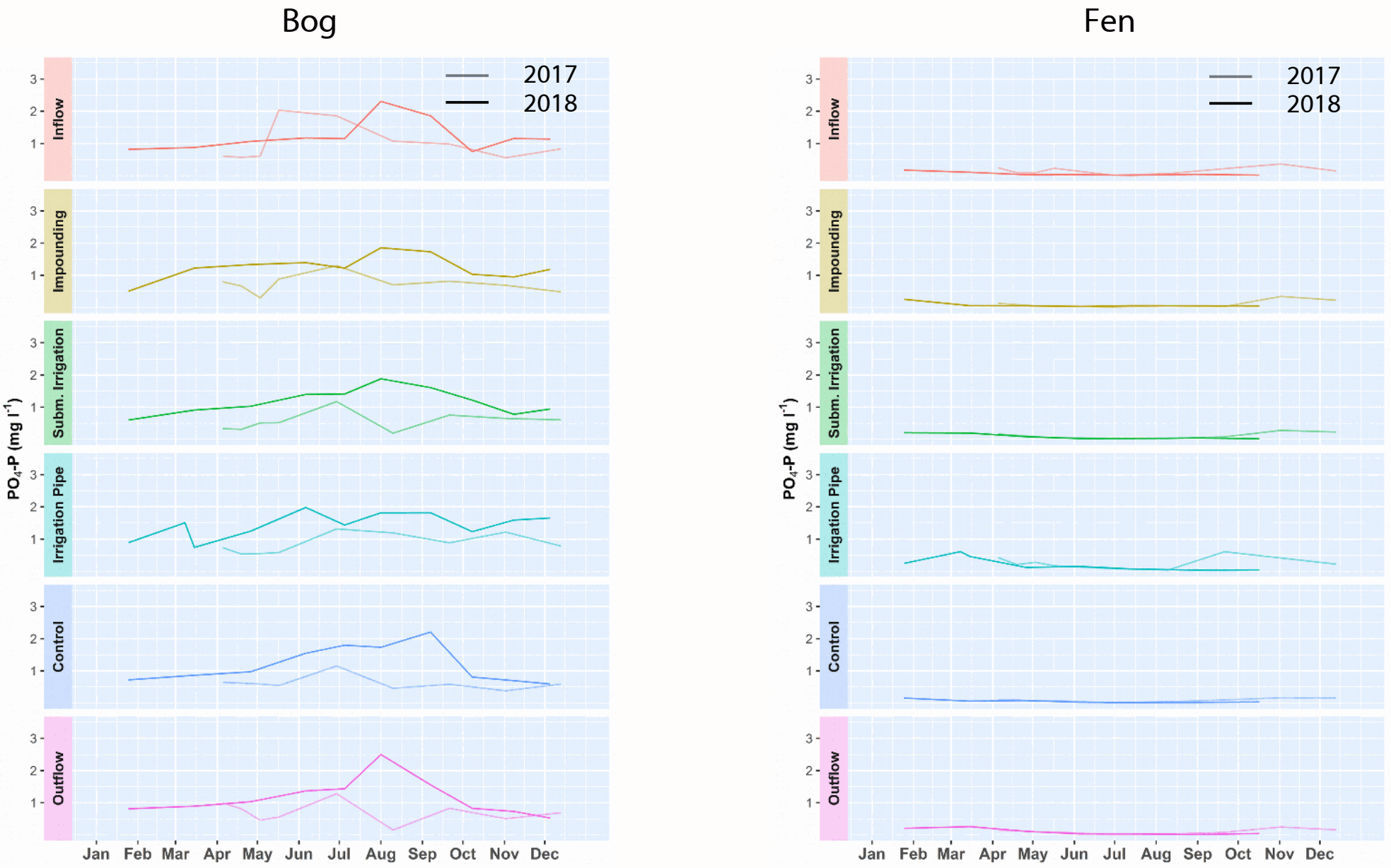
PO_4 in Fen and Bog Ditch Water 2017 vs. 2018



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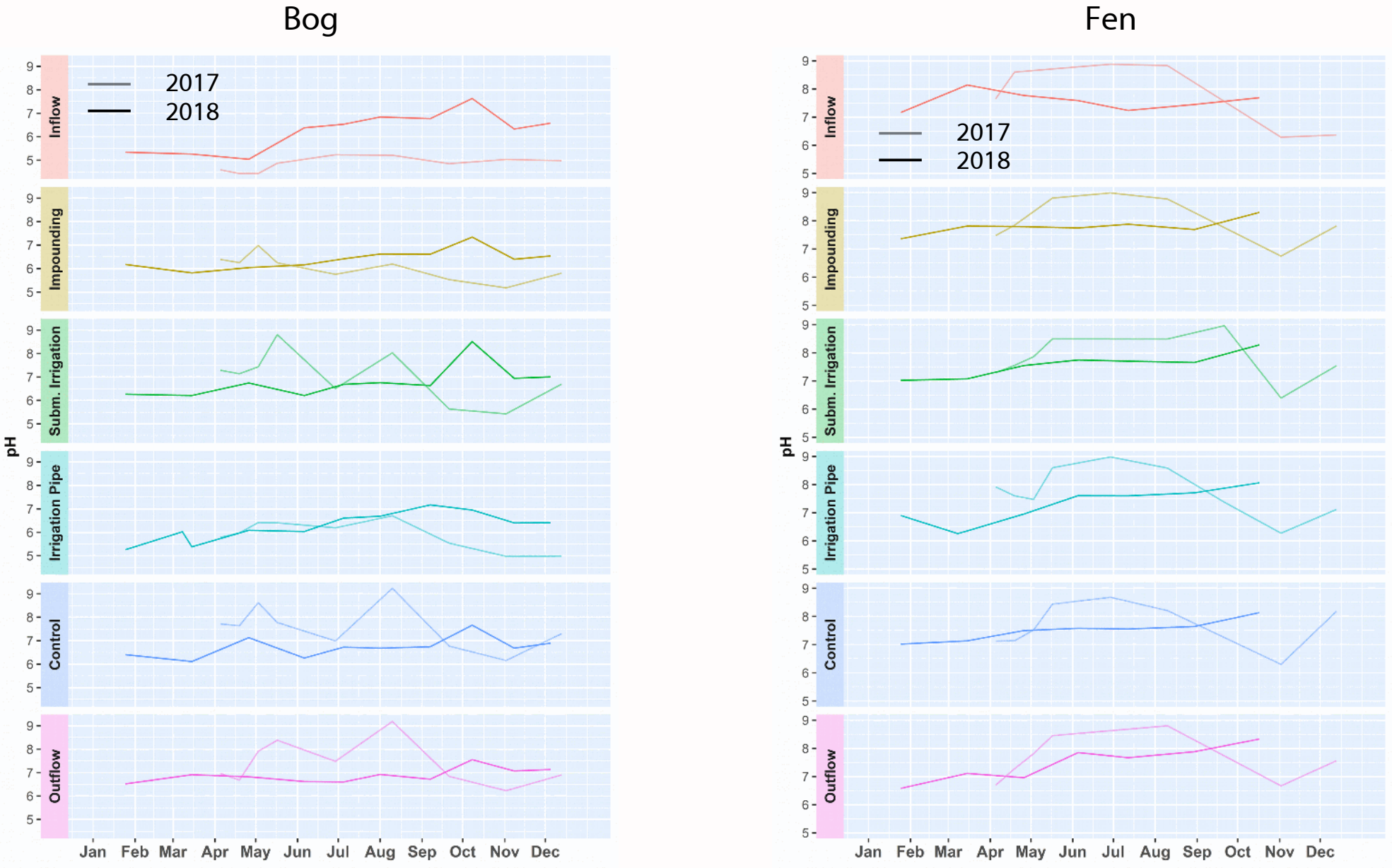
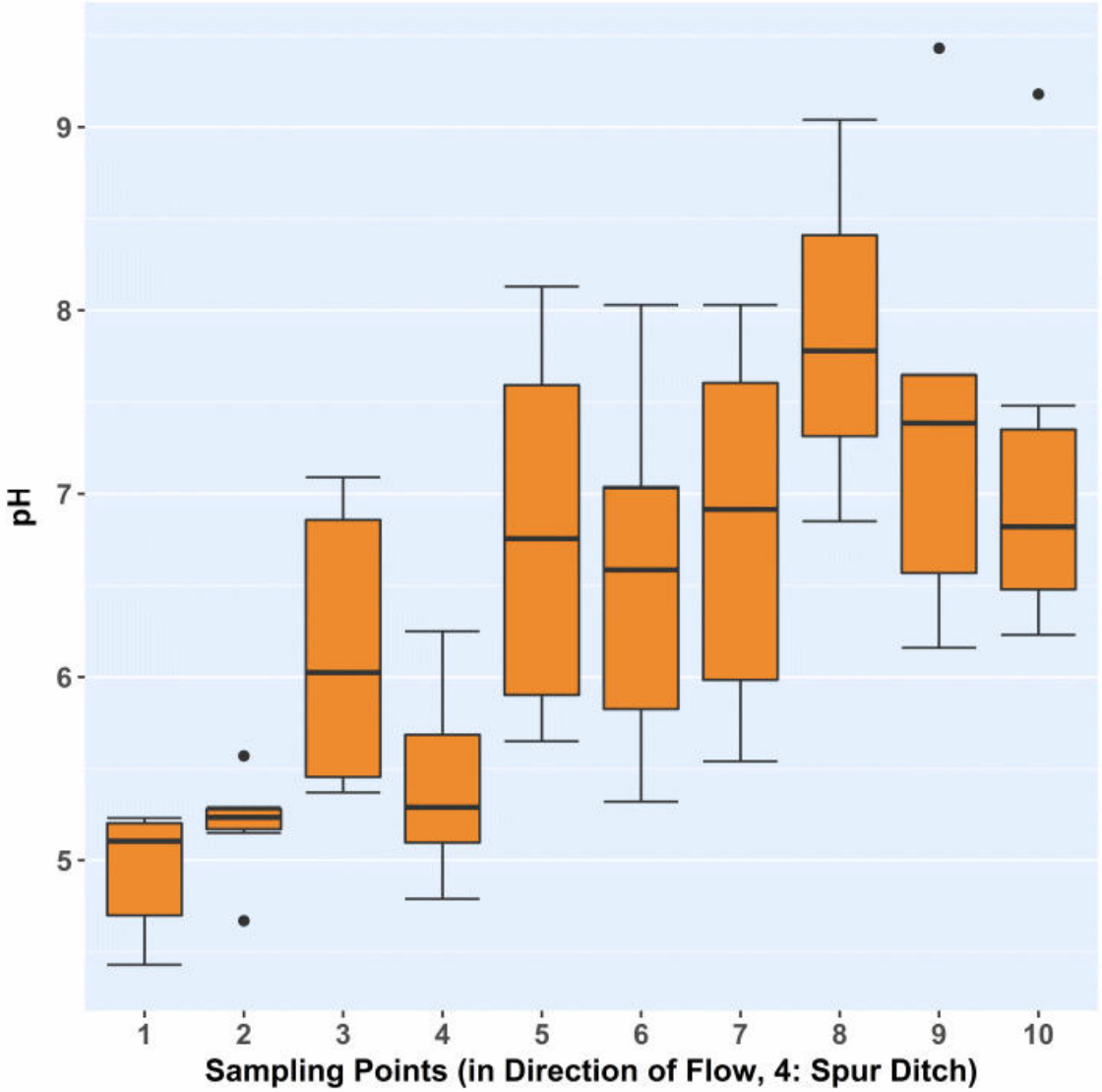
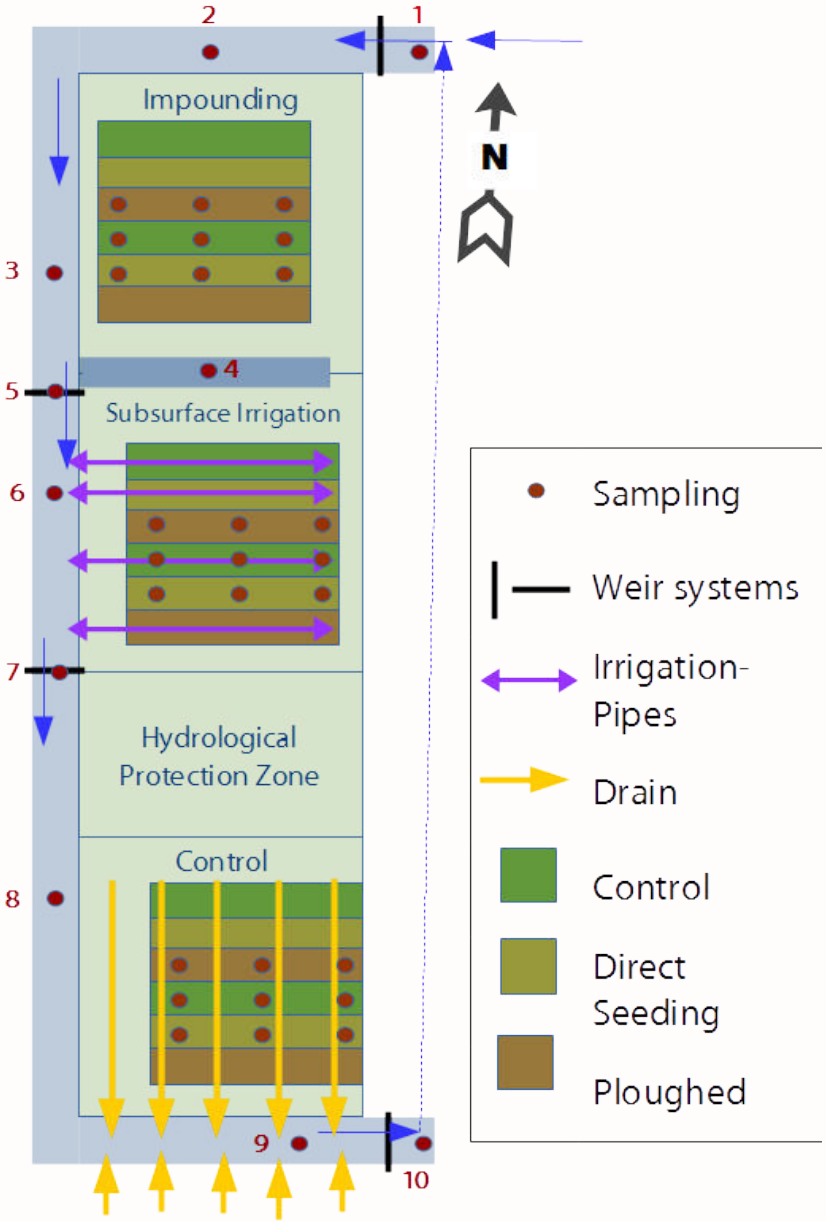
pH in Fen and Bog Ditch Water 2017 vs. 2018



