



Connecting swamps with streams: restoration of alder carrs by flooding

KWR

Watercycle Research Institute

Camiel Aggenbach

... and are now isolated



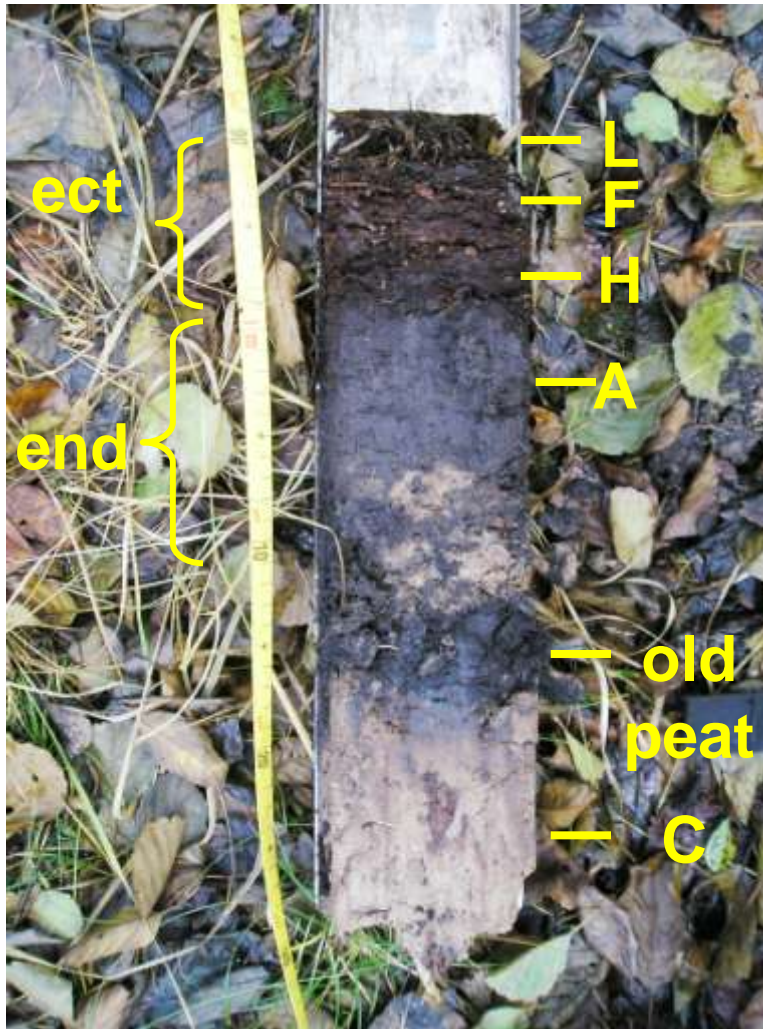
seepage and
flooded disappeared

digged 'stream'

last 50-100 y:
peat decomposition
severe biogeochemical
changes



desiccated and acidified alder cars

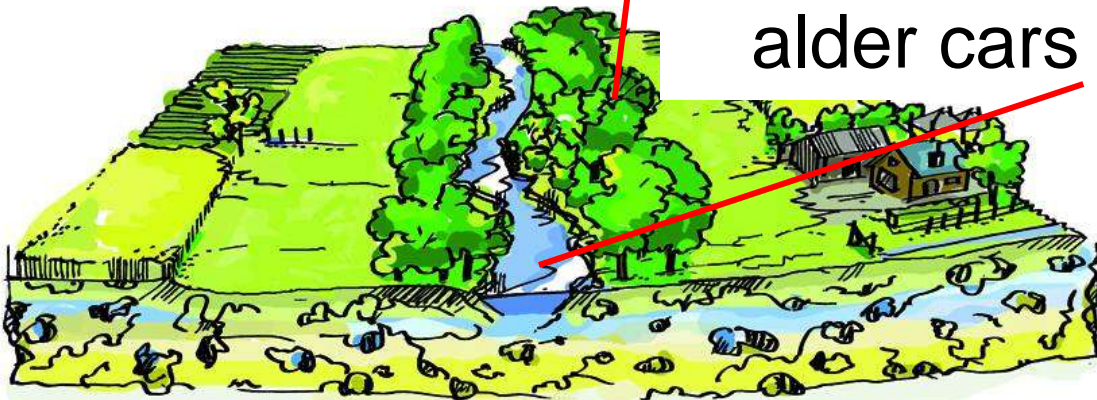


solution? just flood it artificially



Questions

- Can we restore abiotic conditions and vegetation of alder cars by artificial flooding?
- Which processes enhance or restrict alder car restoration?
- Streams not to eutrophic for alder cars or visa versa?



