



Universiteit Utrecht
[Faculty of Science
Biology]

PEATLANDS IN A CHANGING CLIMATE

summer droughts and salinization

Karlijn Brouns, M.M. Hefting, J.T.A. Verhoeven
Ecology & Biodiversity, Utrecht University, the Netherlands

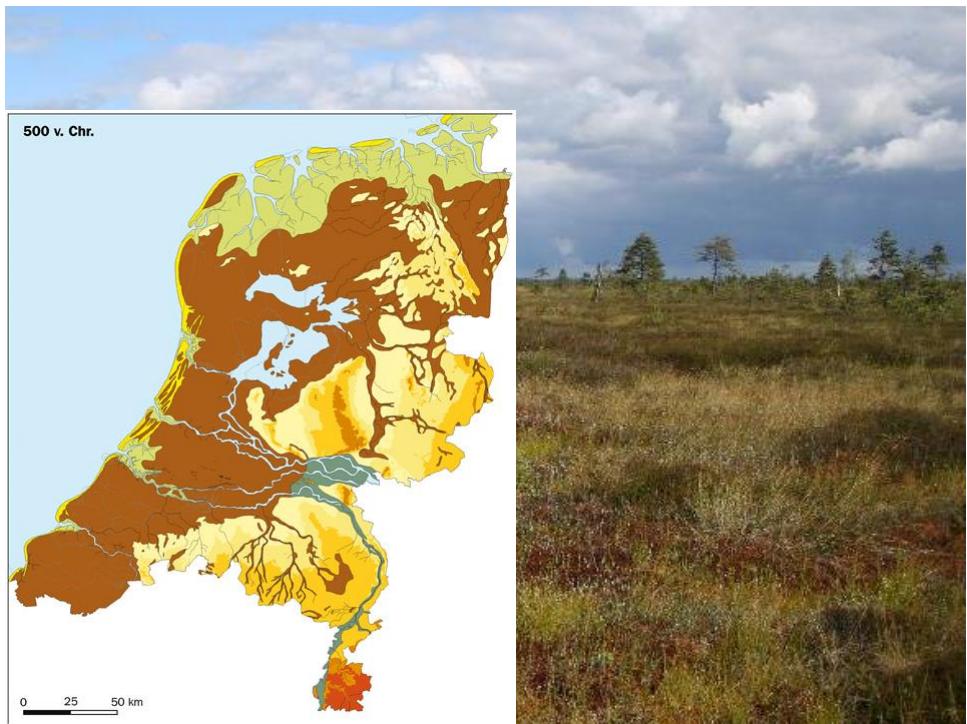
Content

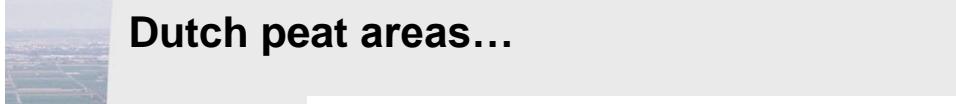
- Introduction into peat soils
- Peat decomposition
- Climate change effects on peat decomposition:
 - Summer drought
 - Salinization
- Conclusions