pH in Bog Ditch Water in 2017 by Sampling Point





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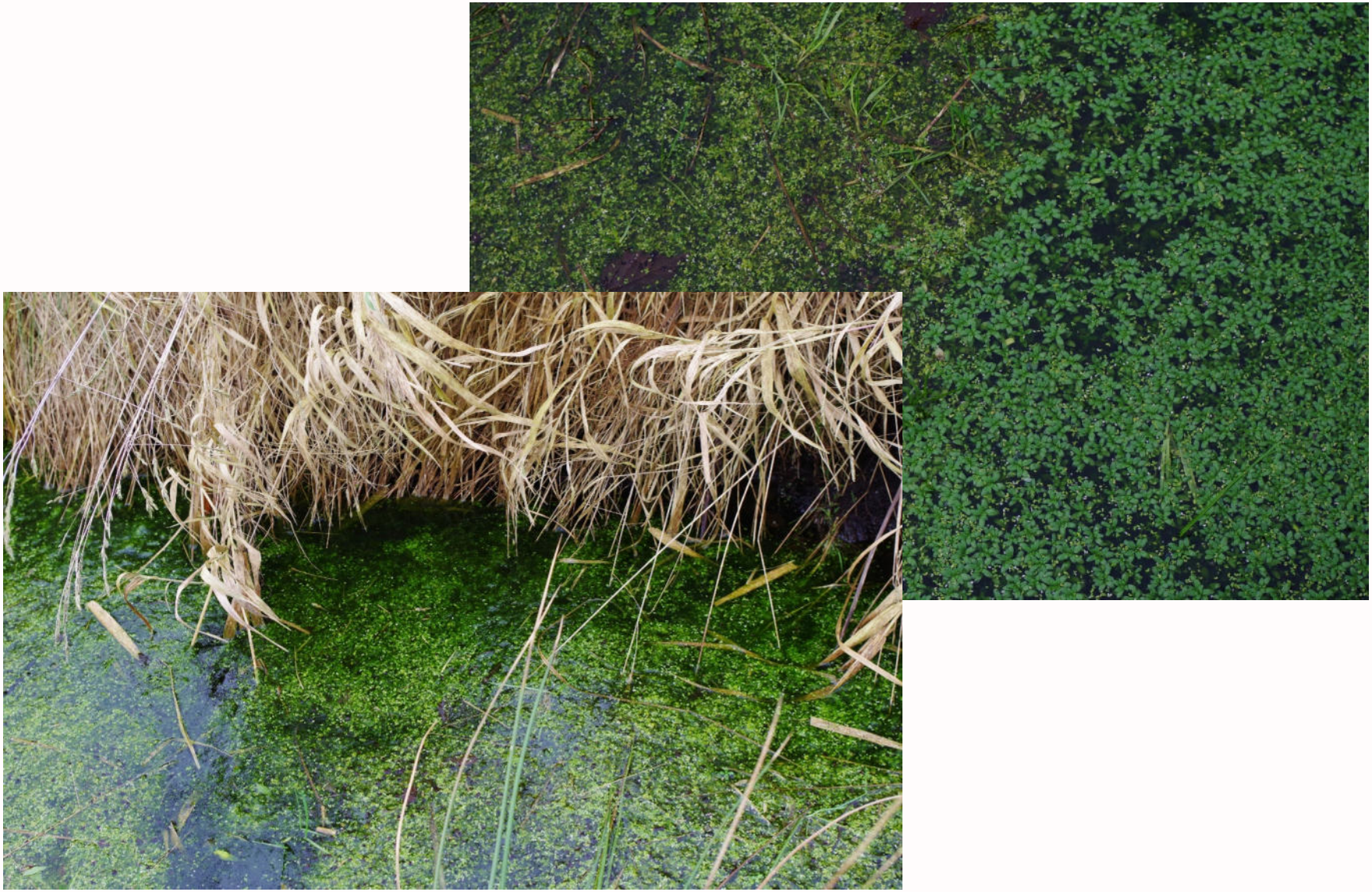
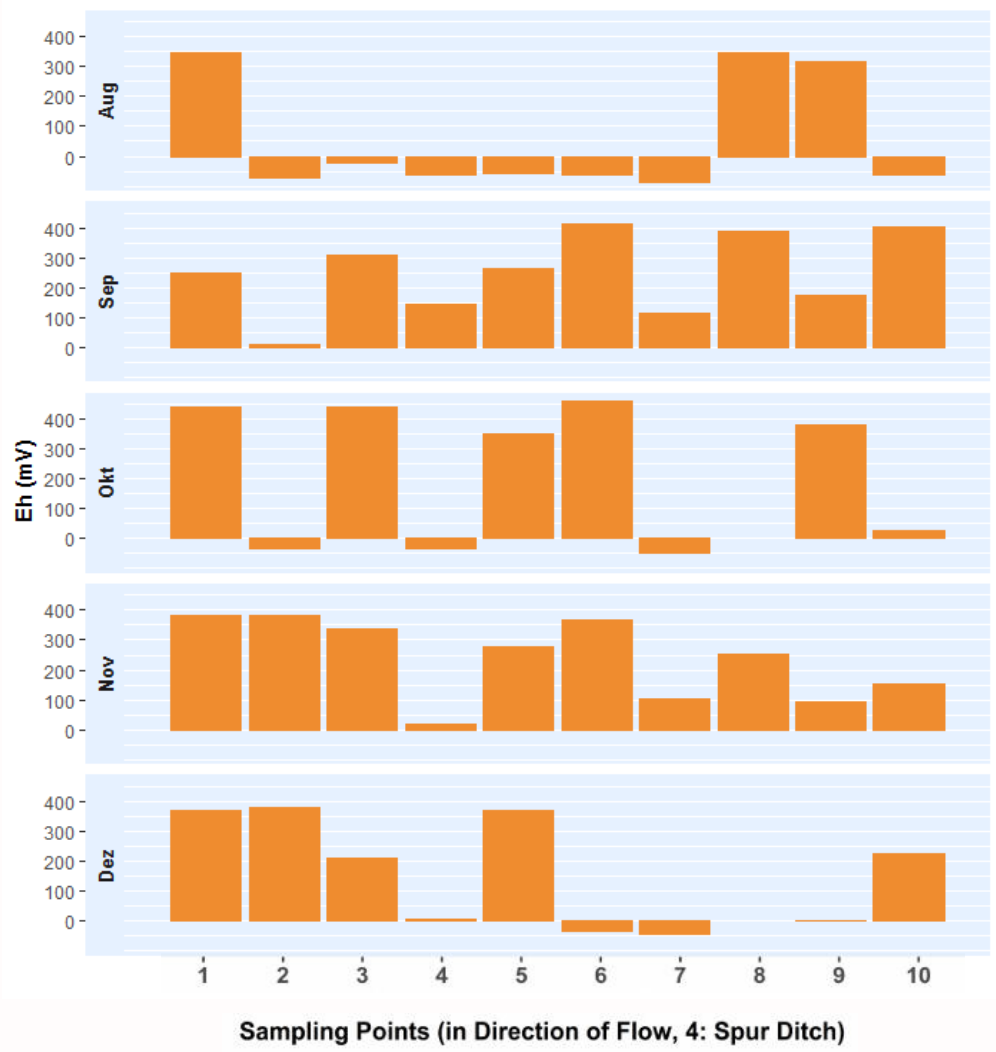
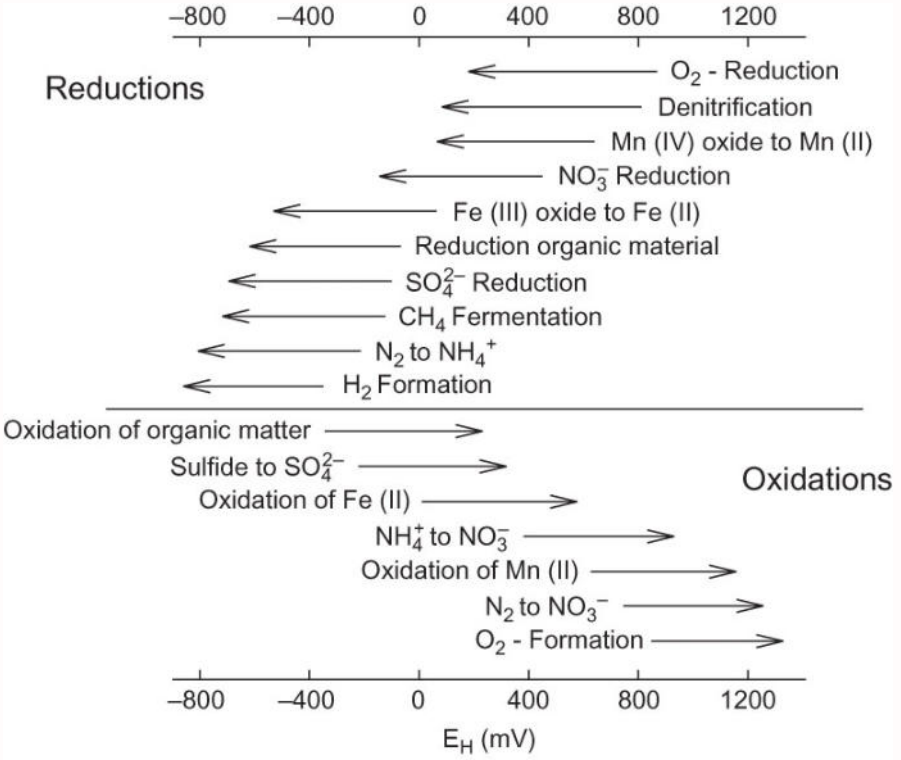
Biomass Accumulation in Ditches



Redox + Oxygen concentration