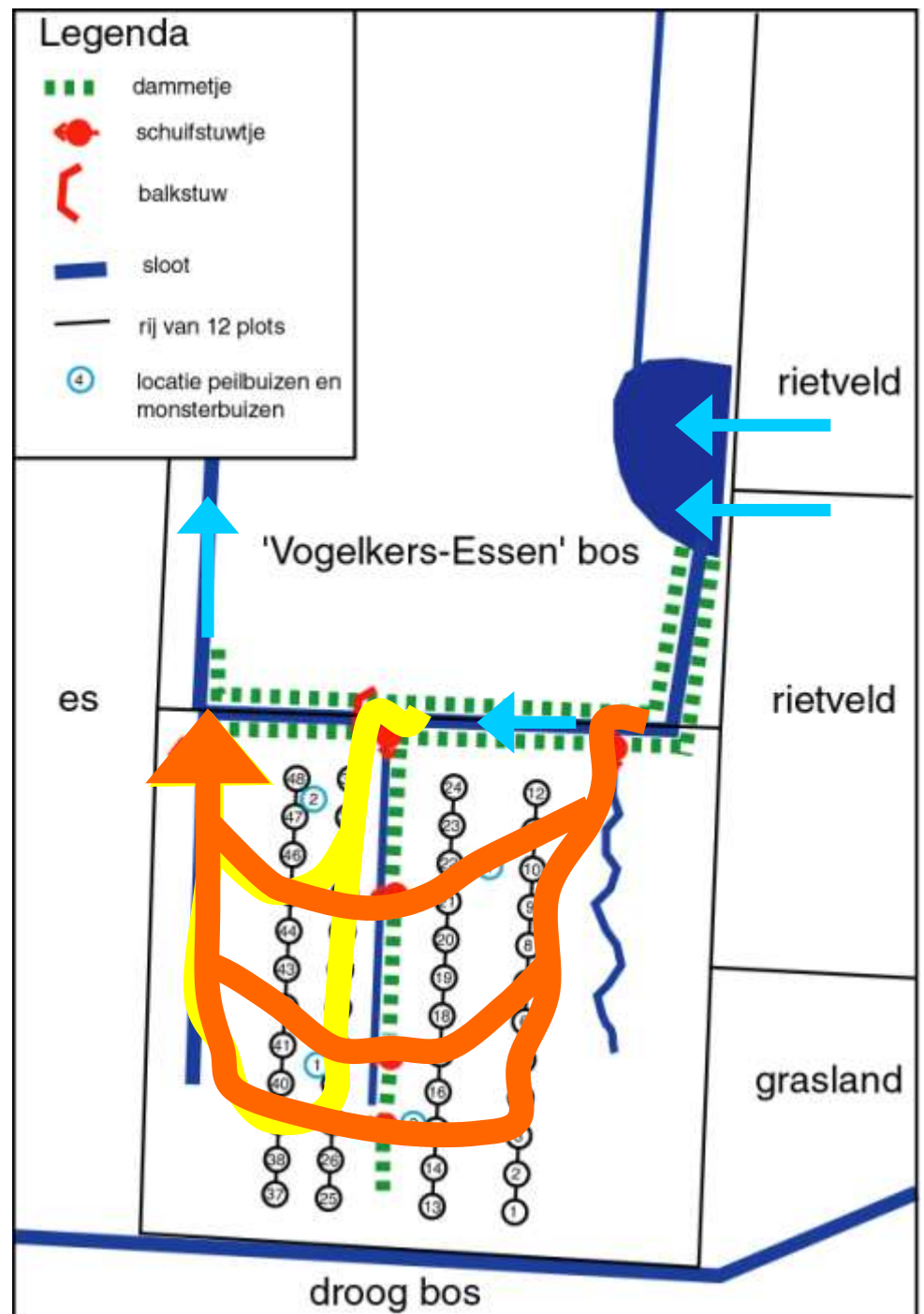
Field experiment

flooding

6 month
compartment

flooding

3+6 month
compartment



2005: before flooding



with flooding:
eutrophic vegetation, with alder car species