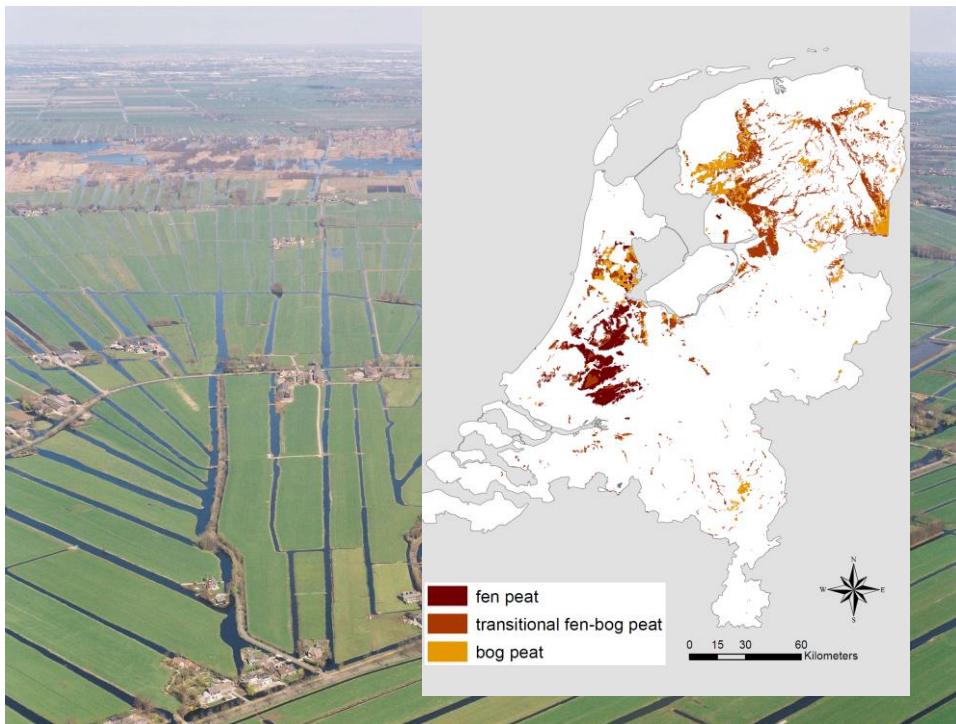
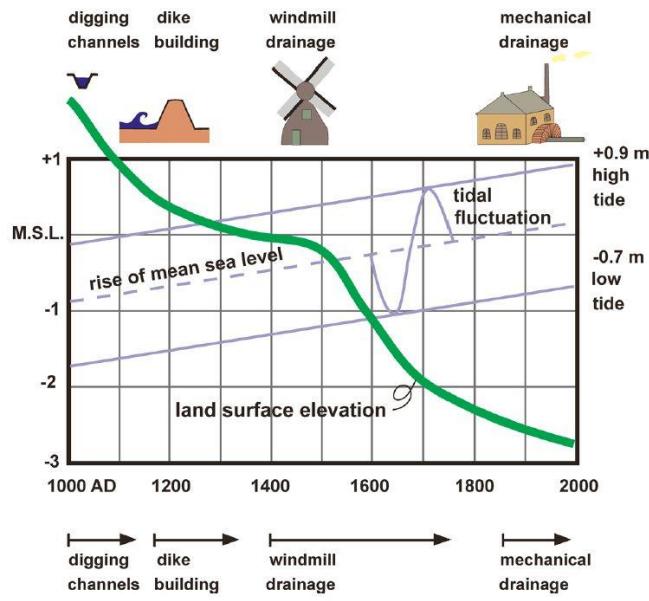
Peatlands...

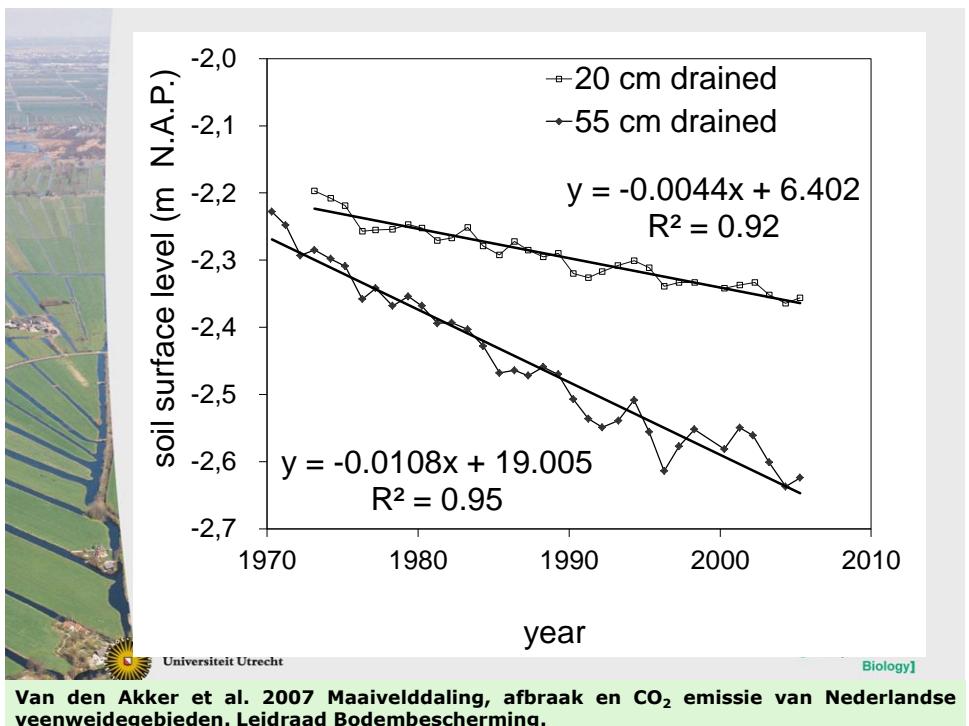
... cover a few percent of the earth's land surface
... are a sink of carbon when undisturbed,
but, this C sink is labile and sensitive to disturbance





... subside, causing
damage to
buildings and
infrastructure
... are costly







Peat decomposition

- Aerobic decomposition (O_2) faster than anaerobic decomposition (NO_3^- , Fe^{3+} , SO_4^{2-})
- Hydrolytic and oxidative enzymes produced by soil micro-organisms
- Poor water quality because of leaching of nutrients and Dissolved Organic Carbon
- Subsidence and greenhouse gas emissions

Universiteit Utrecht

[Faculty of Science
Biology]



