



Setting and reaching restoration targets for GHG exchange, ecosystem services and biodiversity of peatlands require a landscape ecological approach



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Interreg
Vlaanderen-Nederland



ADMIRE



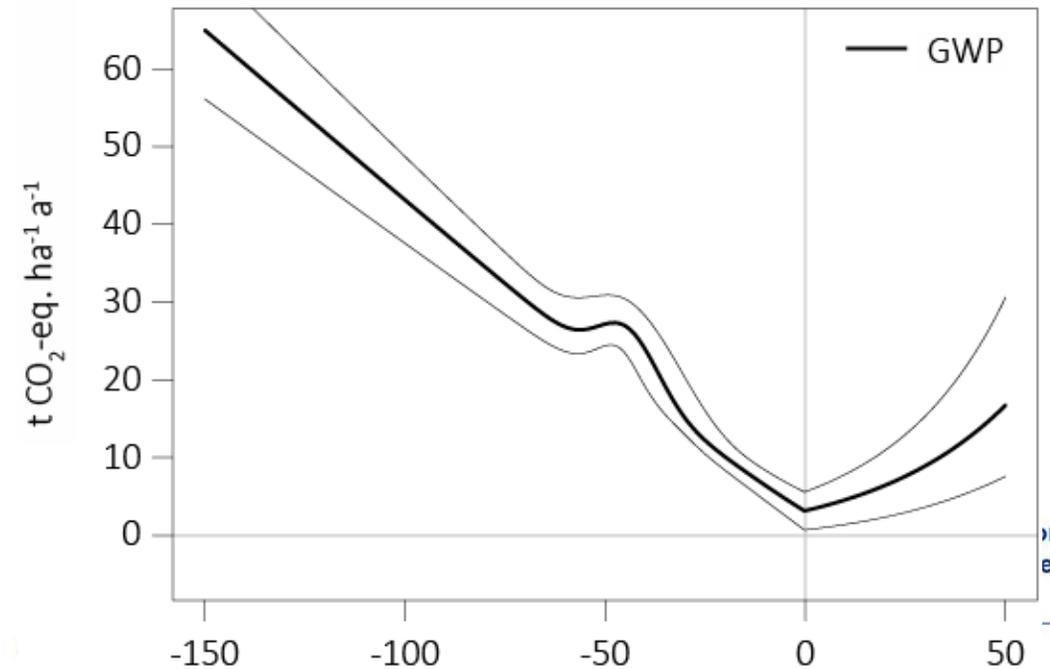
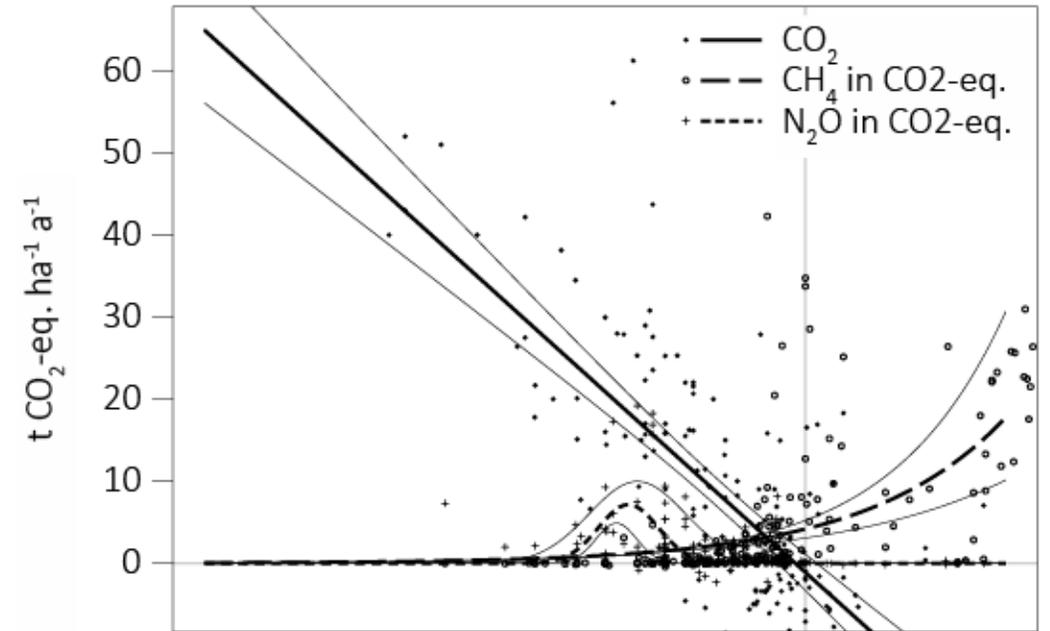
Targets for peatland restoration

- Conservation of peat (archive, C-store), reduction of GHG emission, biodiversity, habitat/ecosystem (Natura 2000), ecosystem services
- Water is key → rewetting of drained peatlands



Relation water table and GHG emission

Jurasinski et al. (2016)



Effects of rewetting on biodiversity

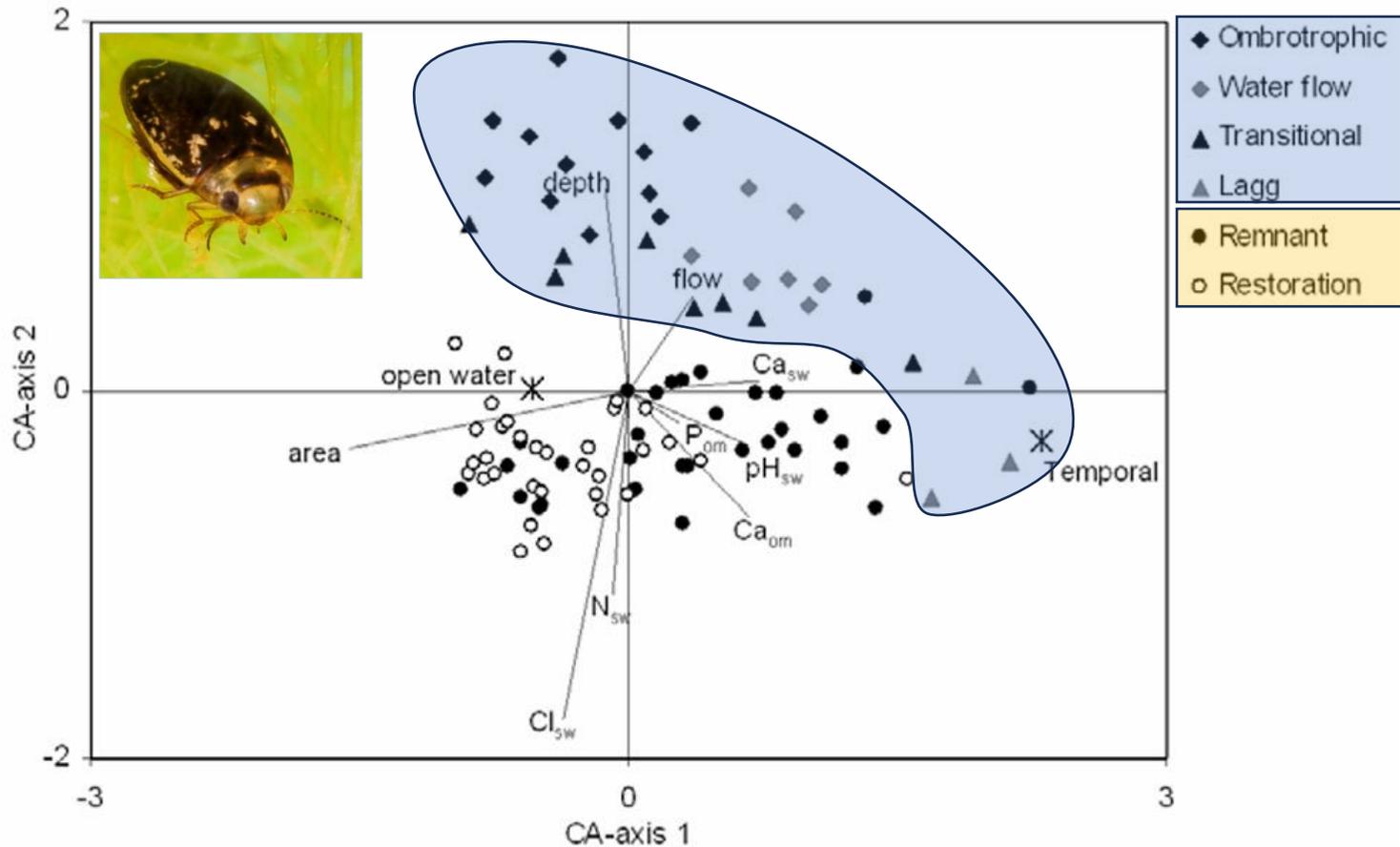
<https://doi.org/10.1038/s41467-021-25619-y>