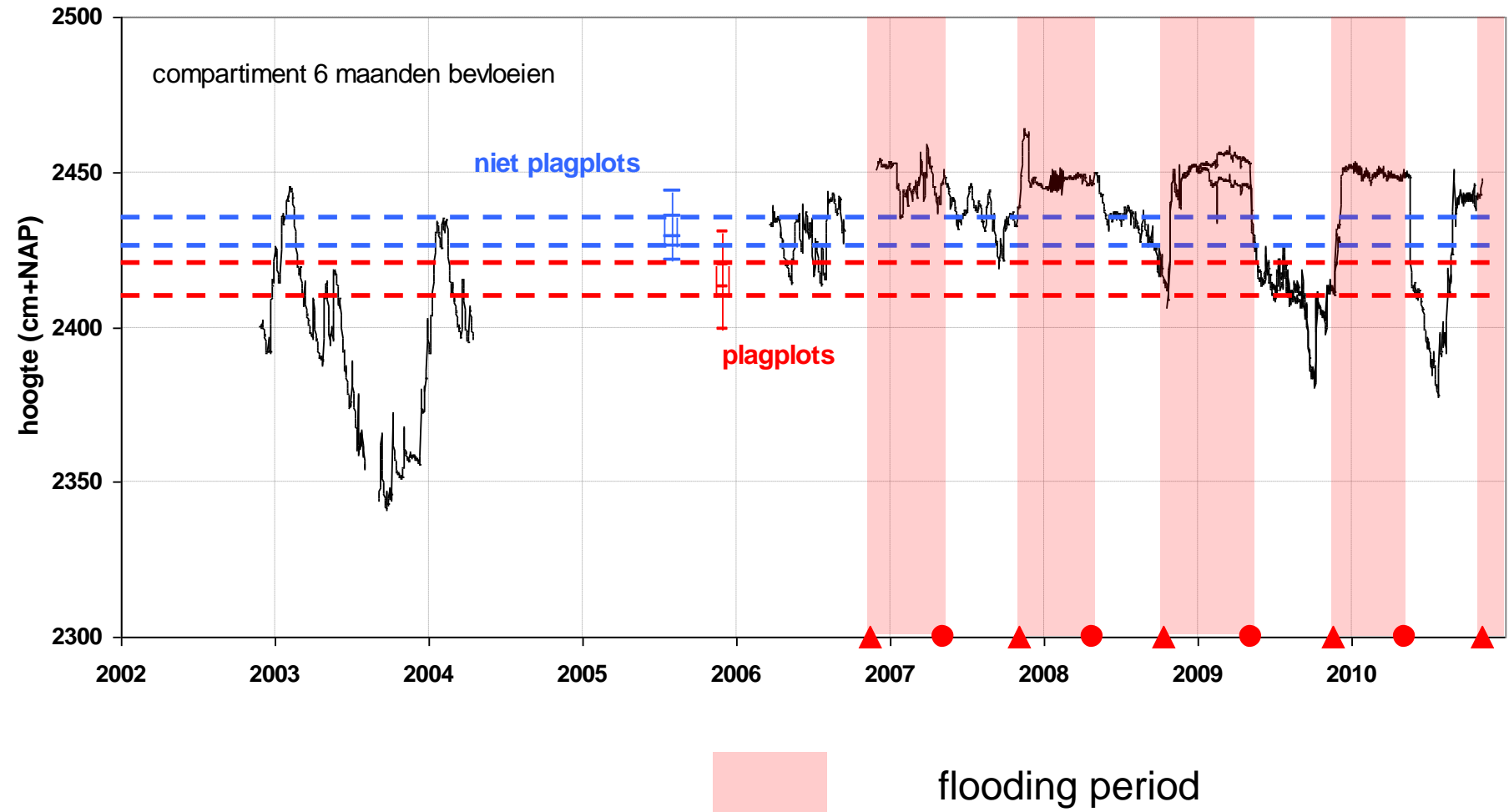


**2007 stagnant surface
water in summer**

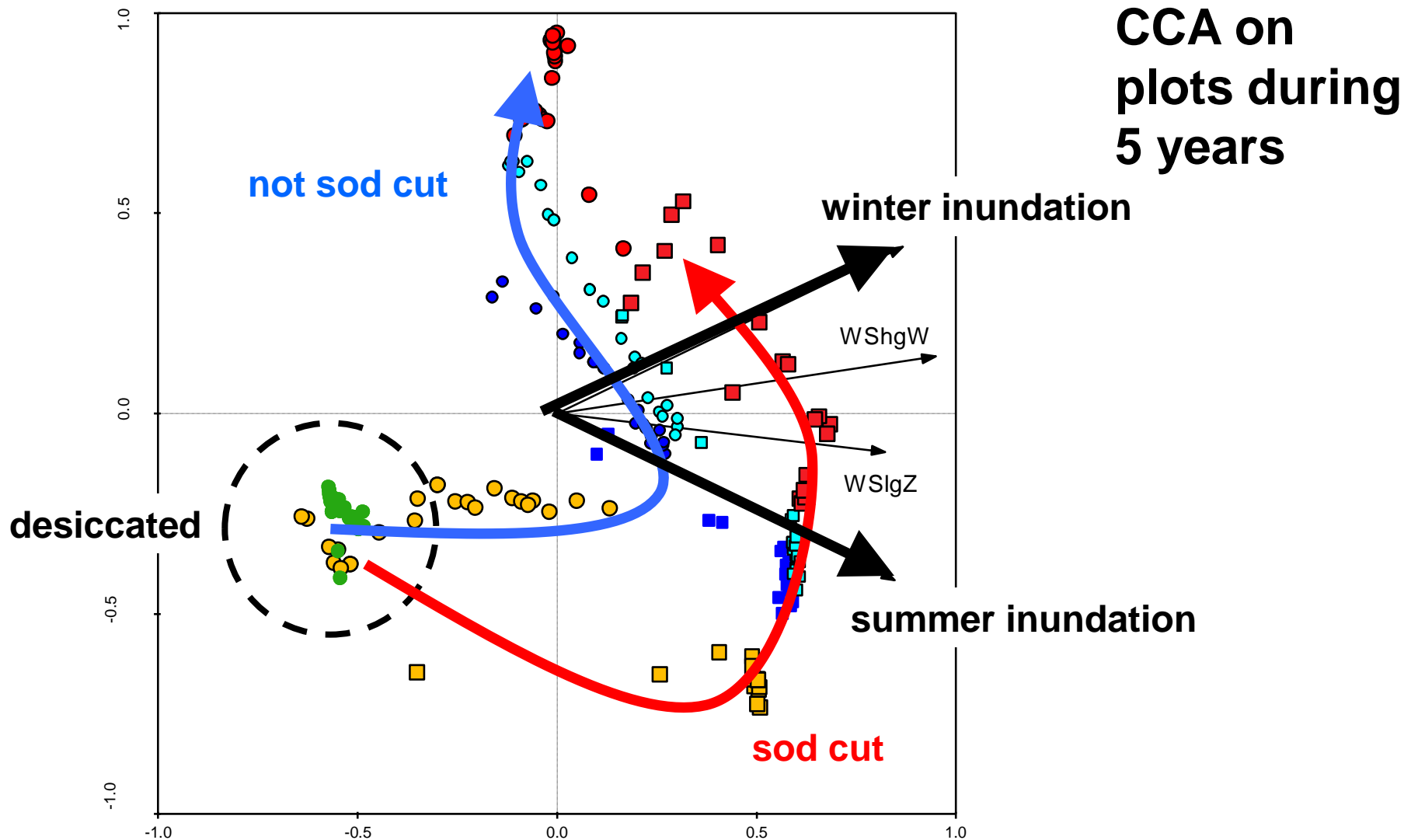


**2009 no inundation in
summer**