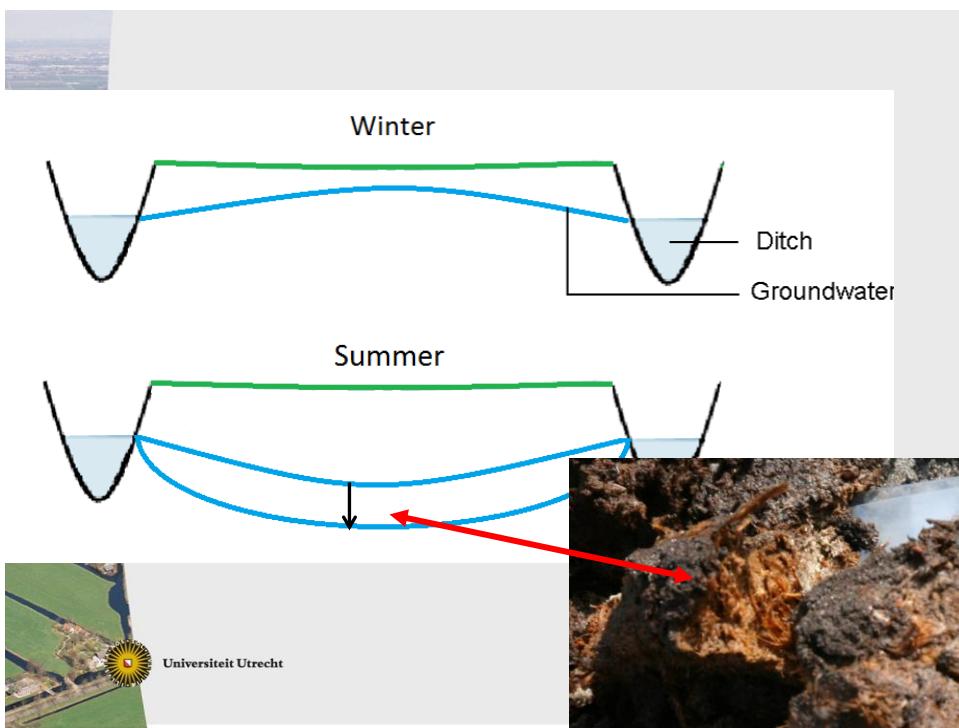
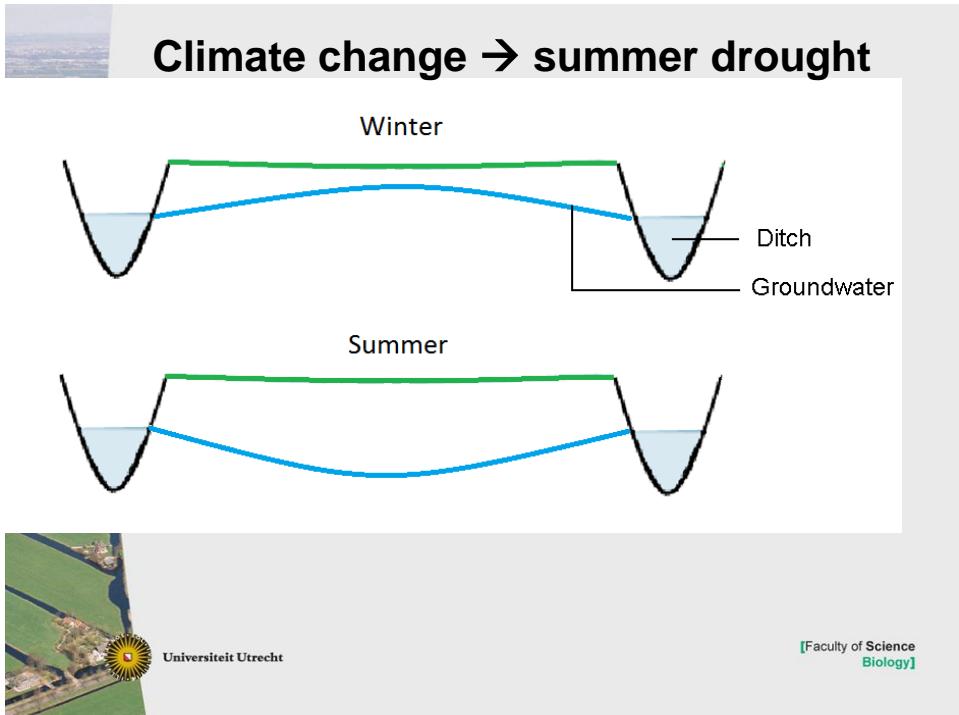
Climate change

Summer in W_H scenario (former: W+):

	change	source
temperature	+ 3.7 °C	1
precipitation	- 23 %	1
evaporation	+ 15 %	1
additional water needed	+ 43 %	2
groundwater level	- 15 cm	2
subsidence rate	+ 70 %	2

¹ KNMI 2014 KNMI'14-klimaatscenario's voor Nederland: Leidraad voor professionals in klimaatadaptatie Zalsman B.V., Zwolle, the Netherlands.

