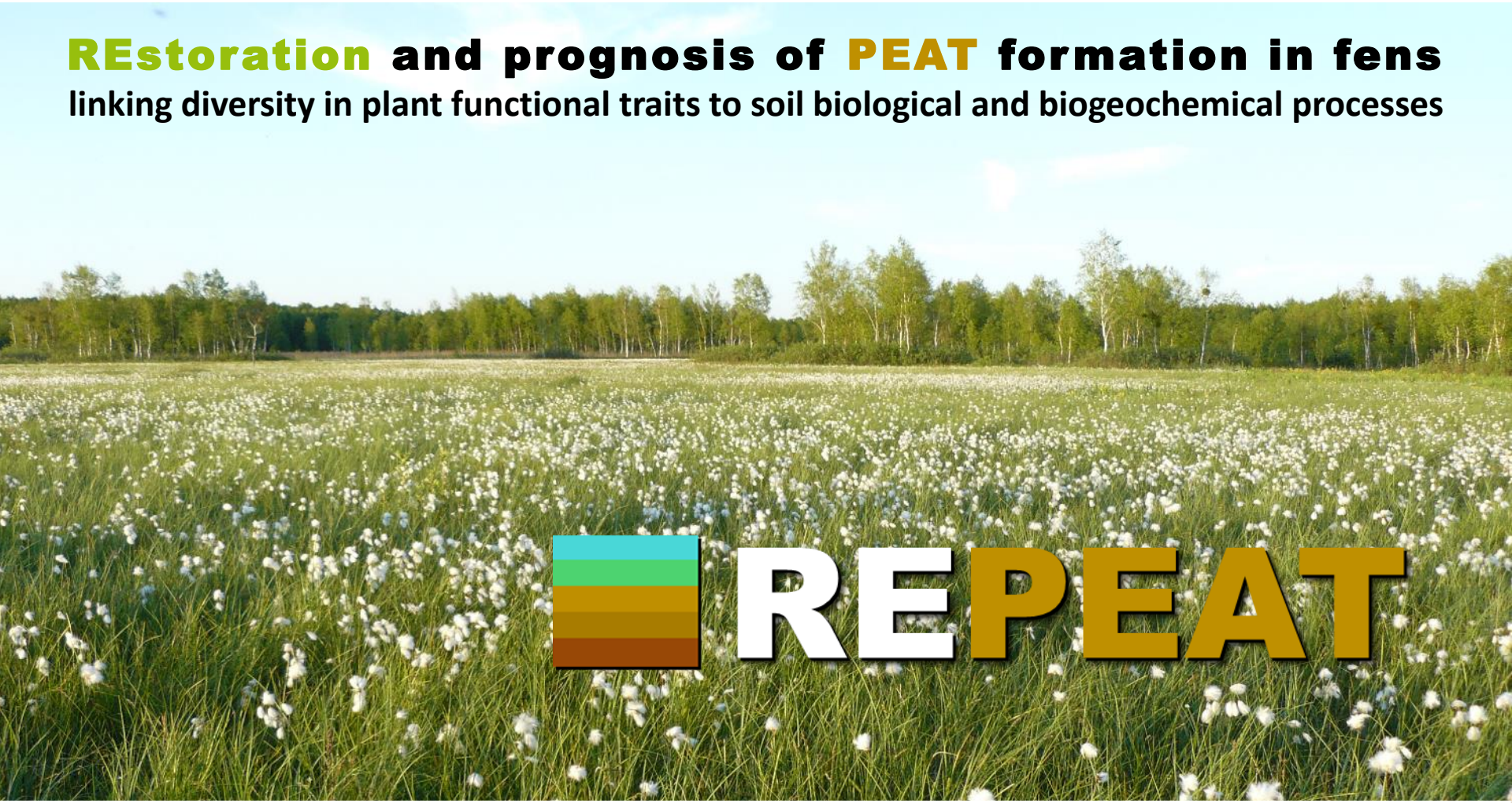
REstoration and prognosis of PEAT formation in fens

linking diversity in plant functional traits to soil biological and biogeochemical processes



Co-ordination: Wiktor Kotowski
w.kotowski@uw.edu.pl
University of Warsaw


Our question

How do environmental factors and human management interact with soil biodiversity in determining rates of peat accumulation in undrained and rewetted fens?