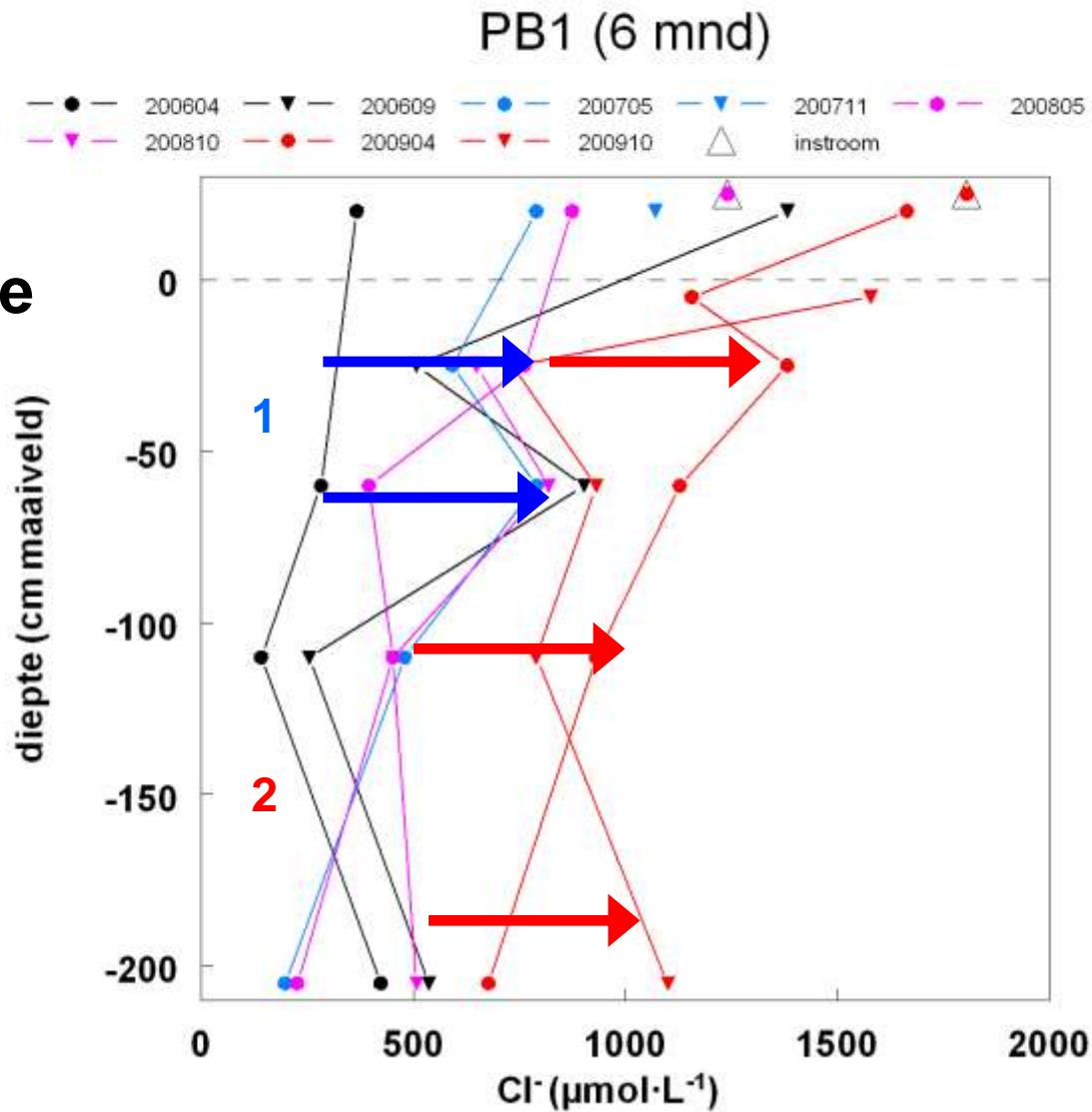
Water levels



Water levels and vegetation development



Infiltration of floodwater?

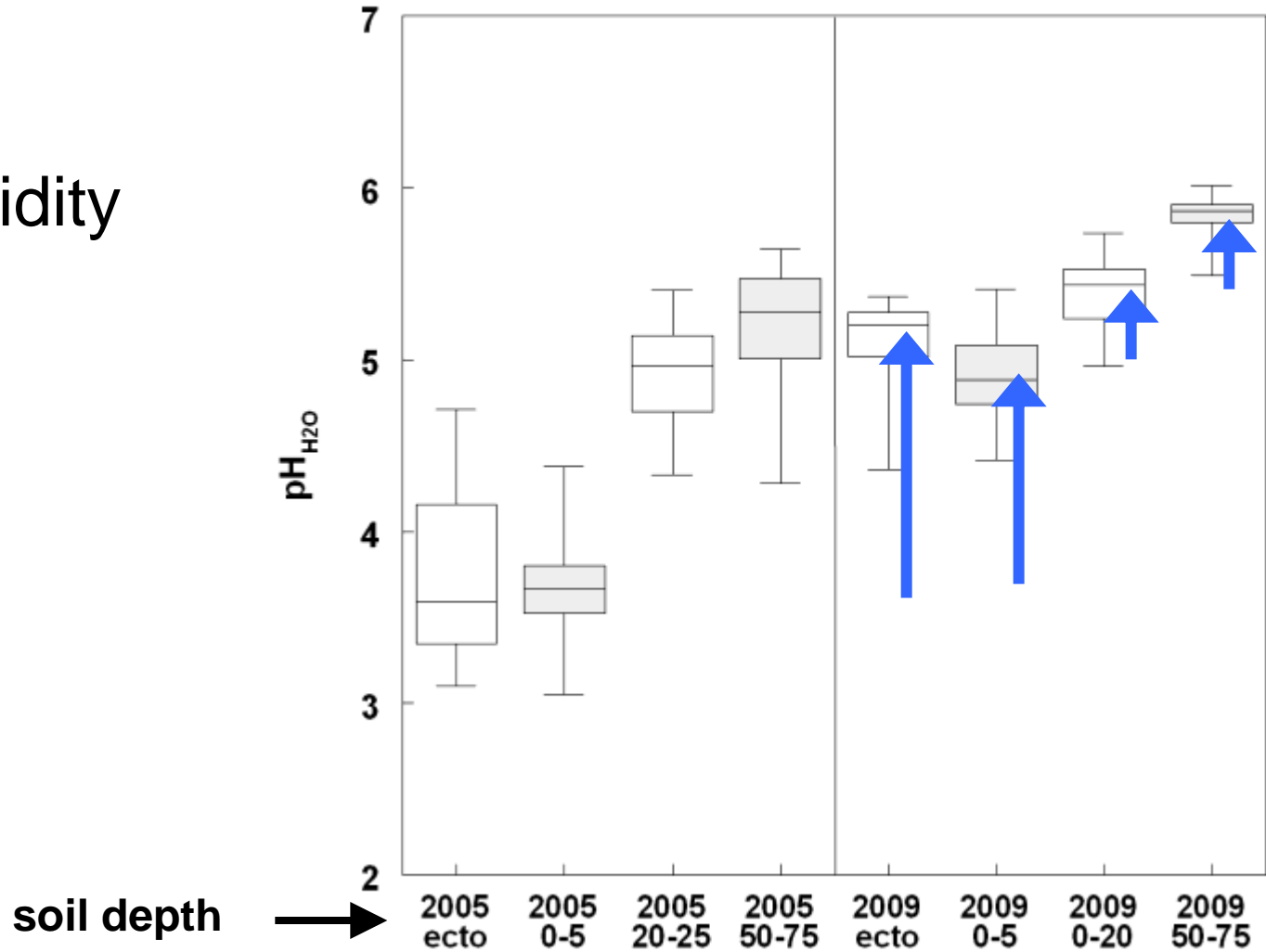


Recovery of high base status?