² Querner 2012 Analysing water level strategies to reduce soil subsidence in Dutch peat meadows. J Hydrol 446-447:59-69.

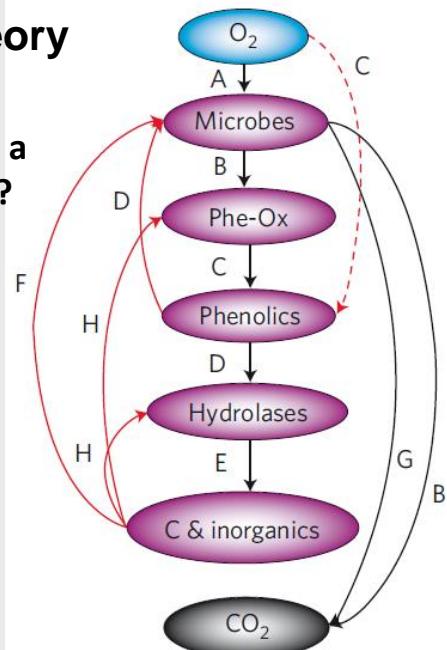




Enzymic latch theory

Does oxygenation release a latch on decomposition?

Universiteit Utrecht



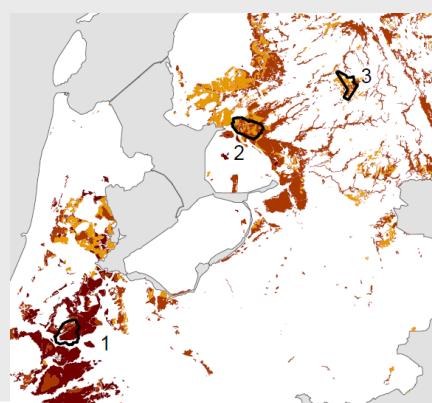
Fenner&Freeman 2011 Drought-induced carbon loss in peatlands. Nat Geosci 4:895-900.