OPEN

Rewetting does not return drained fen peatlands to their old selves

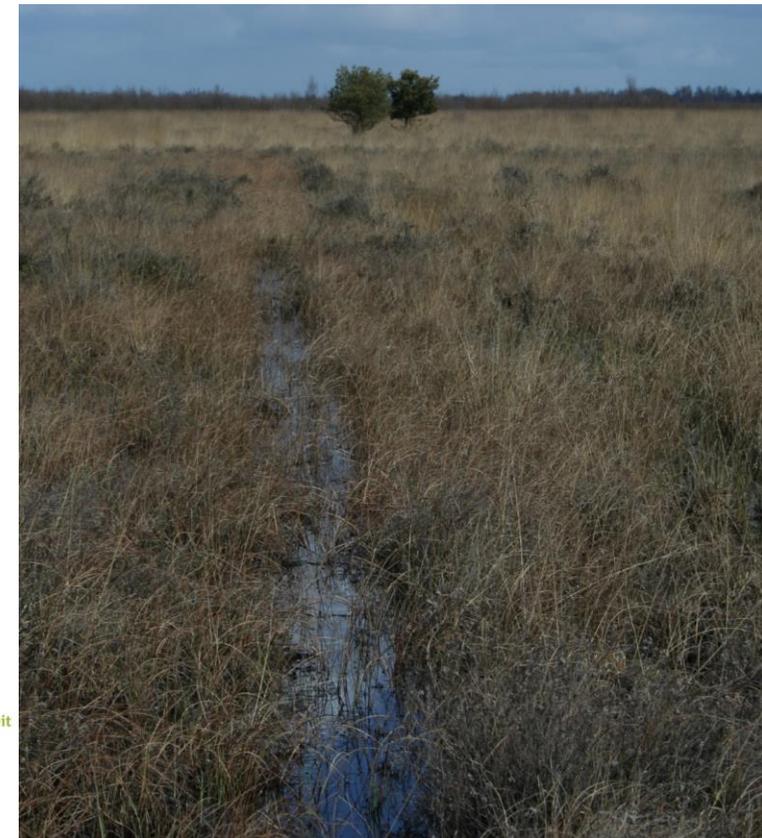
J. Kreyling ^{1✉}, F. Tanneberger ¹, F. Jansen ², S. van der Linden ¹, C. Aggenbach ³, V. Blüml ⁴,
J. Couwenberg ¹, W-J Emsens ⁵, H. Joosten ¹, A. Klimkowska⁵, W. Kotowski⁶, L. Kozub⁶, B. Lennartz ²,
Y. Liczner⁵, H. Liu ², D. Michaelis¹, C. Oehmke¹, K. Parakenings⁷, E. Pleyl⁸, A. Poyda⁹, S. Raabe¹, M. Röhl¹⁰,
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Effects of rewetting on biodiversity

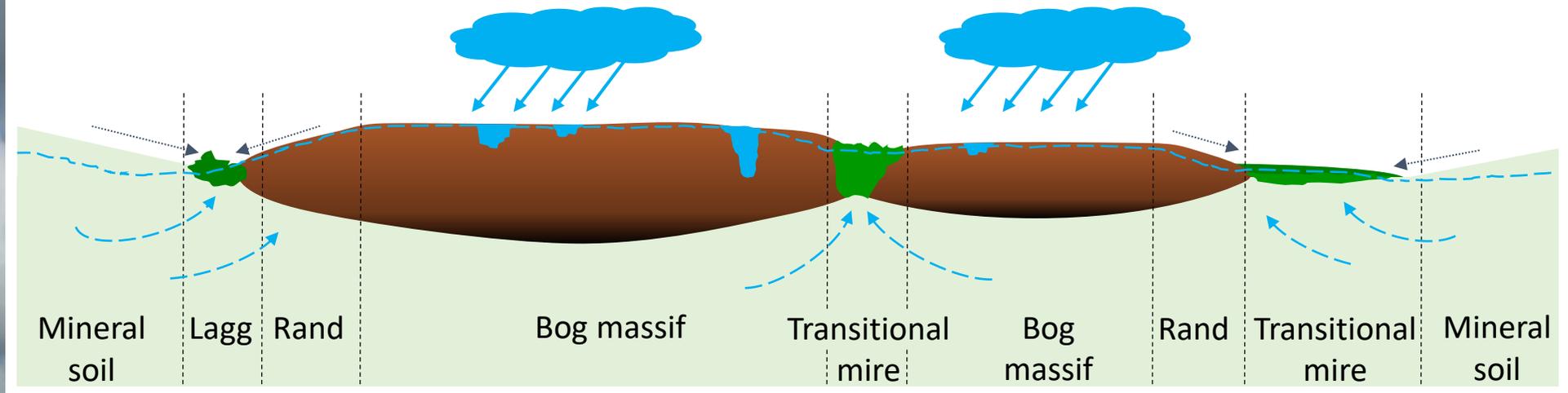


< Raised bog Estonia

< Bog remnants NL



^ Aquatic *macroinvertebrates* (Van Duinen, 2013)



< Fen

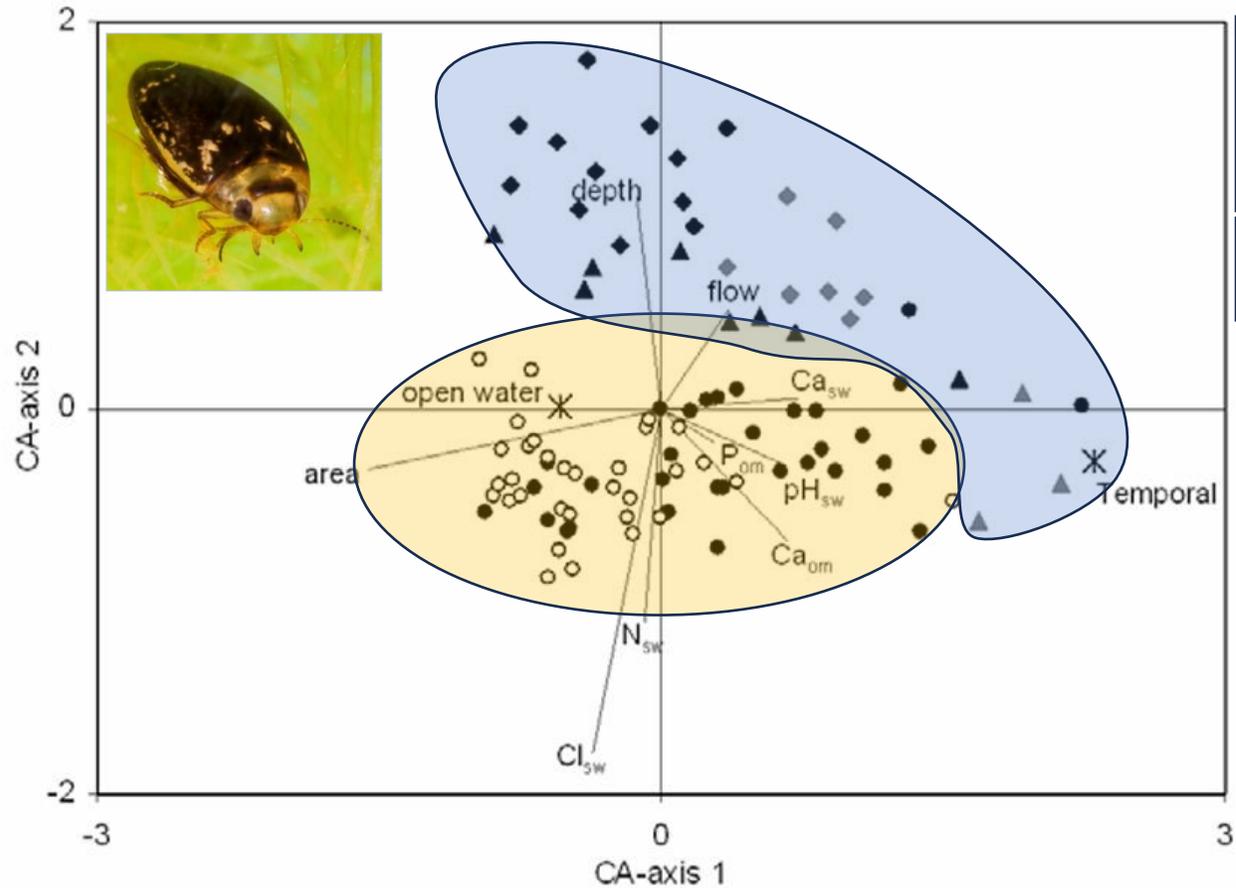
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Transitional mire

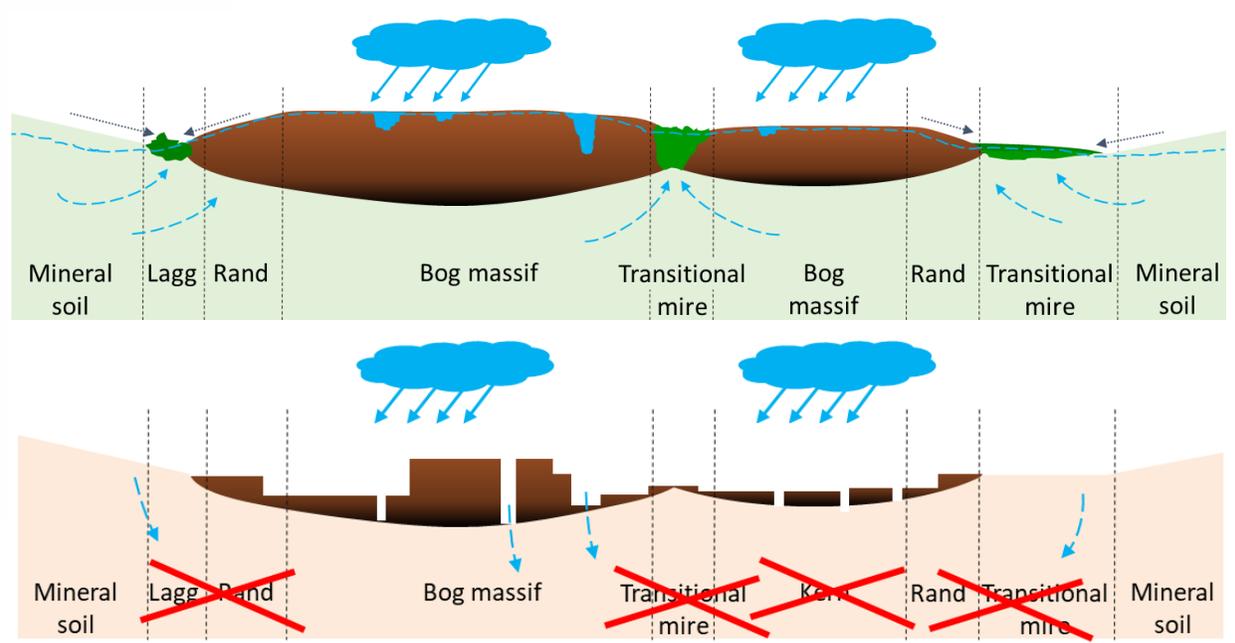
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Raised bog massif >