Redox potential required to complete different reductions and oxidations with energy yield as the difference between the tail and head of the arrow , Dodds & Whiles (2010)

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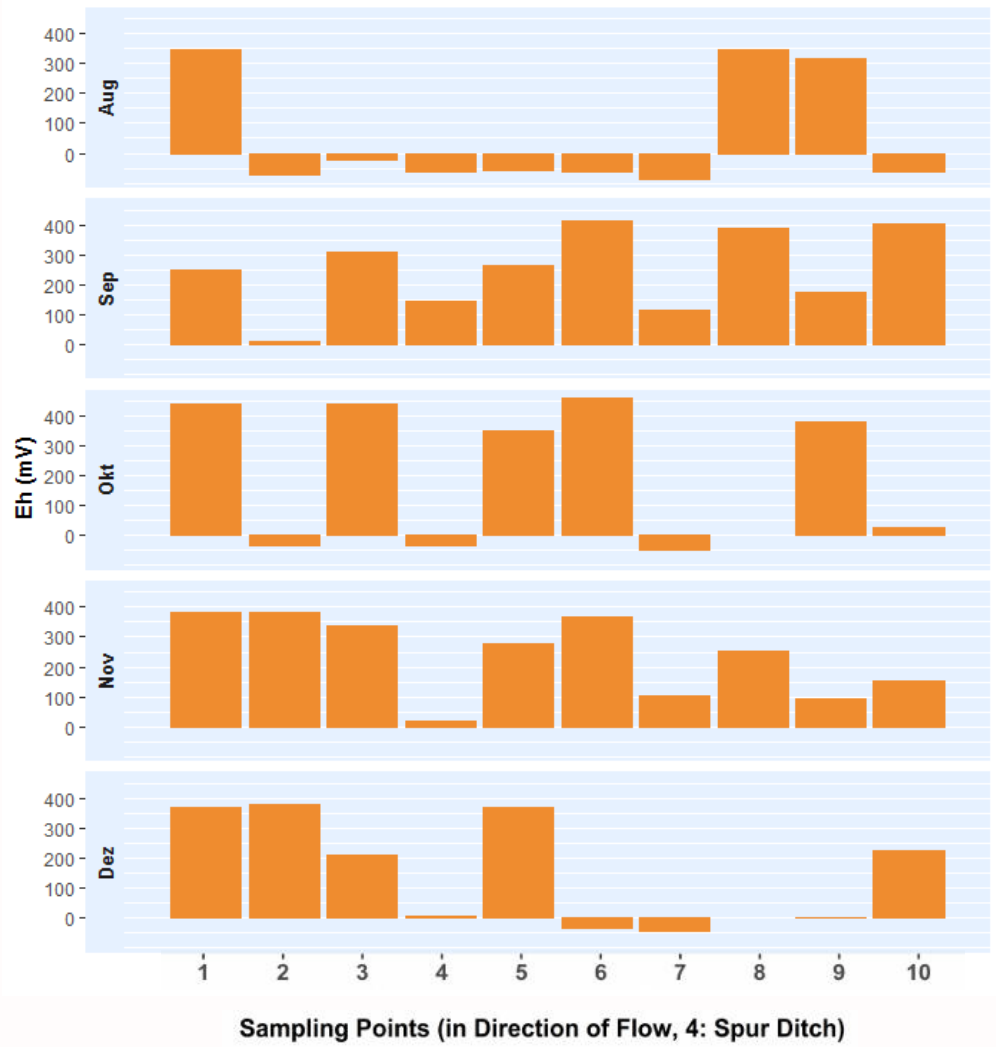
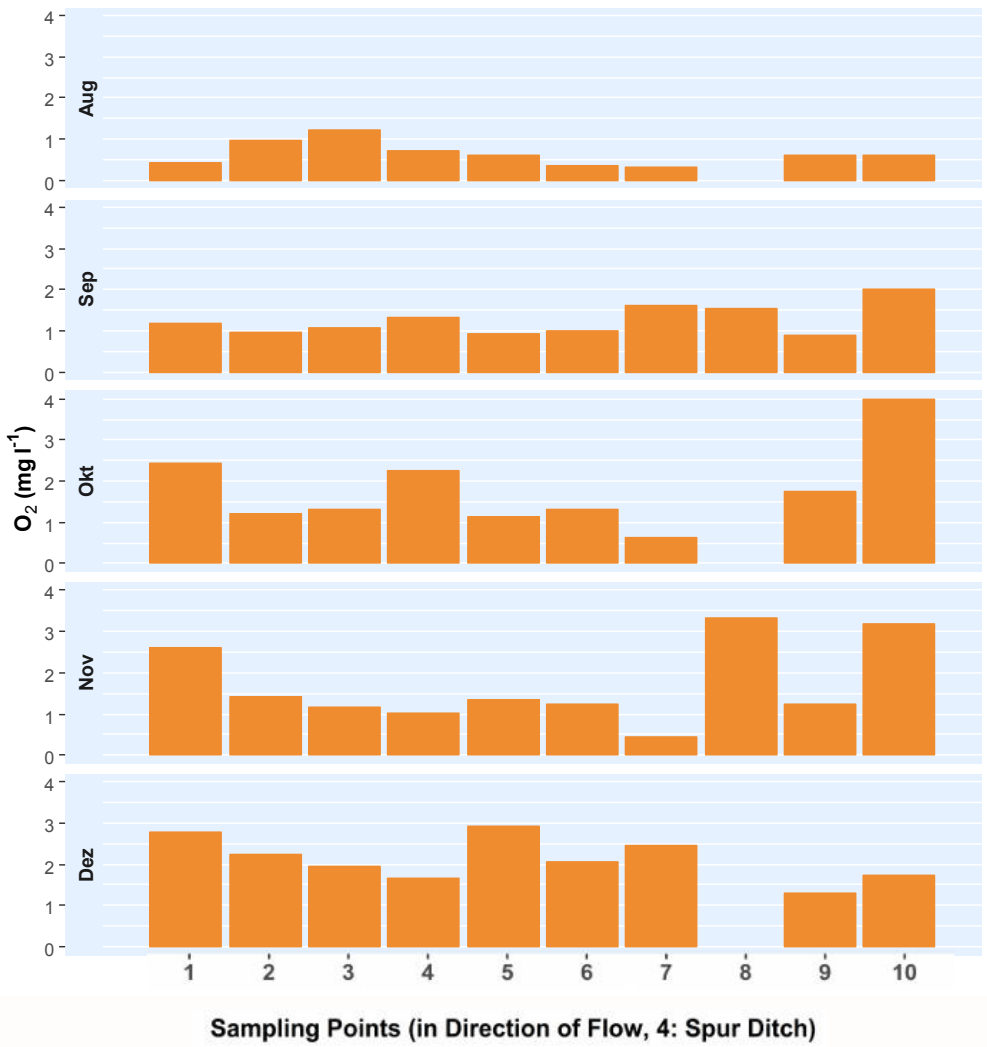