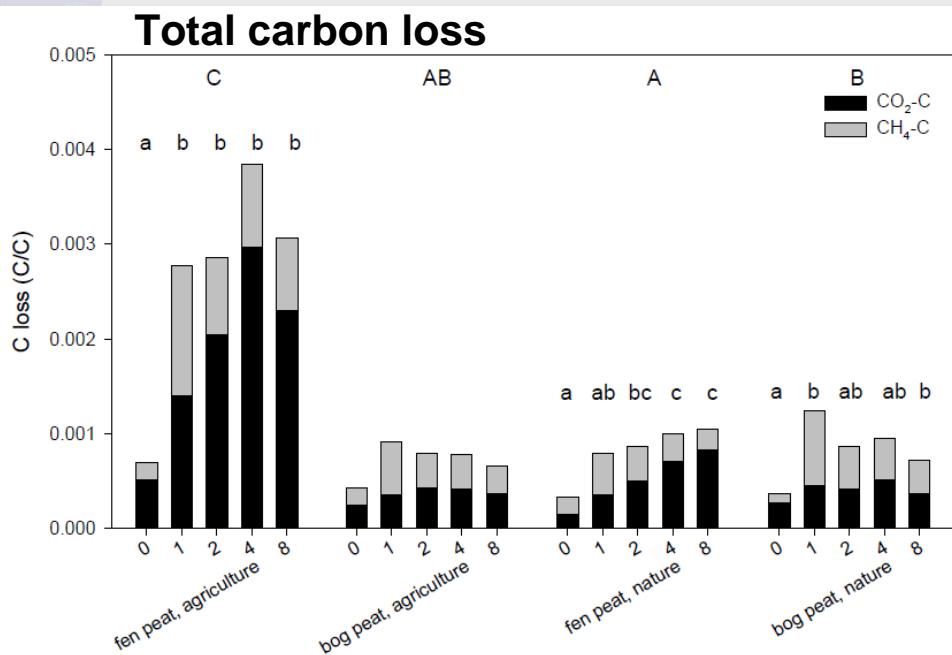


Methods summer drought

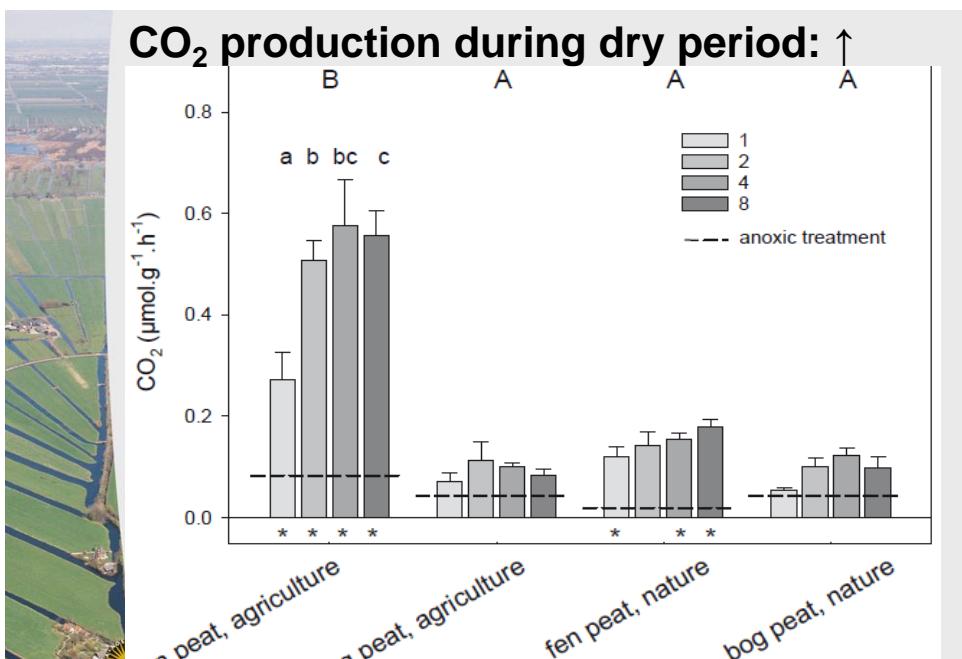
- Peat samples from well below groundwater level
- Anoxic incubation for 14 weeks, 1-8 weeks oxygenation
- Fen peat vs bog peat
Agriculture vs nature

Universiteit Utrecht

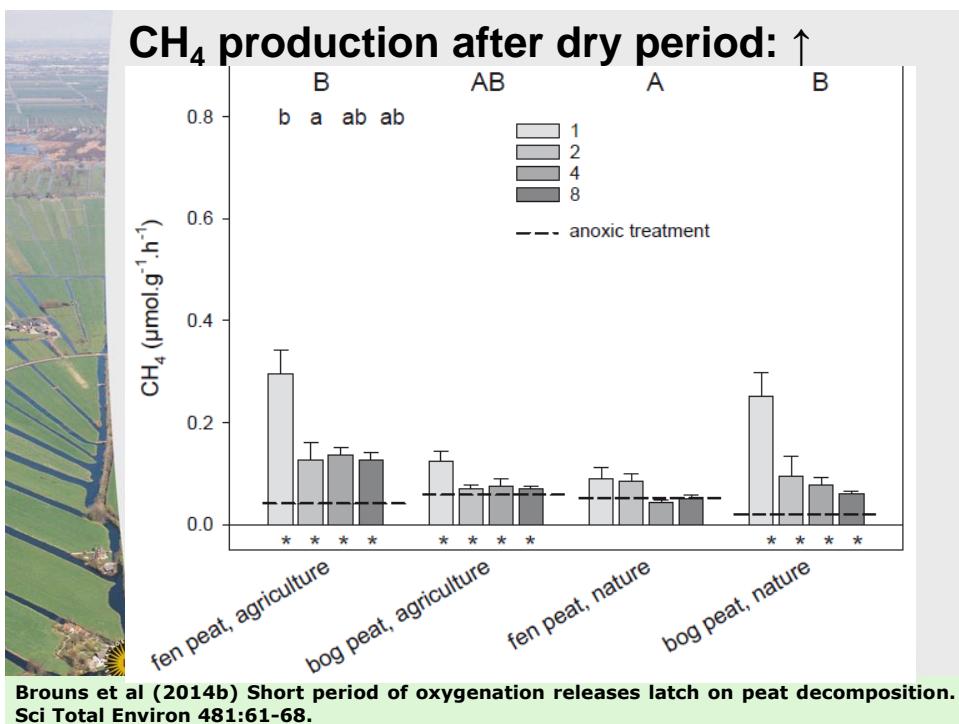
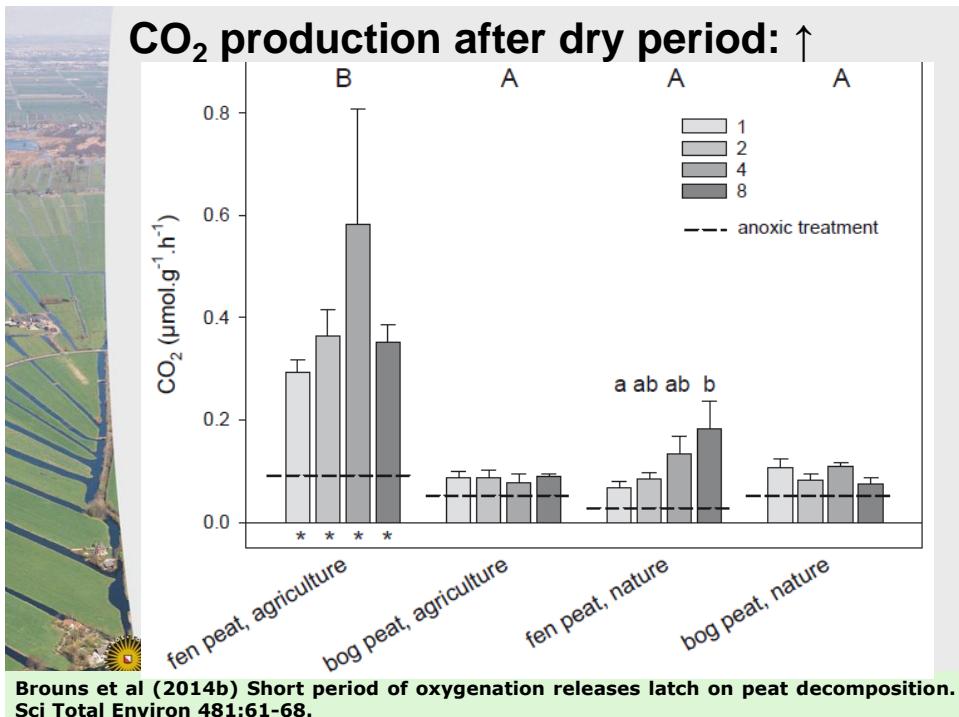