Effects of rewetting on biodiversity

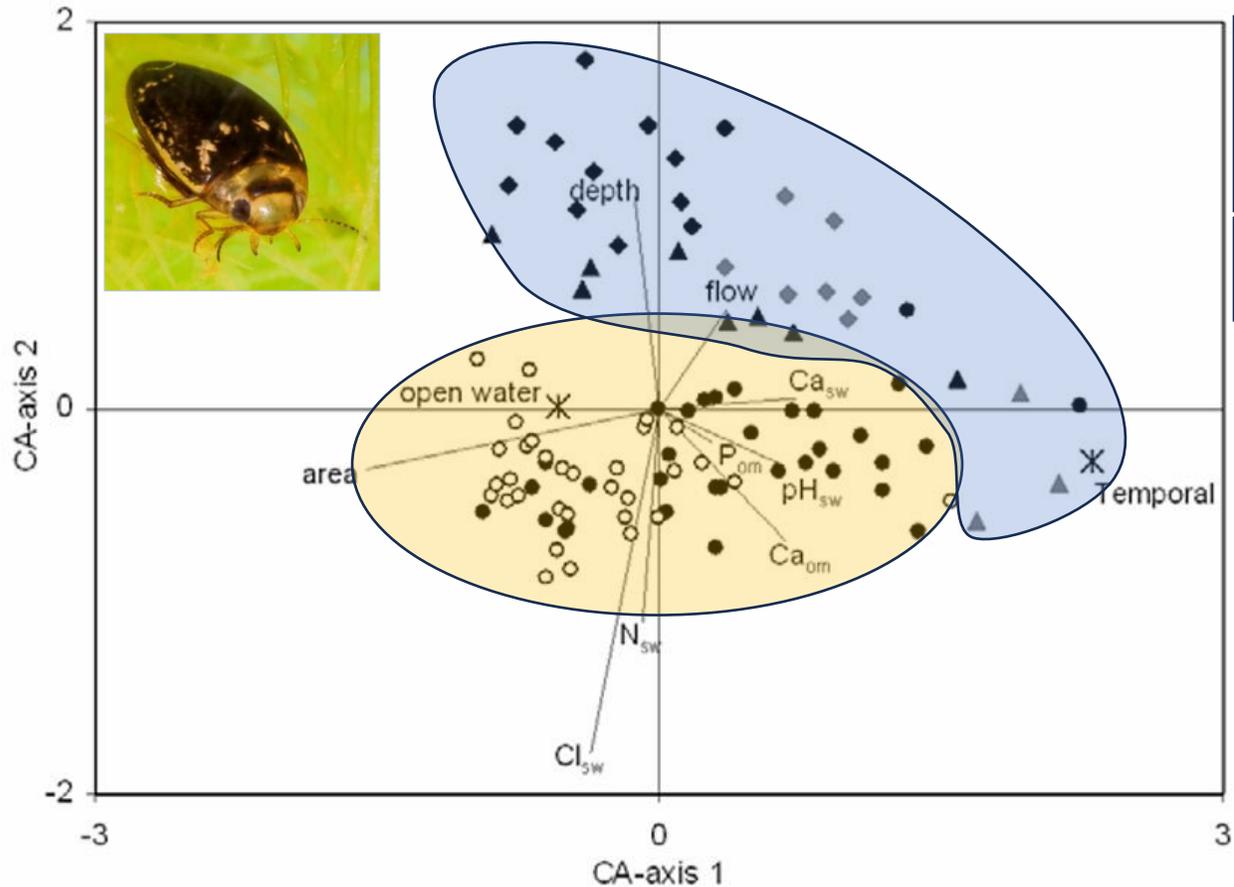


- ◆ Ombrotrophic
 - ◆ Water flow
 - ▲ Transitional
 - ▲ Lagg
- < Raised bog Estonia
- Remnant
 - Restoration
- < Bog remnants NL



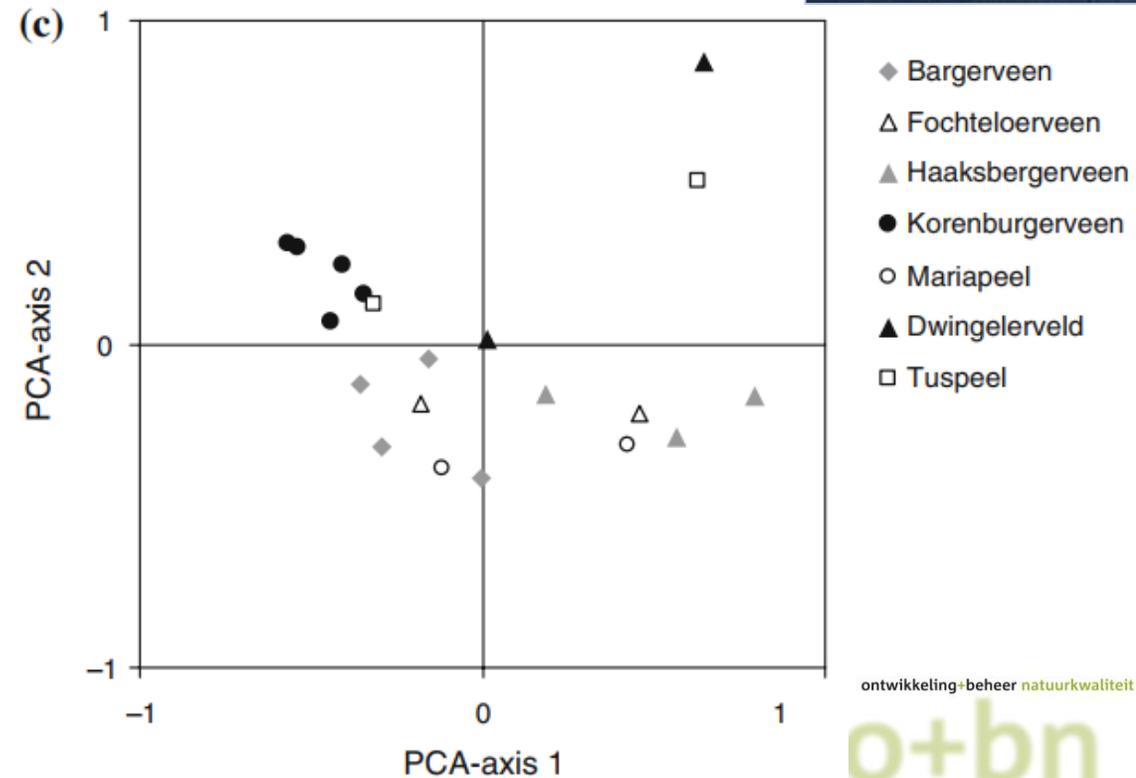
^ Aquatic macroinvertebrates (Van Duinen, 2013)

Effects of rewetting on biodiversity



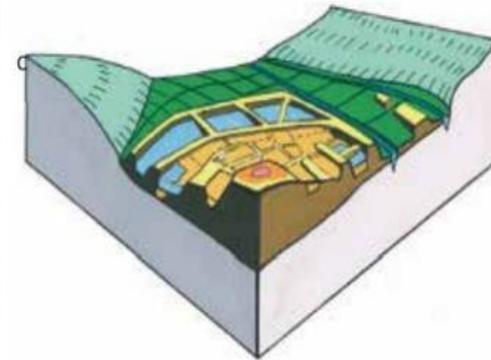
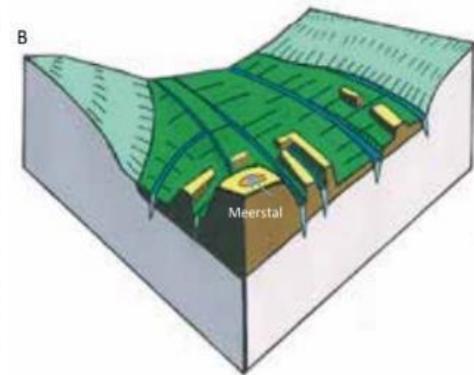
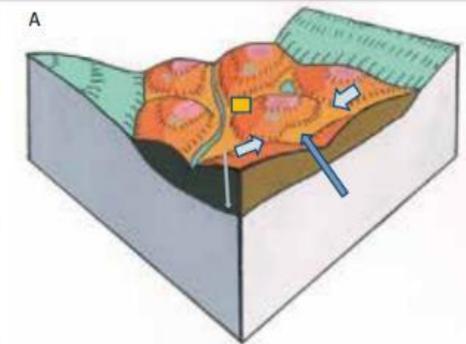
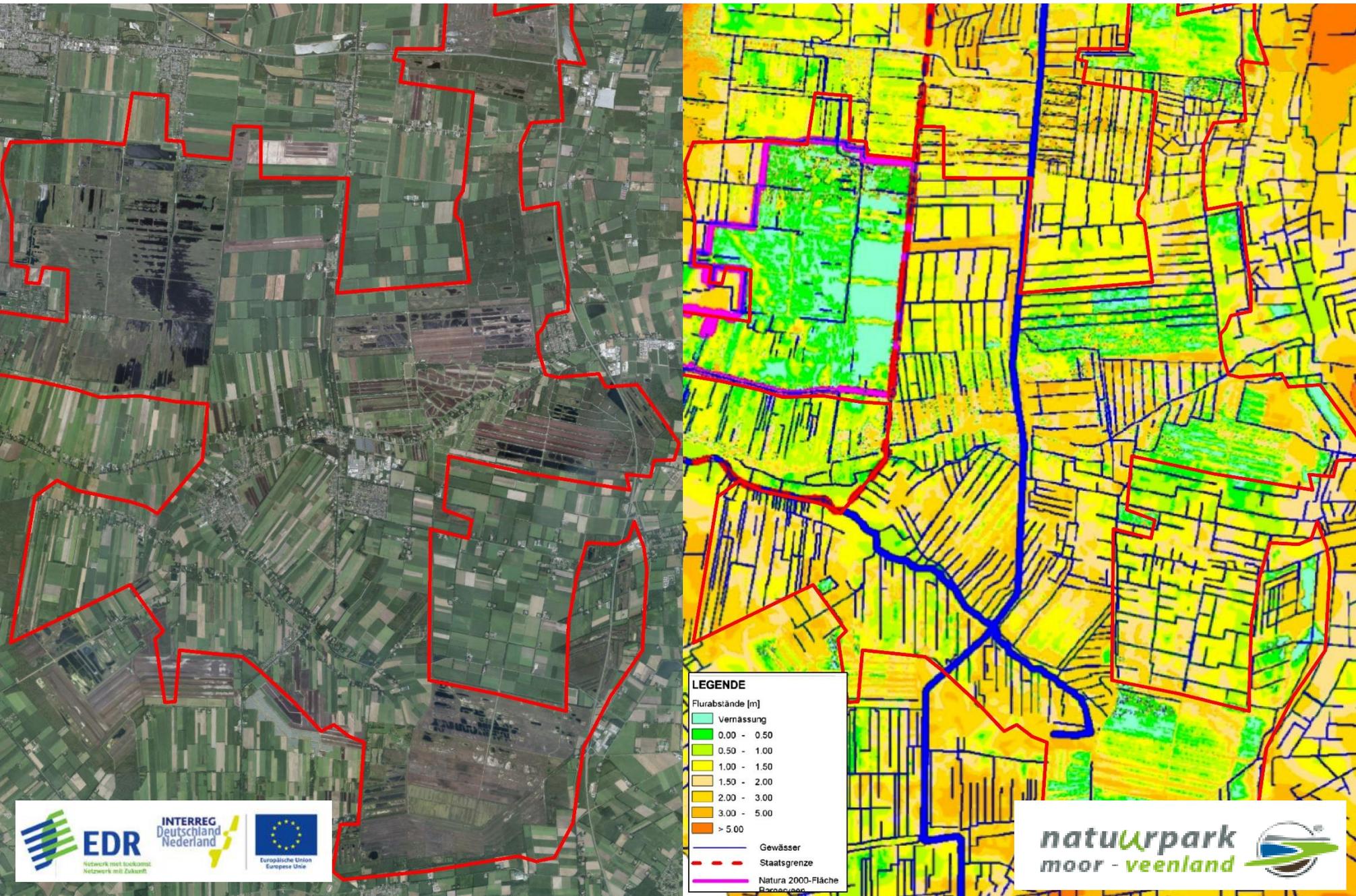
< Raised bog Estonia