Redox + Oxygen concentration





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Summary & Outlook

- Phosphate, ammonium-N and , especially at the beginning of spring, nitrate are leached from Experimental Sites
- High phosphate and ammonium-concentrations in the ditches, strong algae growth, high pH-values compared to soils (pH 7-9) -> eutrophication
- pH-values in the bog ditch were rising from inflow to outflow up to pH 9 in 2017, in 2018 pH stays below pH7 and the pattern is not repeated
- The summer month exhibit a depression in phosphate concentration in the fen ditch water
- Effects of the Water management variants have only been detected for nitrate in 2018 with high amounts found in the control variant

Nutrient loading from the experimental bog and fen site of the adjacent ditches with mineral nitrogen and phosphate manifests in eutrophication, effects of the water management until now could only be detected in conjunction with specific weather conditions

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Thank you!

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Sources

- Dodds & Whiles (2010): Freshwater Ecology. Elsevier.
- NLWKN (2014): Gewässerüberwachungssystem Niedersachsen (GÜN) - Nährstoffe in niedersächsischen Oberflächengewässern - Stickstoff und Phosphor -, Oberirdische Gewässer Band 35, Ausschnitte
- Flessa, H. et al. (2012): Studie zur Vorbereitung einer effizienten und gut abgestimmten Klimaschutzpolitik für den Agrarsektor. Landbauforschung, Vol 361. Johann Heinrich von Thünen-Institut.Geologischer Dienst