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6 countries, 3 field studies

Country:	TRIPLET STUDY	TRANSECT STUDY	MOWING STUDY
Wales	1 x 3 sites		
Belgium	2 x 3 sites		
Netherlands	1 x 3 sites		1 x 2 sites
Germany	3 x 3 sites		2 x 2 sites
Poland	3 x 3 sites	7 x 5 sites	1 x 2 sites
Romania		1 x 5 sites	

TRIPLET = Undrained – Drained - Rewetted
TRANSECT = variation in natural fens
MOWING = pairs of mown and unmown fields

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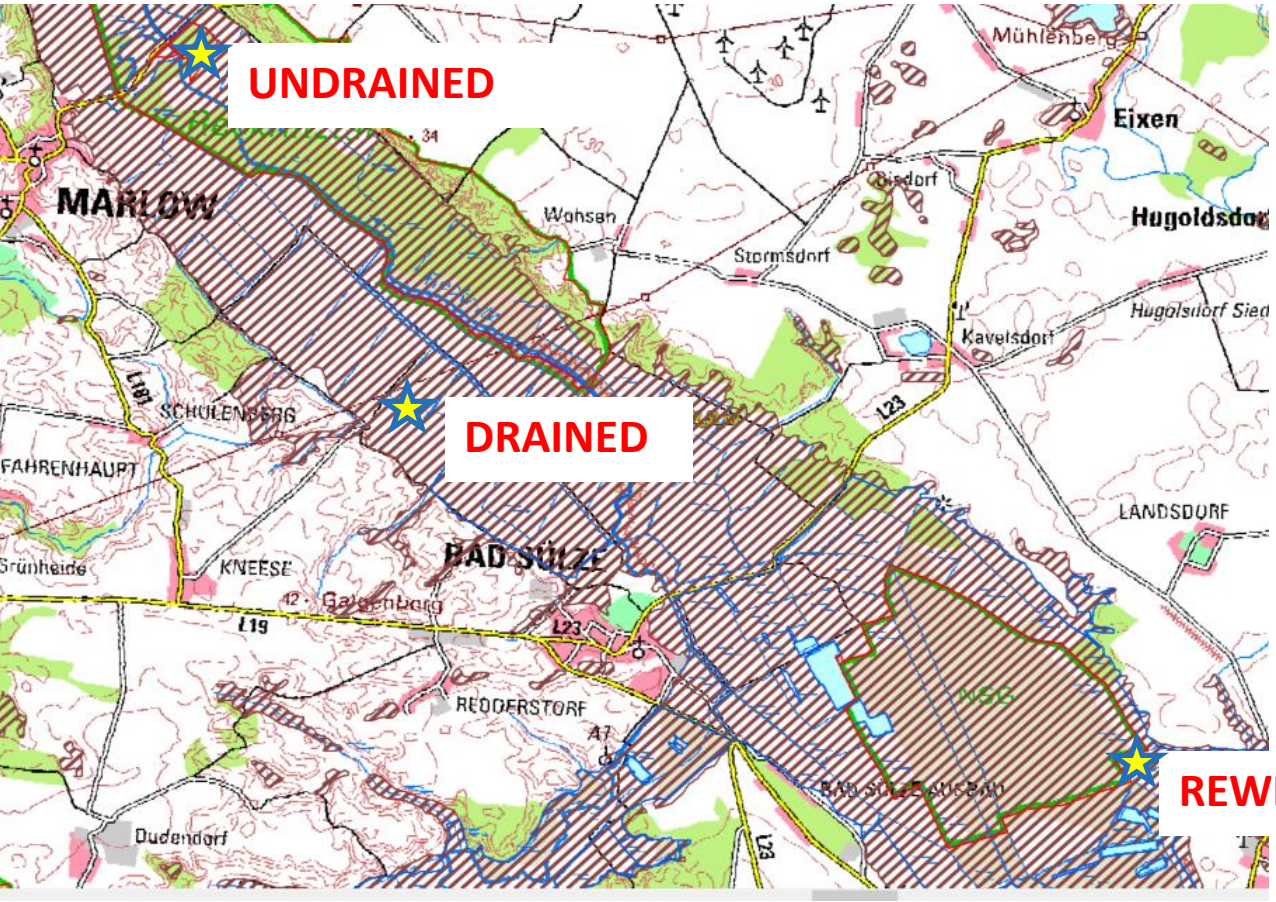
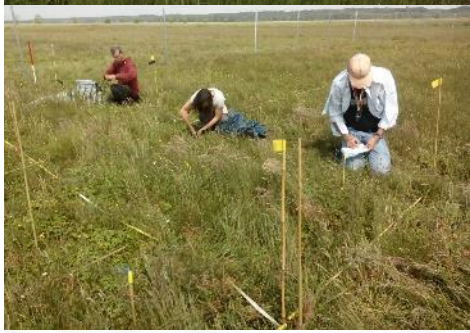
TRIPLET STUDY: does rewetting work?