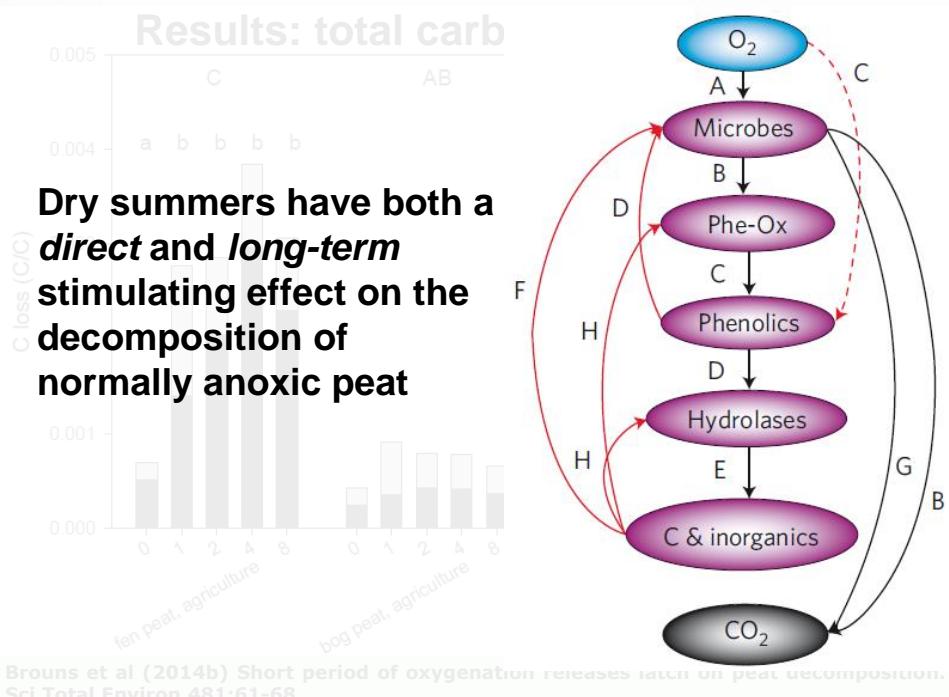


Brouns et al (2014b) Short period of oxygenation releases latch on peat decomposition.
Sci Total Environ 481:61-68.