< Bog remnants NL



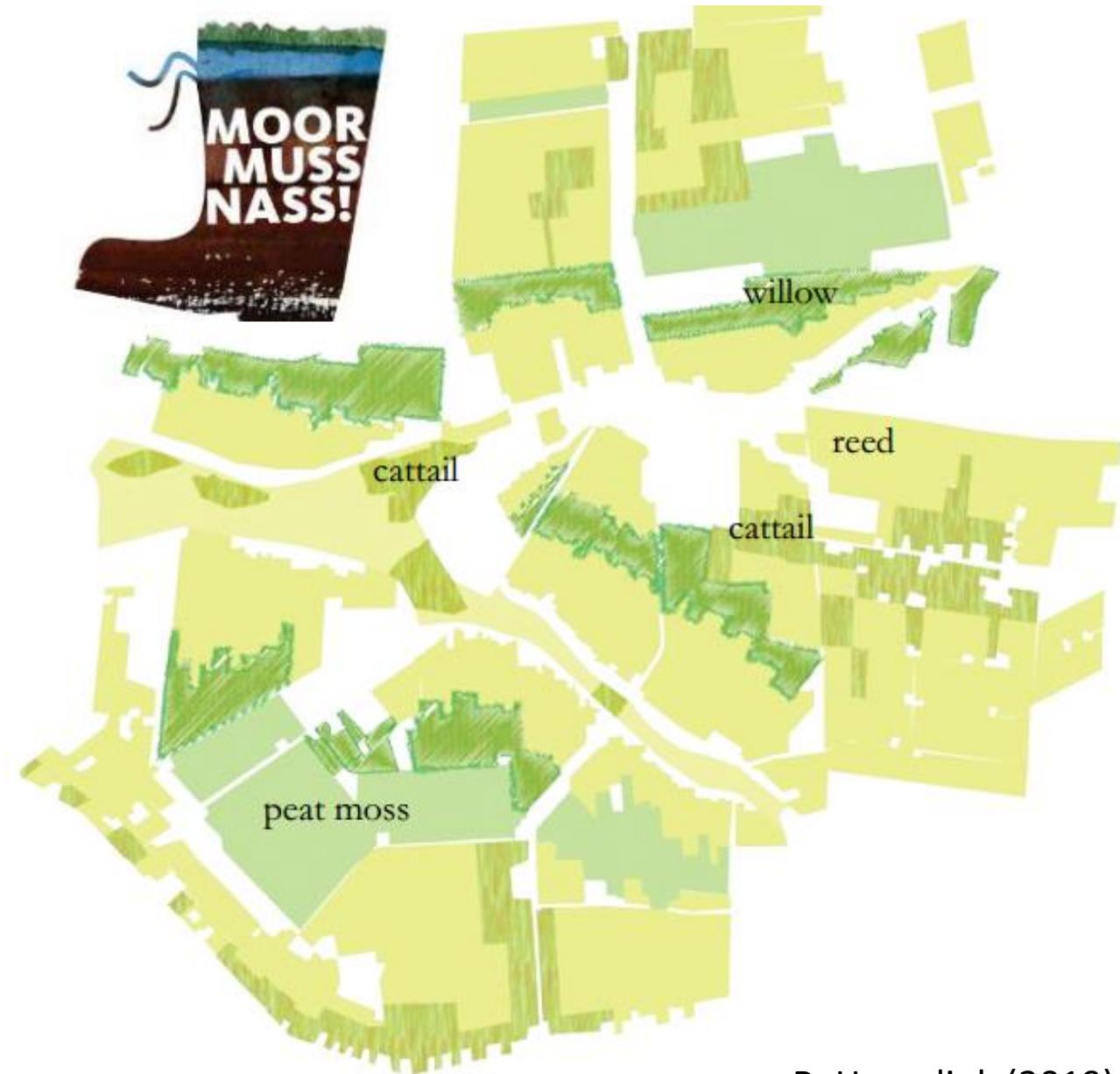
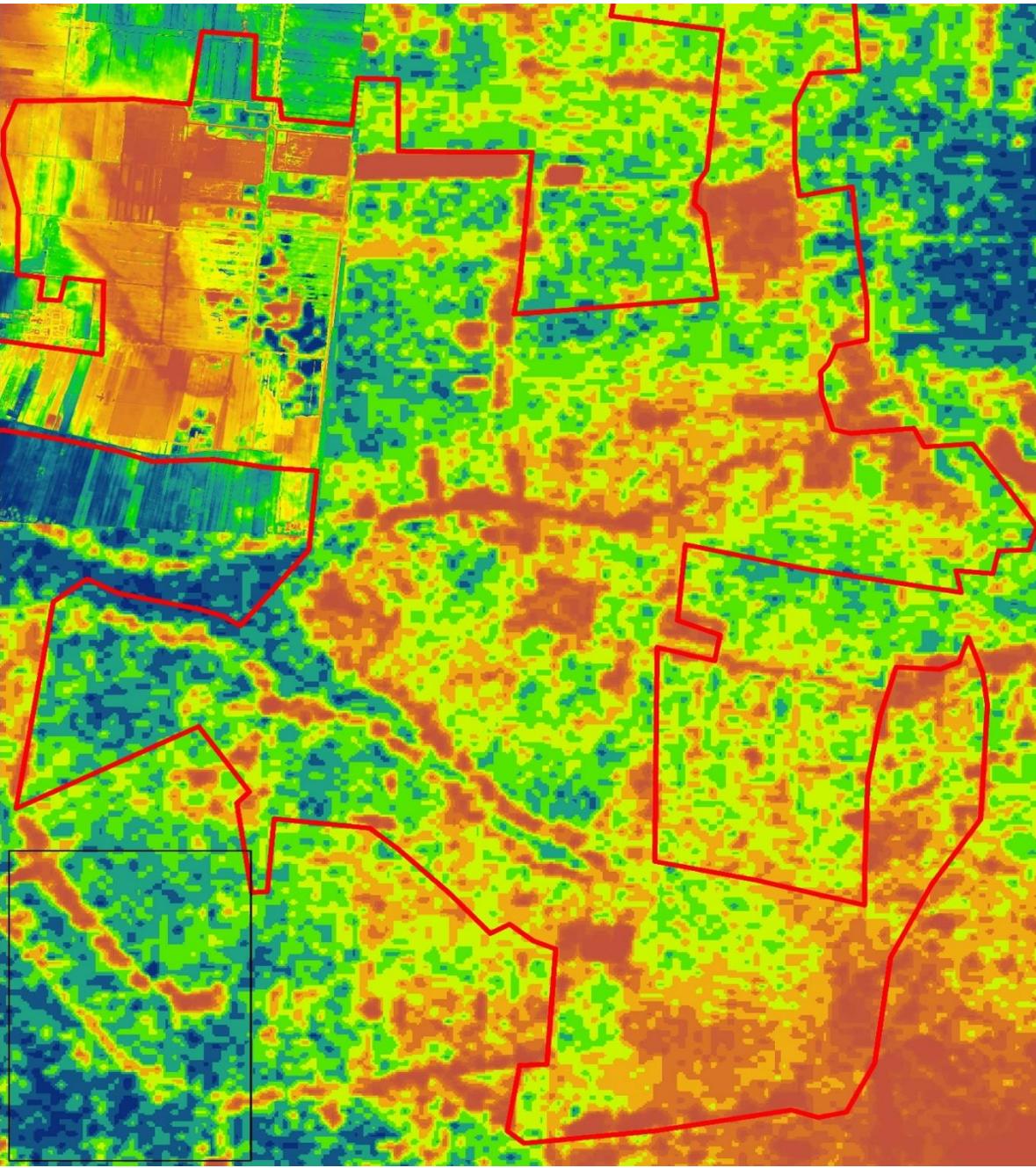
^ Aquatic *macroinvertebrates* (Van Duinen, 2013)
 Aquatic *microinvertebrates* (Van Duinen et al., 2006) >

Bargerveen – Emsland (border NL-DE)