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Transect study: what drives peat accumulation in fens?

REPEAT includes the least degraded fens of the EU, e.g. Rospuda mire in NE Poland

REPEAT

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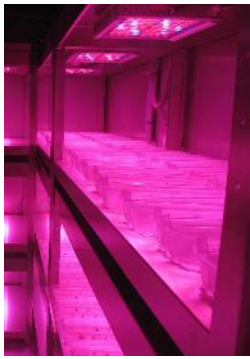
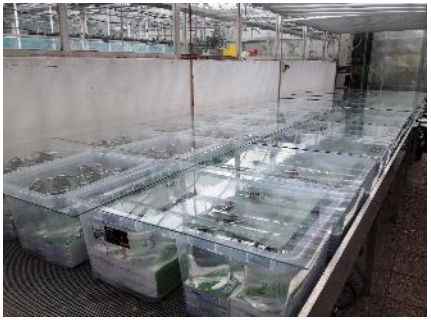
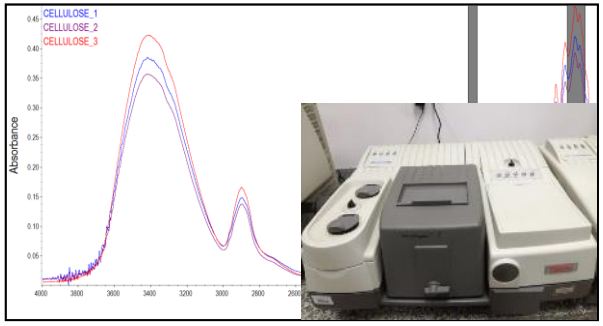
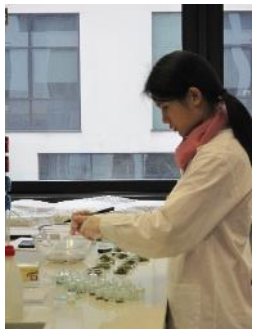
Our methods









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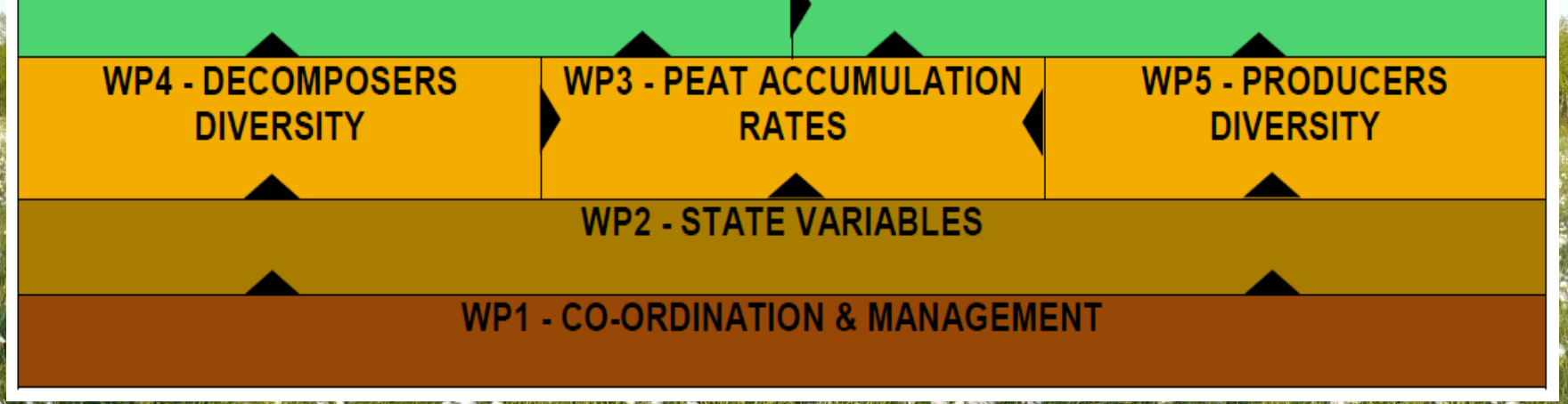
Project structure