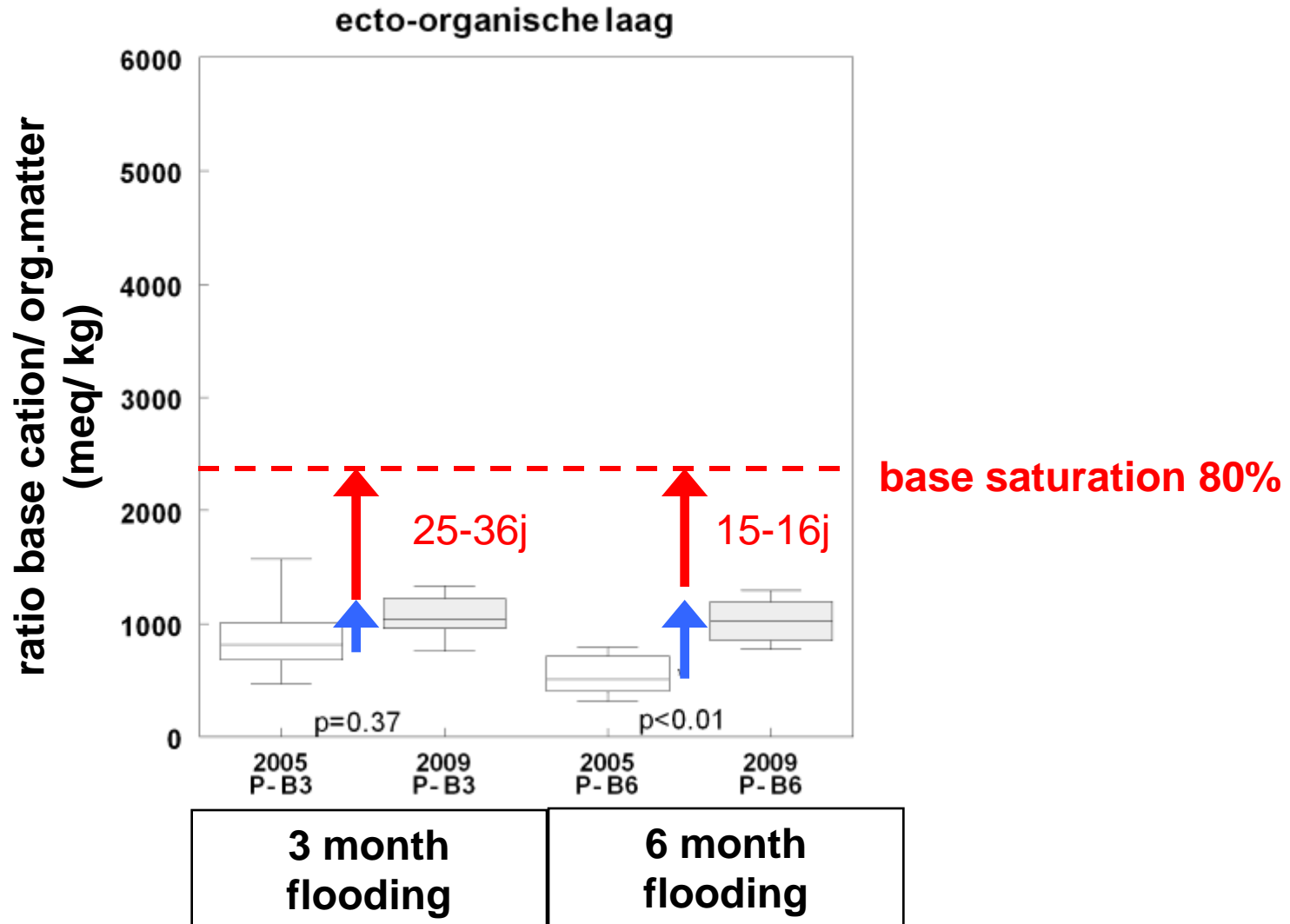
2005: before
flooding

2009: after
flooding

soil acidity

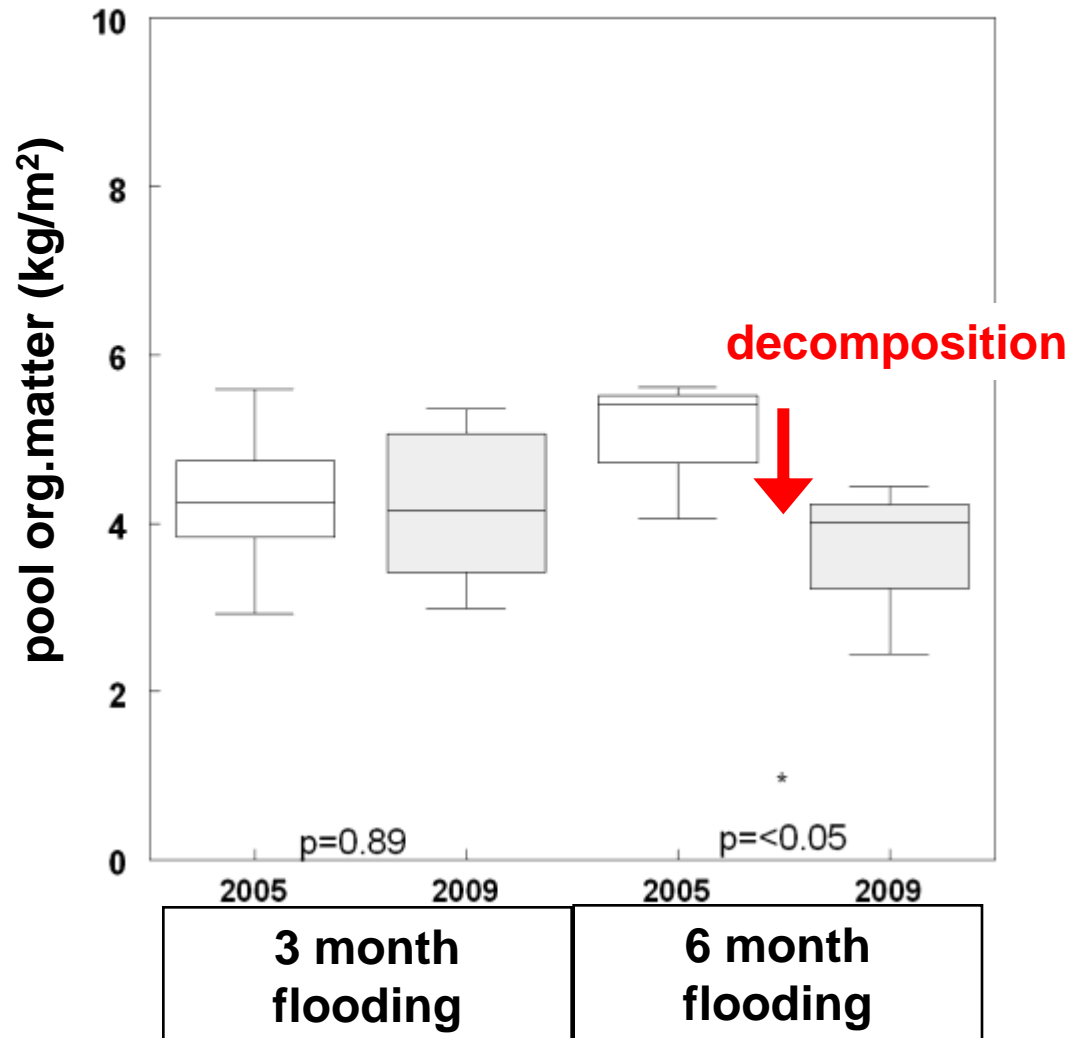


Recovery of high base status?