Drawing: Ab Grootjans

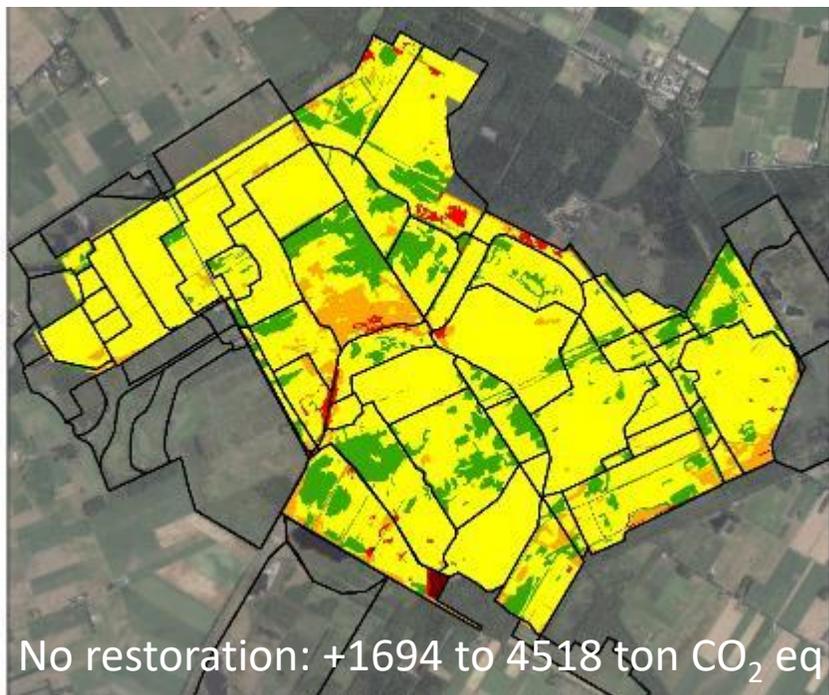
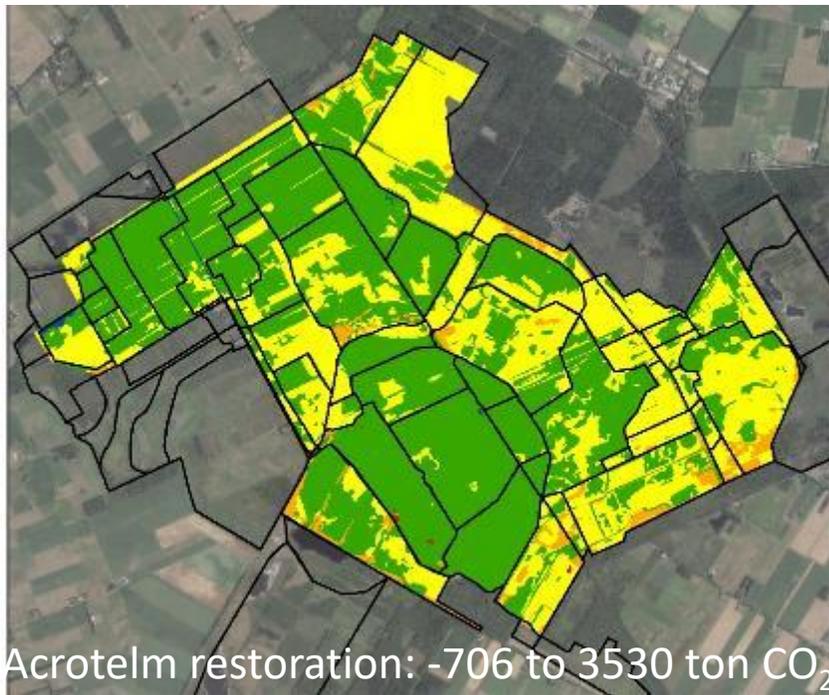
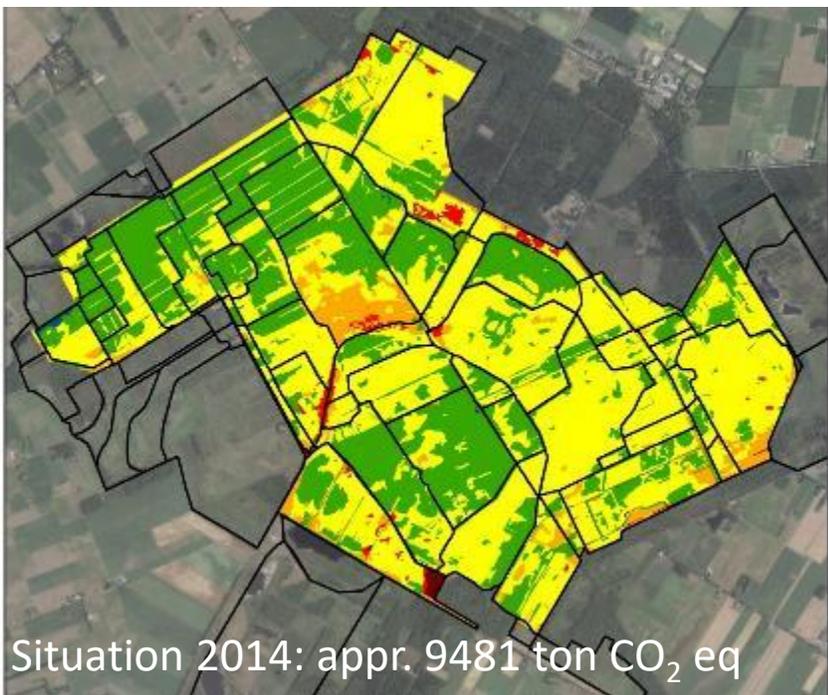
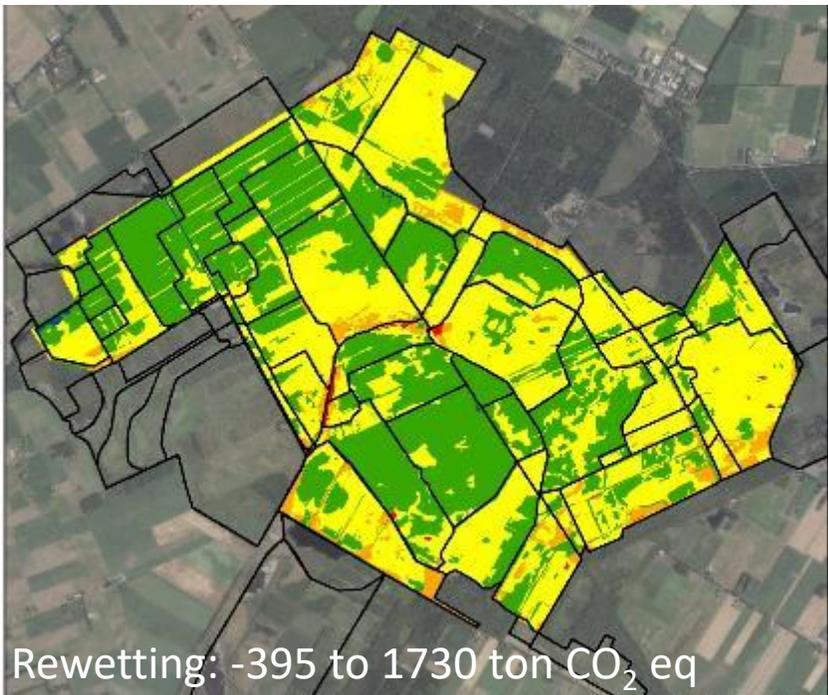
Bargerveen – Emsland (border NL-DE)



R. Hesselink (2019)
Land use: cattail, reed, willow and peat moss

Fochteloërveen (NL) scenarios

GEST approach (Couwenberg et al. 2011)