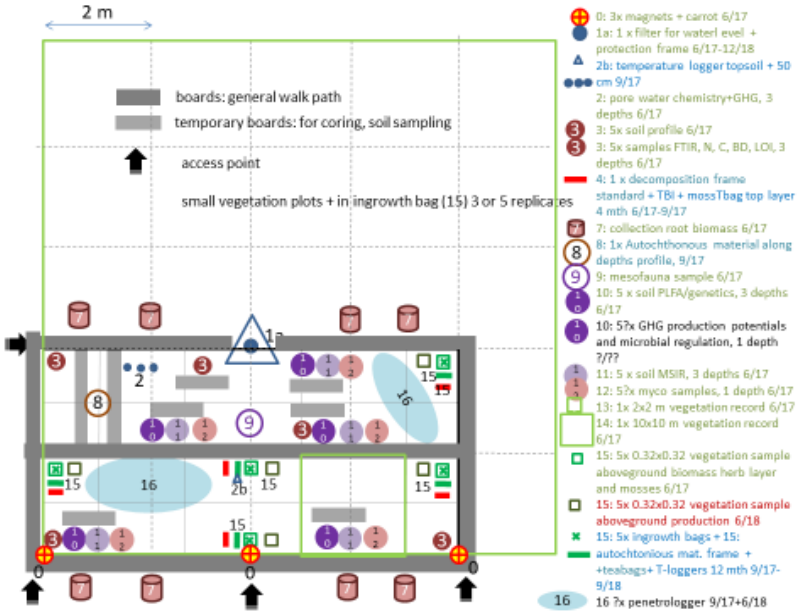
Methods & selected results

WP LEADER
R. V Diggelen
UA

WP2: STATE VARIABLES

hydrology | hydrochemistry | greenhouse gasses | peat decomposibility | Nutrients stoichiometry | management

C. Aggenbach (UA) J. Hangau (DDRI) Ł. Kozub (UW) H. Silvenoinen (NIBIO) G. Li (UW) E. Pronin (UW) Ł. Kozub (UW) F. Tanneberger (UG)



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WP LEADER
H. Joosten
UG

WP3: PEAT ACCUMULATION RATES

SUBRECENT PEAT FORMATION

PRODUCTION RATES

DECOMPOSITION RATES

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Below-ground production (1 yr)

Ingrowth cores (0-50 cm), 3 per plot,
Filled with sand/granulate (tested)

Moss production (1 yr)

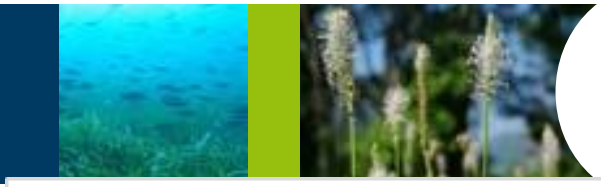
In-situ transplants of all dominants
5 replicates per plot.

Below-ground decomposition (1 yr)

Litter bag sets (0-50 cm), 3 per plot,
Incubation of local roots and standards

Above-ground decomposition (1 yr)