Organic matter dynamics

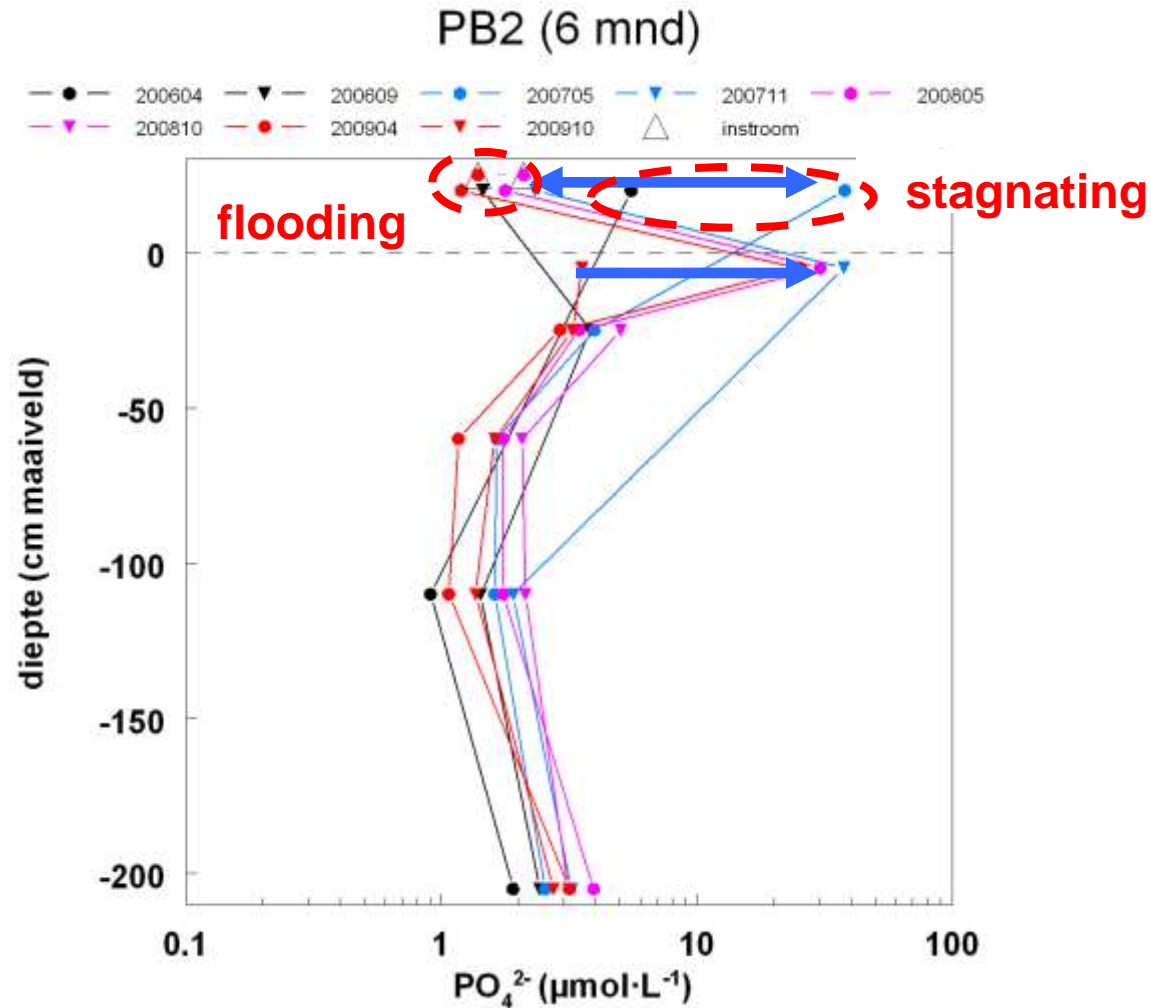
mineral top layer



plots without
sod cutting

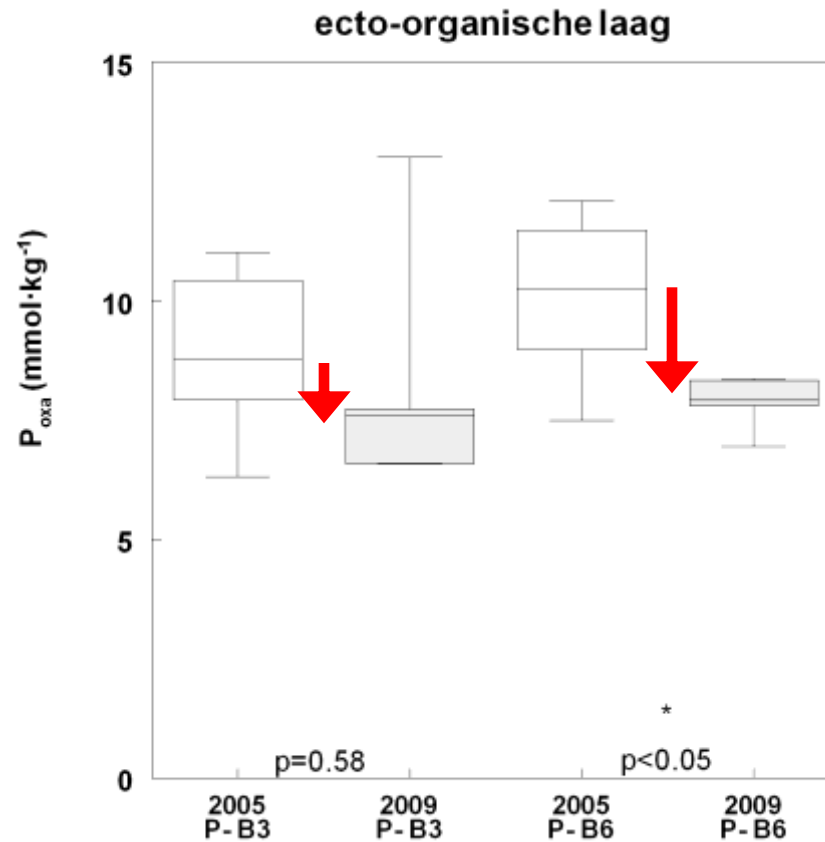
nutrient dynamics

depth profile PO₄ in water

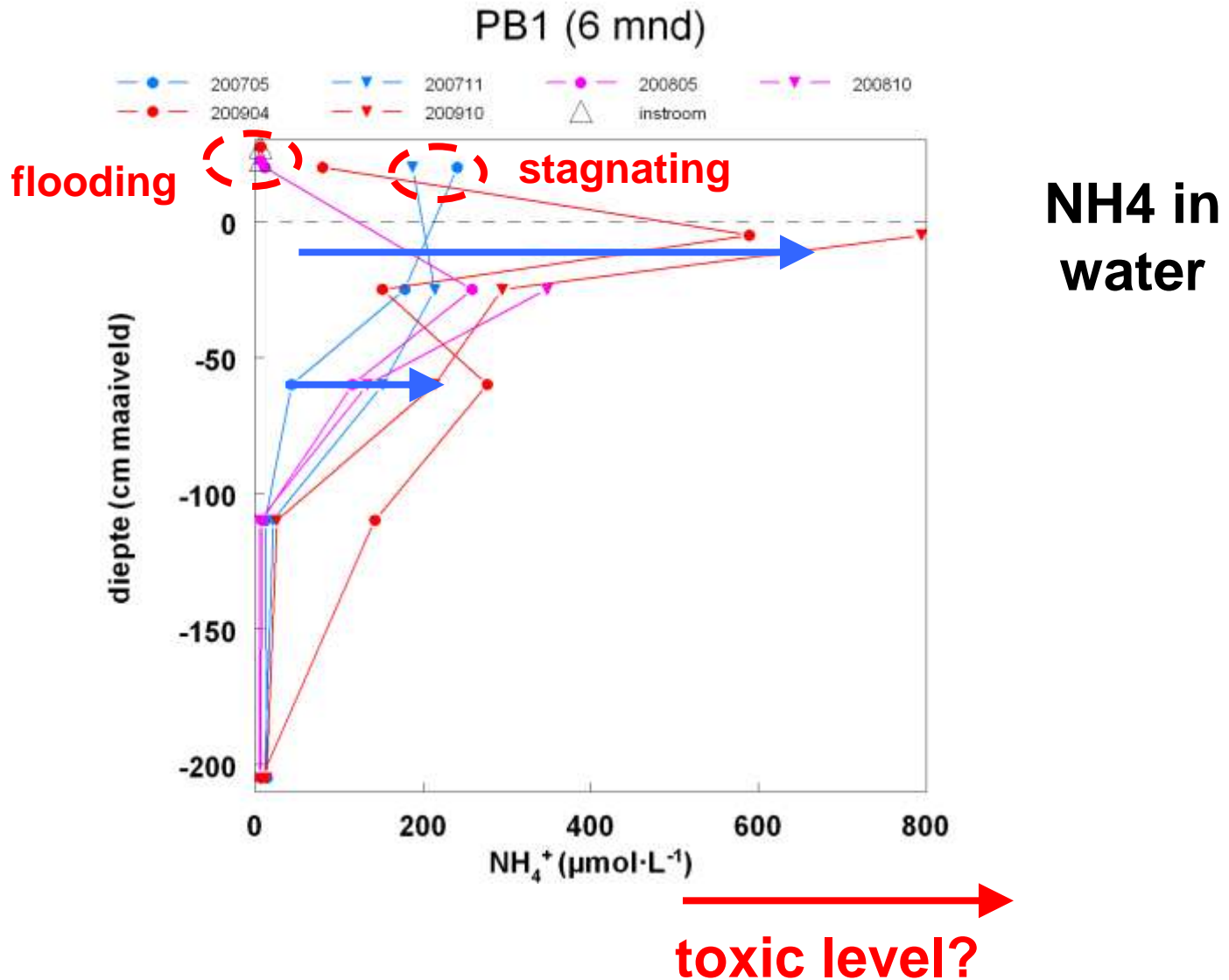


nutrient dynamics

oxalaat-PO4 in ectorganic layer



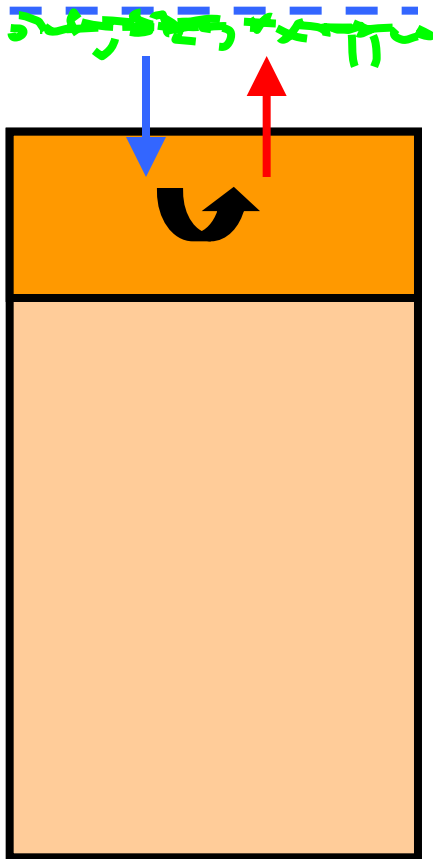
nutrient dynamics



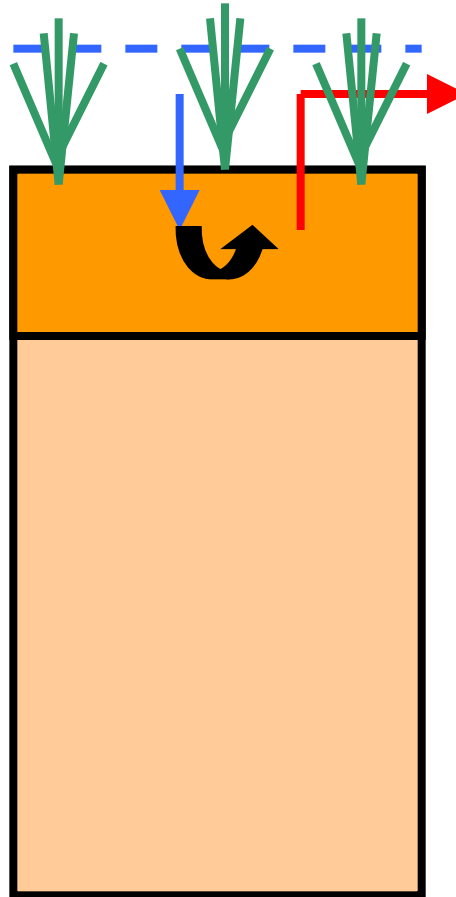
processes

- $\text{Ca}+\text{K}+\text{HCO}_3+\text{SO}_4$
- PO_4+NH_4
- ↻ decomposition

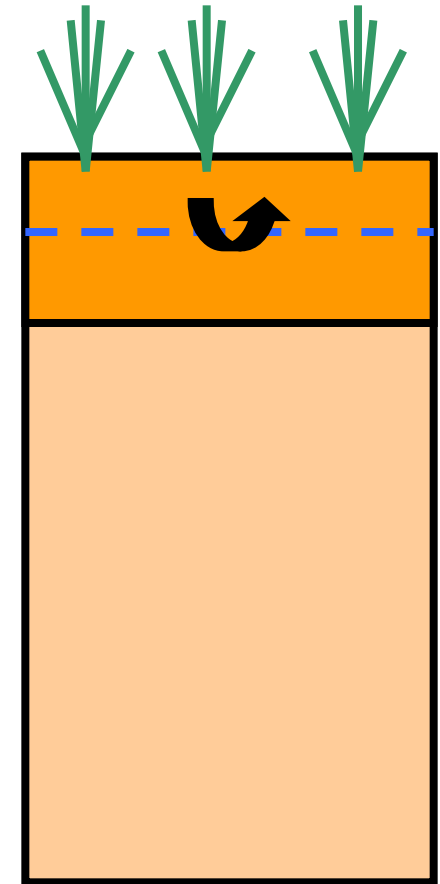
stagnant
high summer
water table



flooding



no flooding
low summer
water table



Can we restore abiotic conditions and vegetation of alder cars by artificial flooding?

- sustainable recovery of high base status
- strong eutrophication with P and N
- but also strong leaching of P and N
- fast recovery of alder car species
- but strong increase of eutrophic species
- toxicity for plants not a big deal?
- long term recovery vegetation unclear
- prospects aquatic fauna???

Which processes enhance or restrict alder car restoration?

- proportional to flooding time:
 - loading with base cations
 - leaching of N and P
- surface water must flow:
 - keeps [PO₄] and [NH₄] in surface water low
- recovery herb layer dependent on summer tables below soil surface:
 - for seedlings
 - no dominance of Lemna and algae
- eutrophication by:
 - strong anaerobic decomposition + mineralization
 - desorption of PO₄ and NH₄
- sod cutting is useless
- excavating the organic soil is an option

Streams not to eutrophic for alder carrs or visa versa?

- relatively low content dissolved P is a pre
 - fertilizer budgets catchment
 - better sewage purification
 - alternative purification
- P-input by sedimentation must be low
 - brook valley design: spatial differentiation in sedimentation
- flooded deteriorated alder carrs are nutrient sources
 - brook valley design: depends on balance between flooding flux and alder carr surface
 - option: get rid of the nutrient pool before flooding