GHG emission
in t CO₂.eq.ha-1.a-1
Fochteloërveen 2014

Legenda

GWP

	-1 - 0
	0,01 - 5
	5,01 - 10
	10,01 - 15
	15,01 - 20
	20,01 - 30
	Compartimenten

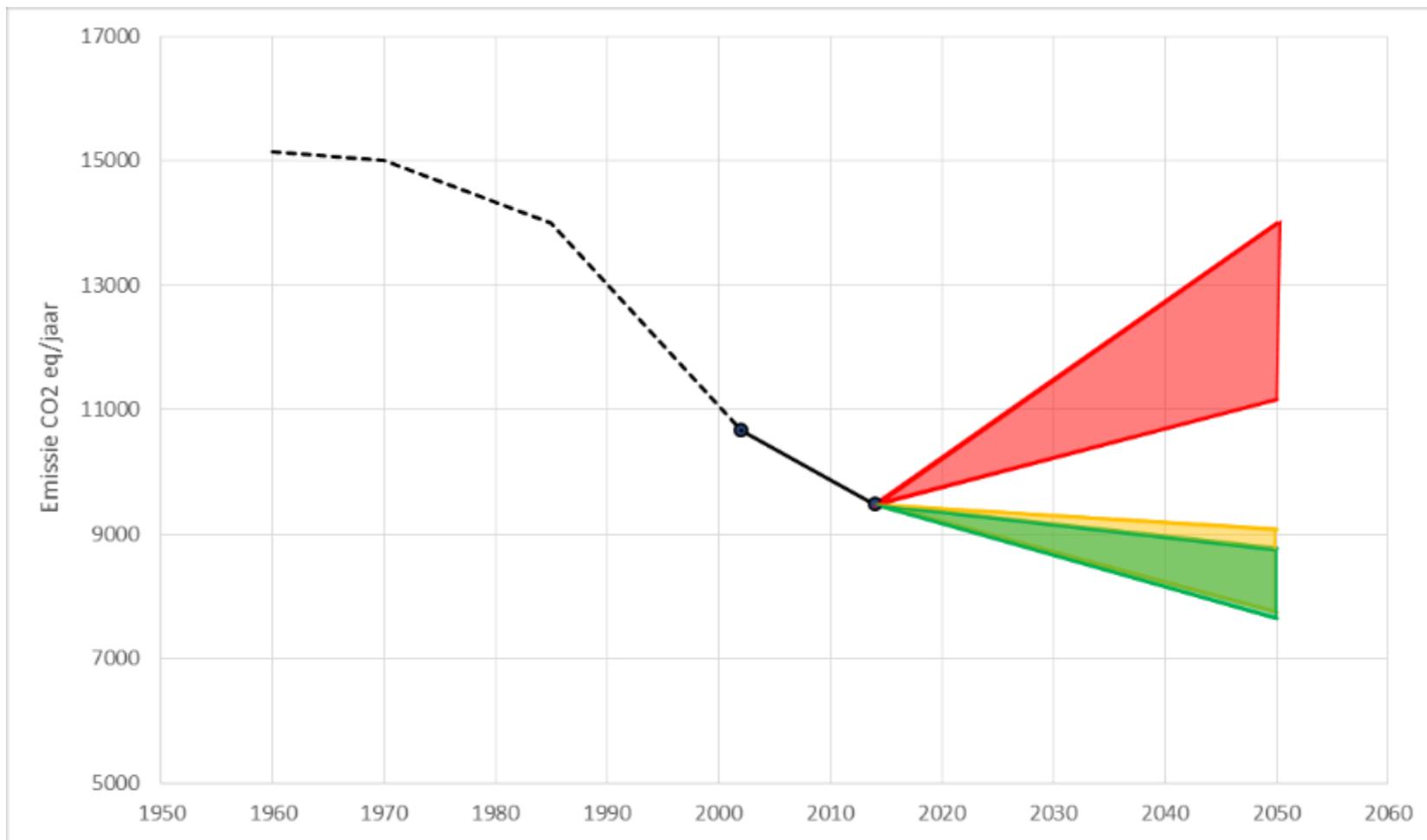
0 375 750 1.125 1.500 Meters

Schaal: 1:30.000

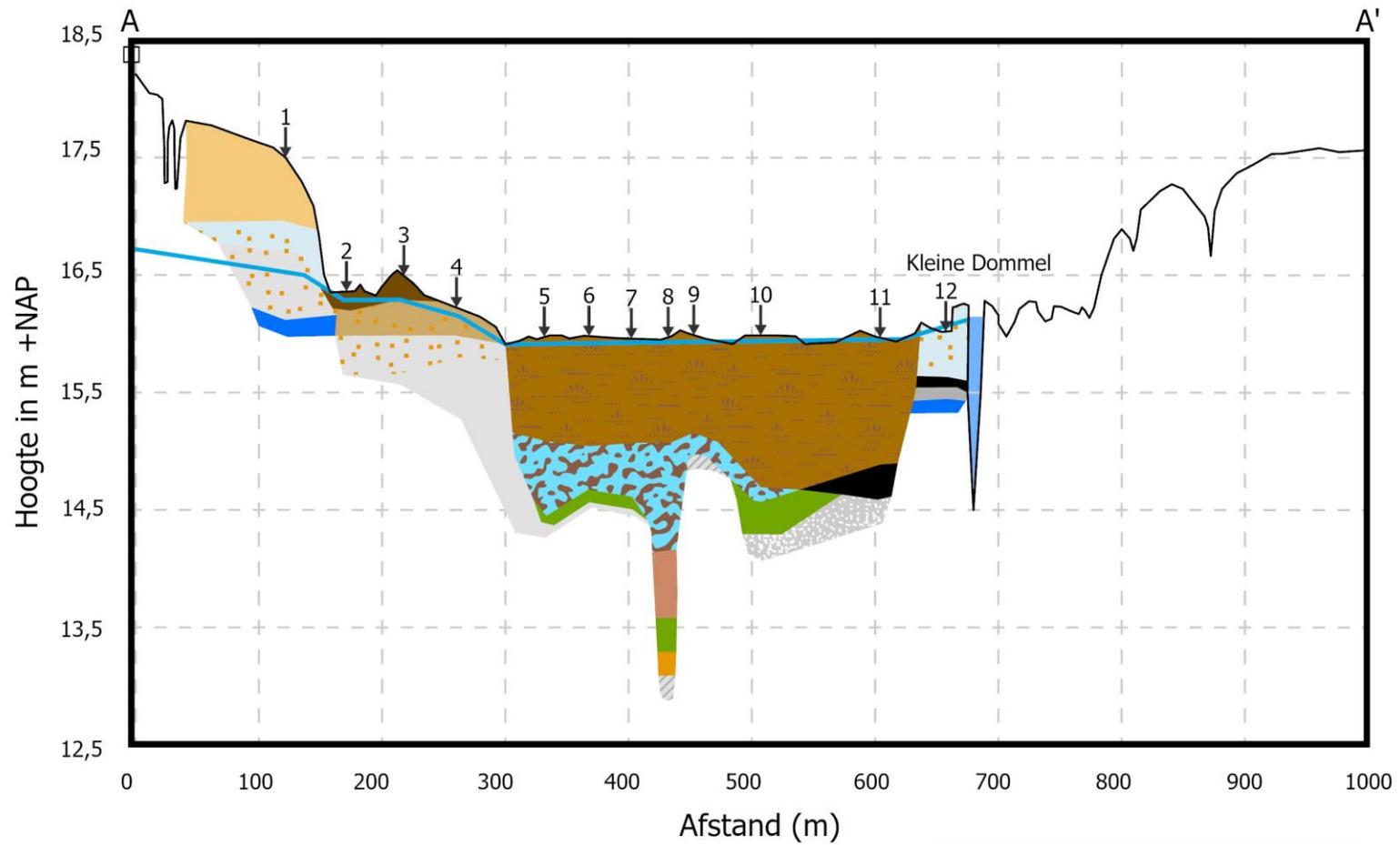
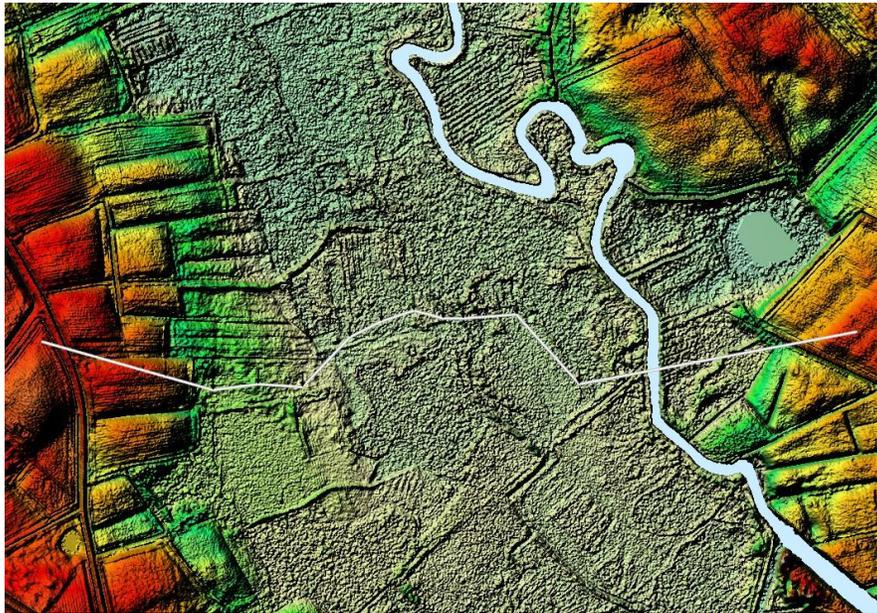
Achtergrond: Dienst voor het kadaster en openbare registers, Apeldoorn. ESRI Nederland

Result GEST approach: 3 scenarios for future developments

From: Fritz & Van Duinen 2020

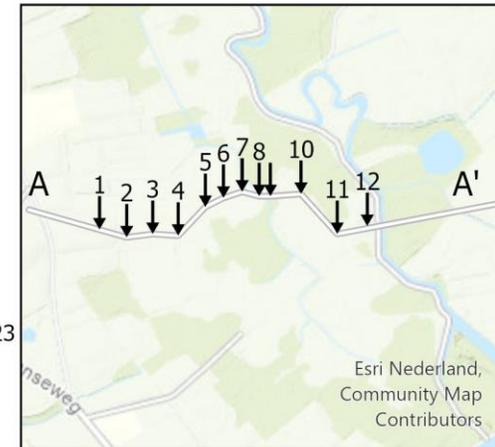


Urkhovense Zegge (NL)



Legenda

- | | | |
|---------------------|---------------------------|---------------------------------|
| Gley | H7 Bruinmos-zeggeveen | Leem |
| Fijn zand | H7-H10 veen | Lemig fijn zand |
| Grof zand | Humeus tot moerig zand | Water/Slurrie |
| Grof zand, grindjes | Humeus zand | Zand, lemige en moerige bandjes |
| Gytija | Kragge van riet-zeggeveen | Boringen |
| H10 veen | | Grondwater 16-10-2023 |
| H5 Bruinmosveen | | |



GEST-approach baseline Urkhovense Zegge (NL)

GWP 621 t CO₂ eq



45 ha

Legend

- Fme2
- Fme3
- Fme4
- Fme5
- Fo2
- G1
- G2
- G3
- G3m
- G4s
- G5
- G5s
- S13
- U11
- U12
- U15
- U3
- U4
- U9