Litter bag sets (0 cm), 3 per plot,
Incubation of mosses & leaf litter




➢ Primary production in undrained fens

Production shifts from mosses & roots to shoots along fen riverine zonation

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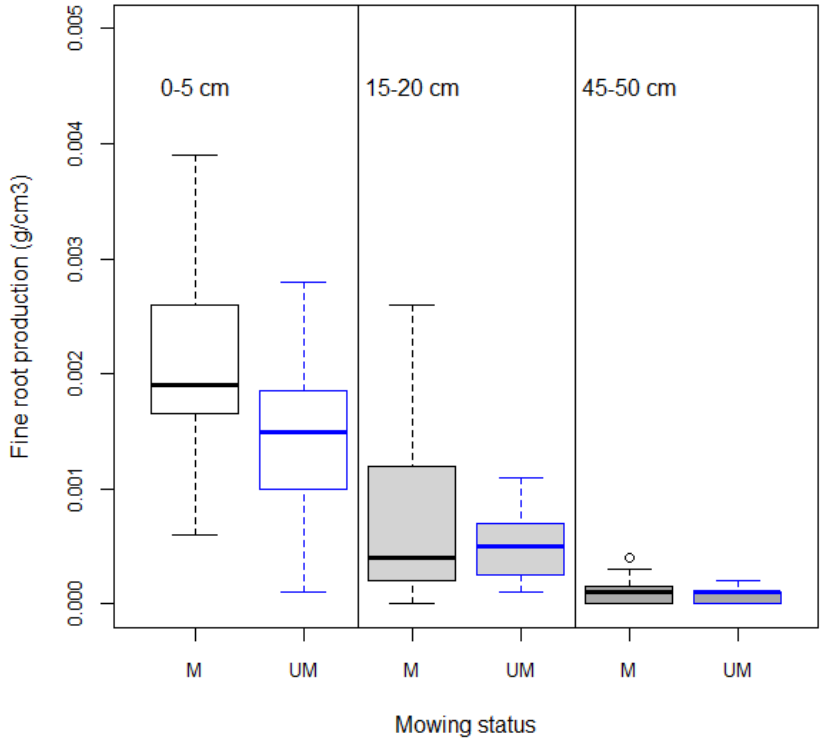
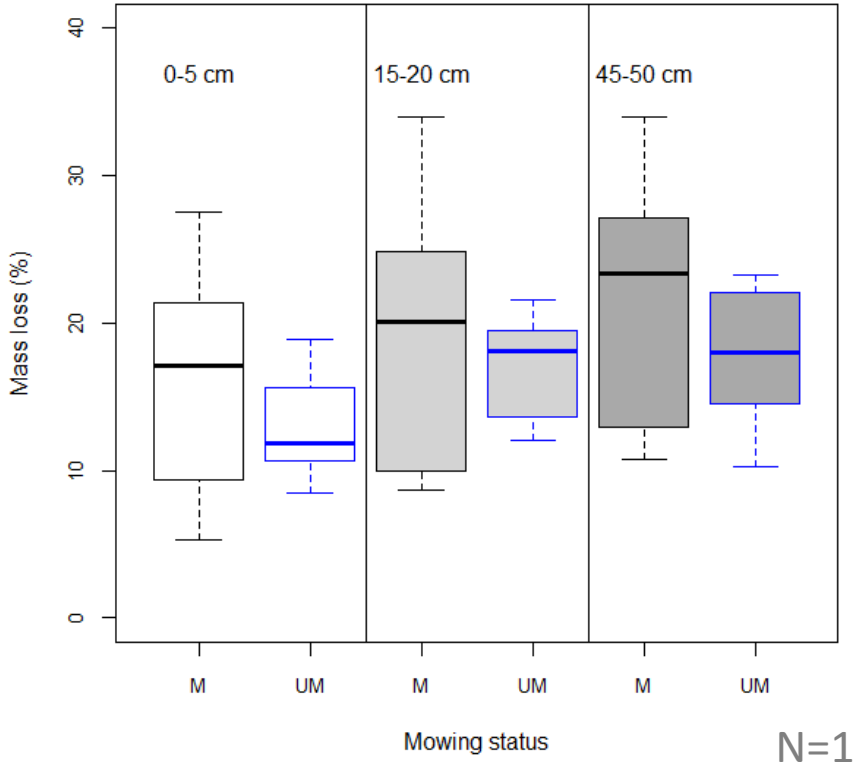
➢ impact of mowing





N=11 pairs

NO IMPACT OF MOWING ON ROOT GROWTH & DECOMPOSITION DETECTED

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WP LEADER
E. Verbrugen
UA

WP4: DECOMPOSERS DIVERSITY

SOIL MESOFAUNA

MICROBIAL COMMUNITIES

MICROBIAL FUNCTIONAL DIVERSITY

PHYSIOLOGICAL PROFILING

GHG PRODUCTION POTENTIAL

J. Frouz (CU)

WJ Emsens (UA)