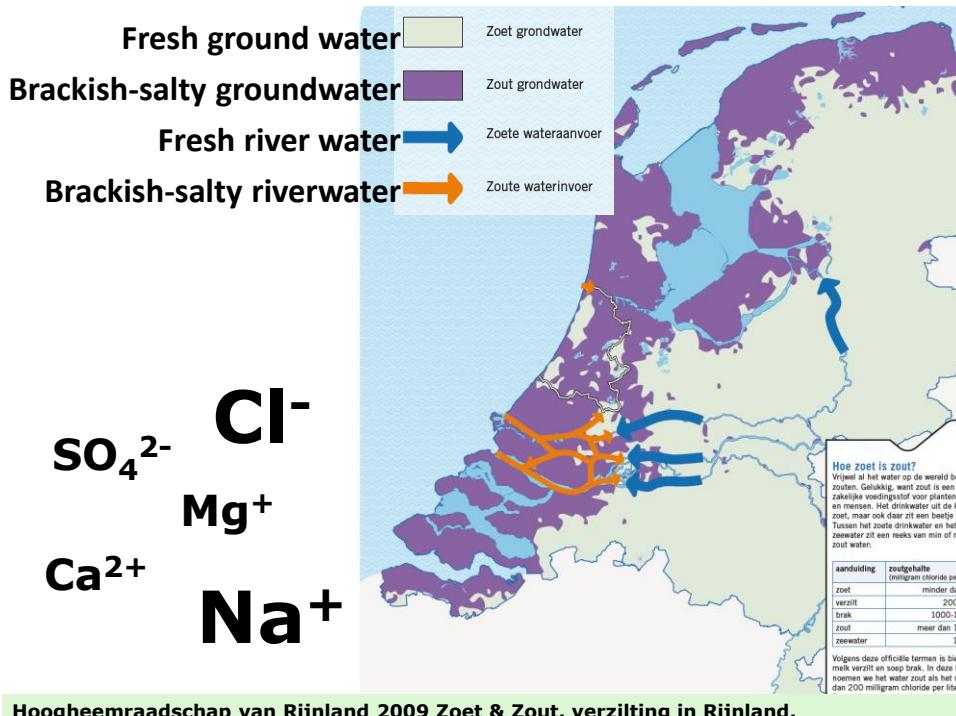


Brouns et al (2014b) Short period of oxygenation releases latch on peat decomposition.
Sci Total Environ 481:61-68.



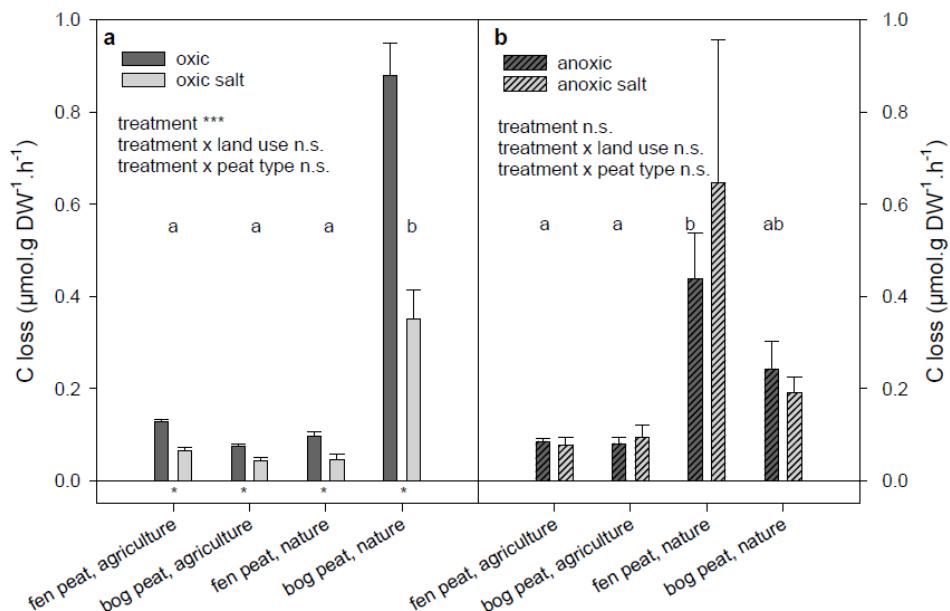


Brouns et al (2014b) Short period of oxygenation releases batch on peat decomposition. Sci Total Environ 481:61-68.





De Louw et al. 2007 Karakterisatie van ondiepe brak-zoute grondwatersystemen in Nederland. Conference 'leven met zout water', 24 sept 2007



Brouns et al 2014a The effects of salinization on aerobic and anaerobic decomposition and mineralization in peat meadows: the roles of peat type and land use. J Environ Manage 143:44-53.



Conclusion

- Summer droughts will stimulate peat decomposition during and after this dry period. Current estimates of the effects of drier summers should be re-evaluated.
- Salinization might hamper the decomposition process although effects can be restricted to very local spots.
- Anaerobic decomposition might contribute more to subsidence than previously thought

Universiteit Utrecht

[Faculty of Science
Biology]



More information:

- Karlijn Brouns en Jos T.A. Verhoeven (2013) Afbraak van veen in veenweidegebieden: effecten van zomerdroogte, verbraking en landgebruik.
Eindrapport van Kennis voor Klimaatproject HSOV01A
- PhD thesis expected in 2015



Stakeholder communication: workshops

- Transfer of information
- Create social basis for changes in land use or drainage depths
- Identifying bottlenecks in current situation
- Exploration of scenario's (climate change scenario's and/or changes in land use or drainage)

Universiteit Utrecht

[Faculty of Science
Biology]



Stakeholder communication: workshops

- Participants: water board, province, municipality, farmers, nature conservationists, recreation, etc.
- Touch table with GIS application
- Assignments to become familiar with touch table, the models and problems

Universiteit Utrecht





Stakeholder communication: workshops

Participant evaluation:

- Knowledge level
 - New insights
 - Involved in decision-making
-
- Tessa Eikelboom (IVM VU Amsterdam)
Thursday DD11.6, 15.45h, Beurs
lounge

Universiteit Utrecht

[Faculty of Science
Biology]