0 0.5 1 2 km

GWP 870 t CO₂ eq

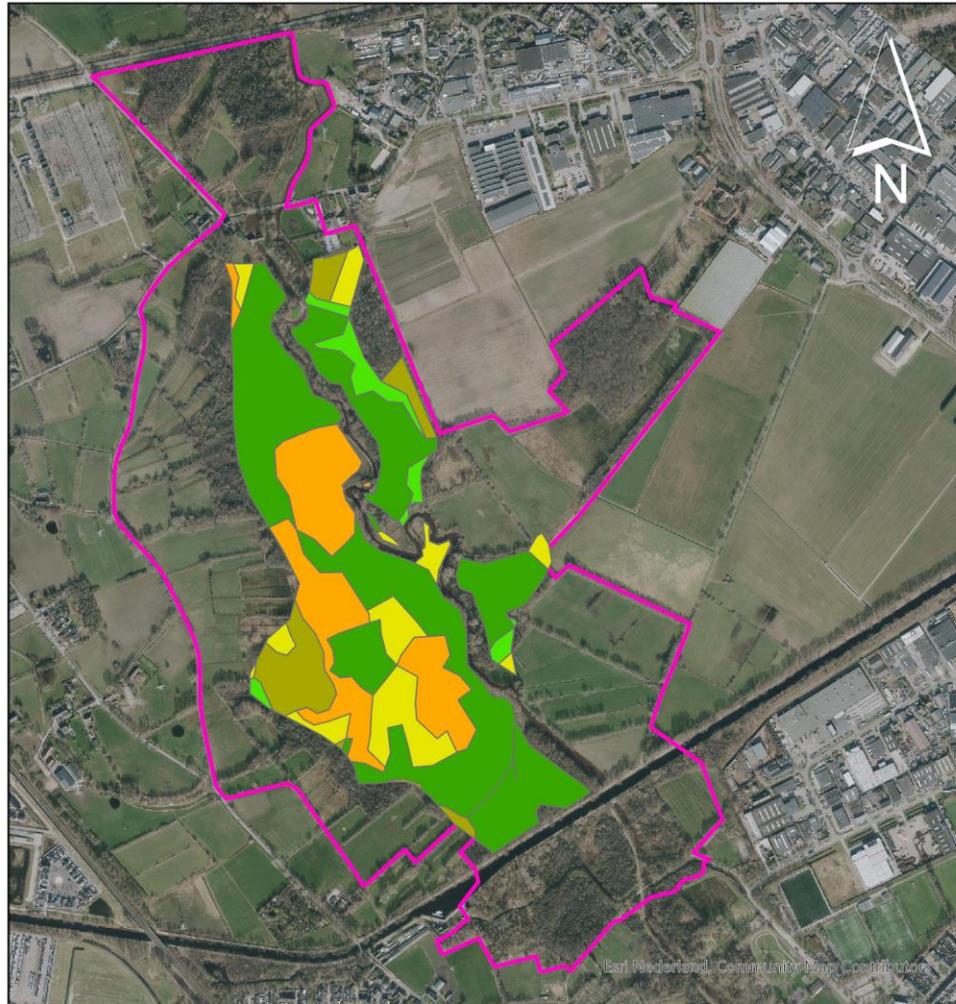


Legend

- Fme1
- Fme2
- Fme3
- Fme4
- Fo1
- G1
- G1v
- G2
- G3s
- G4
- G4s
- S13
- U11
- U2
- U4
- U6
- U8

0 0.5 1 2 km

GEST-approach wet scenario Urkhovense Zegge



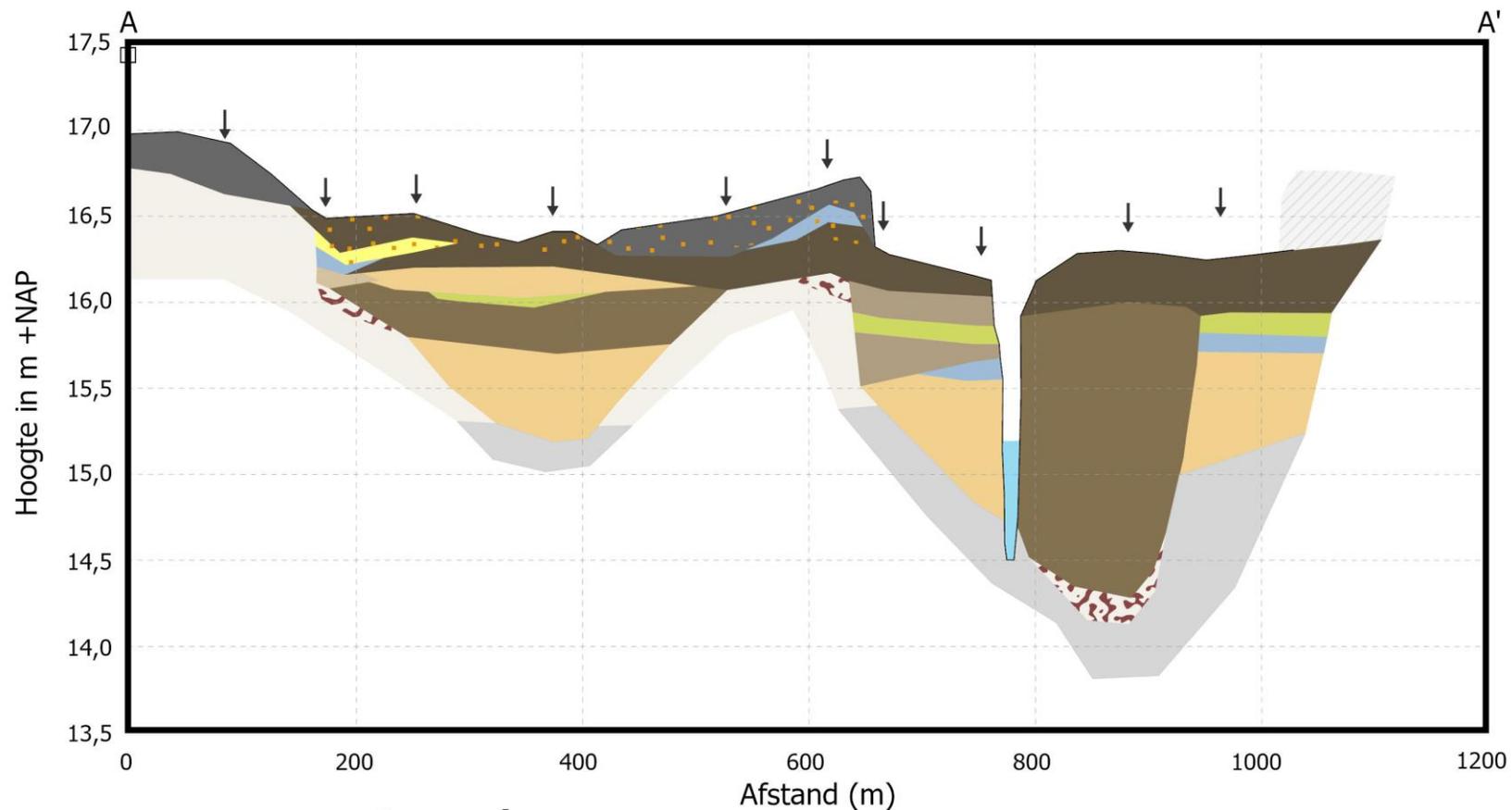
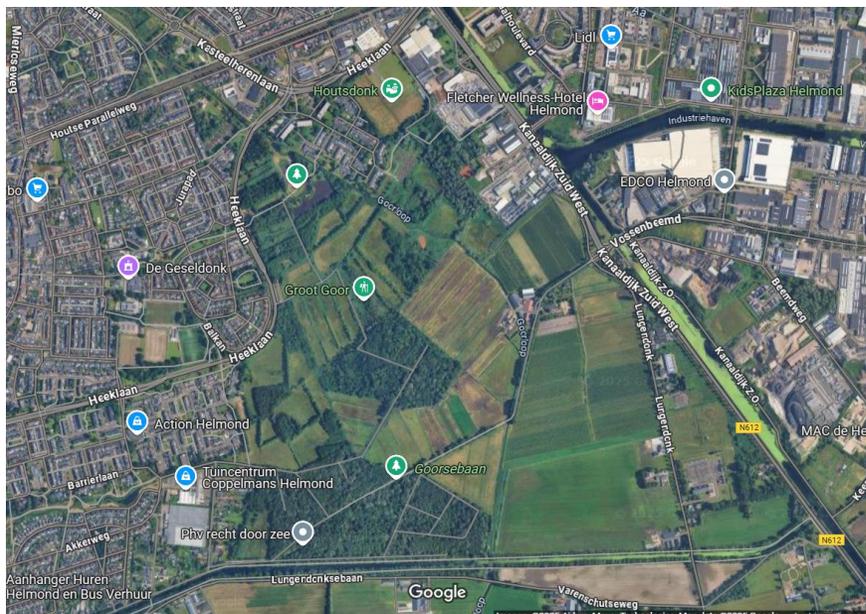
Legend

- Fme4
- Fme5
- G4
- G4s
- G5s
- U12
- U9

Type	Area (ha)	GWP (t CO ₂ eq)
F	25	148
G	9	25
U	9	39
Total	45	213

0 0.5 1 2 km

Groot Goor (Helmond, NL)



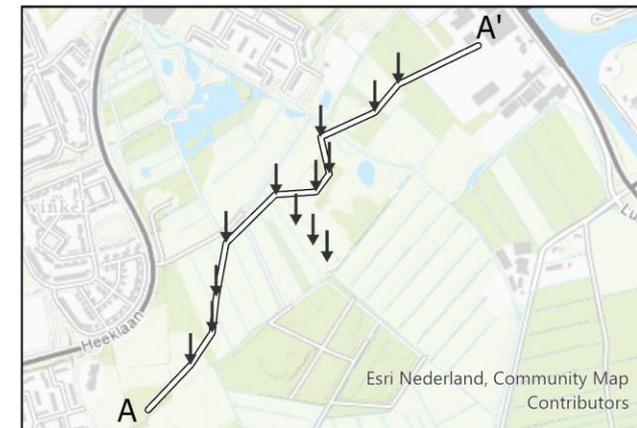
Legenda

Beschrijving

- Lebermudde
- Leem
- Veen (H4-5), zegge-bruinmos
- Veen (H6-7), zegge
- Veen (H8), zegge-broek

- Veen (H8-9), broek-zegge
- Veen (H9-10)
- Vergraven grond
- Zand, (matig) grof
- Zand, fijn
- Zand, houtresten

- Zand, humeus
- Zand, oranje
- Gemiddeld peil (15,25 m+NAP)
- Goorloop (15,25 m+NAP)
- Ijzeroer
- Boringen