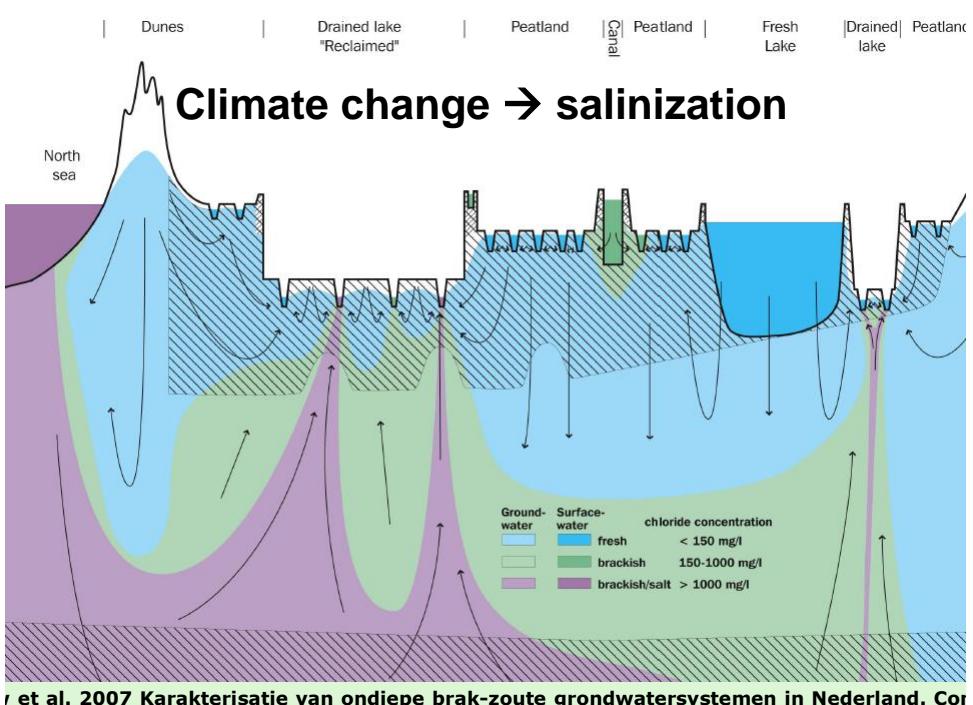
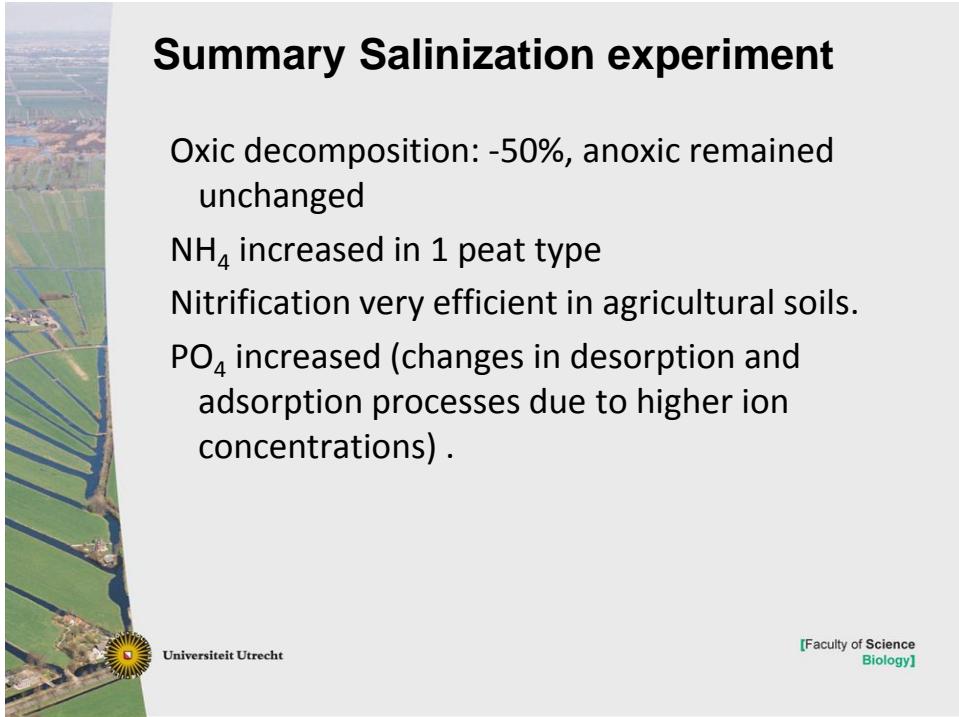


Conclusion

- Summer droughts will stimulate peat decomposition during and after this dry period. Current estimates of the effects of drier summers should be re-evaluated.
- Salinization might hamper the decomposition process although effects can be restricted to very local spots.

Universiteit Utrecht

[Faculty of Science
Biology]





Universiteit Utrecht

[Faculty of Science
Biology]