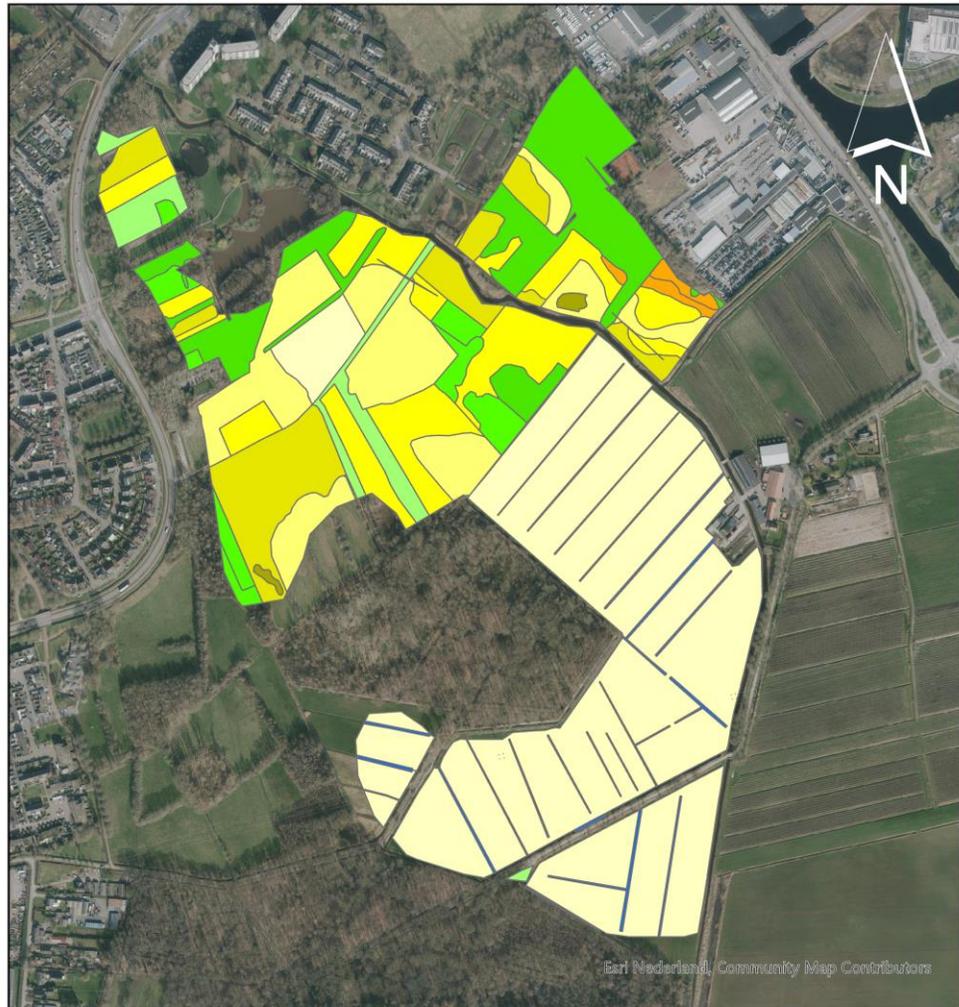


Baseline Groot Goor (Helmond, NL)

GWP 958 t CO₂ eq

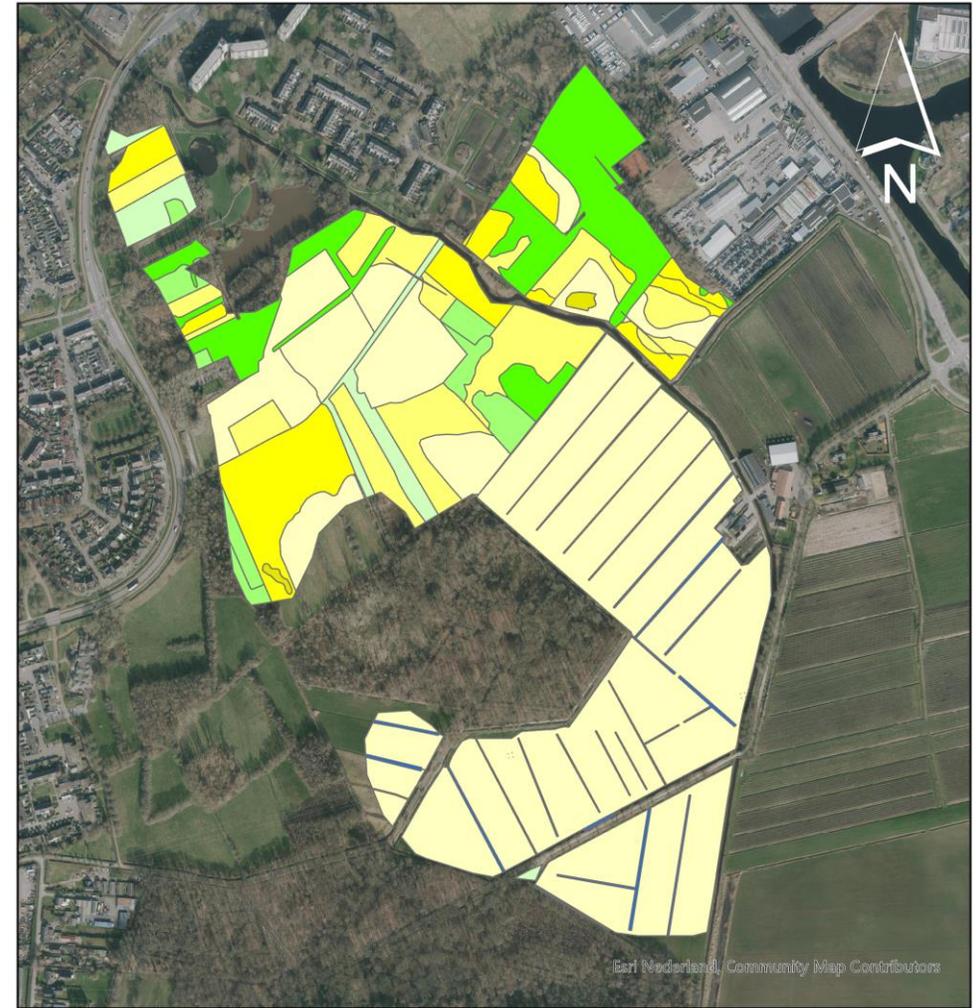
47 ha

GWP 1590 t CO₂ eq



Legend

- Fme2
- Fme3
- Fme4
- Fo2
- G1
- G2
- G3
- G4
- G4s
- G5
- S13
- U11



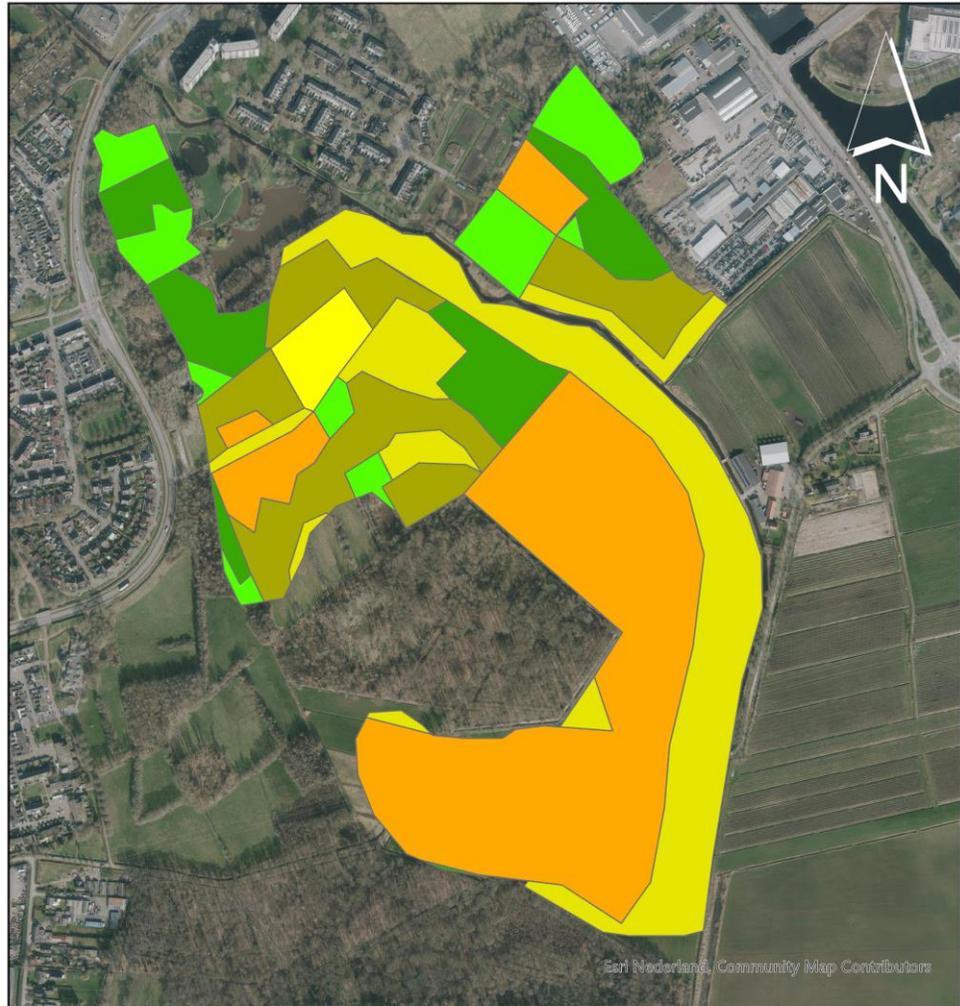
Legend

- Fme1
- Fme2
- Fme3
- Fo1
- G1
- G1v
- G2
- G3
- G3f
- G3s
- G4
- S13

0 0.3 0.6 1.2 km

0 0.3 0.6 1.2 km

Wet scenario Groot Goor (Helmond, NL)



Legend

- Fme3
- Fme5
- G3
- G4s
- G5s
- U9

Type	Area (ha)	GWP (t CO ₂ eq)
F	10	103
G	21	97
U	18	-9
Total	50	191

0 0.3 0.6 1.2 km

Setting and reaching restoration targets for GHG exchange, ecosystem services and biodiversity of peatlands require a landscape ecological approach

- More than just water...
- Setting realistic targets for specific sites: understanding key processes, functional relations/feed-back mechanisms in specific peatland types, species traits/responses, landscape ecological setting, limits to ecosystem restoration due to degradation, former and current land use and climate change
- Crucial in the process of drafting effective restoration strategies for peatlands