M. Wilk (UW)

A. Klimkowska (UA)

Y. Liczner (UA)

H. Silvenoinen (NIBIO)

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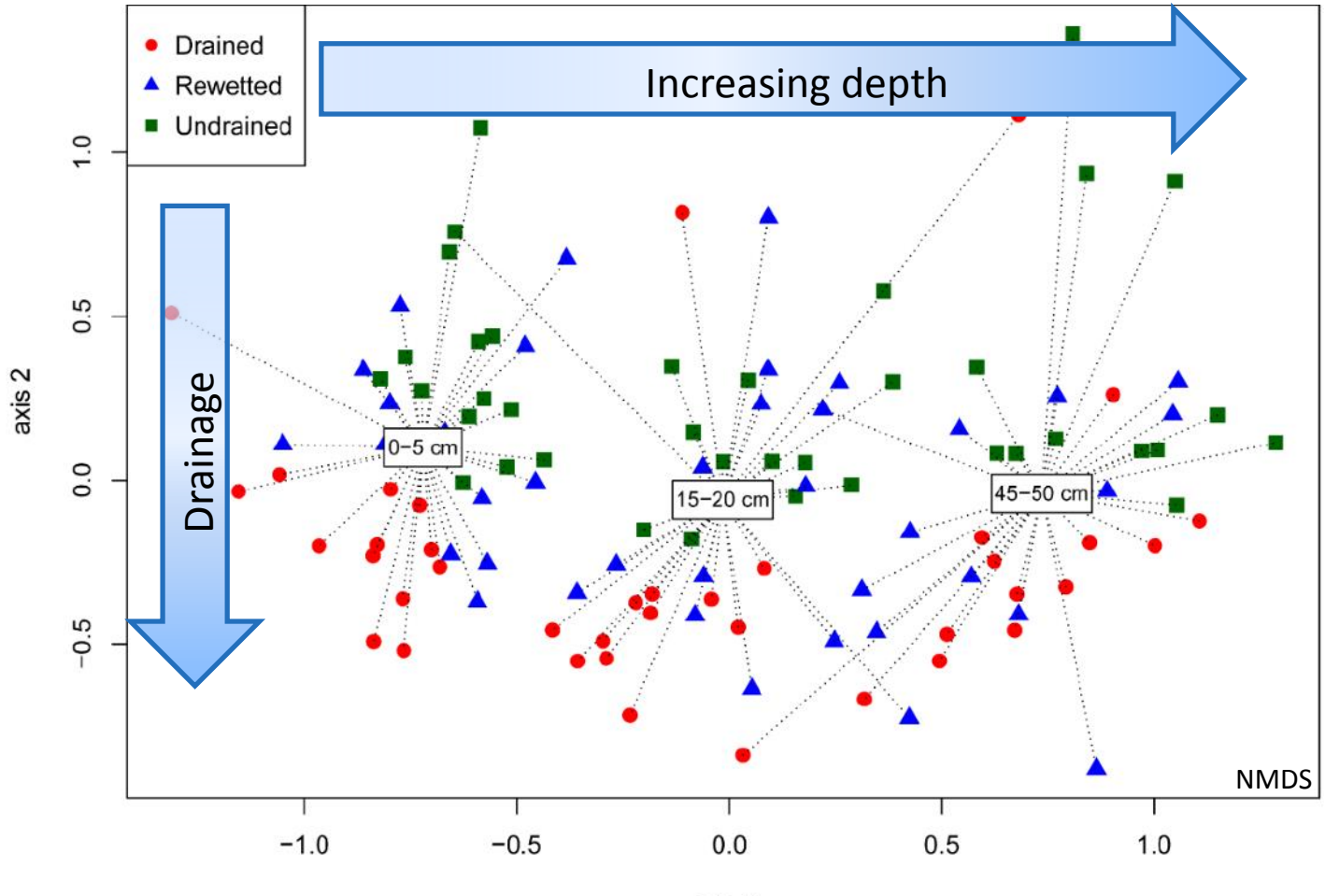
➢ Procaryotic diversity



➢ **Procaryotic assemblages: drained ≠ undrained ≈ rewetted**

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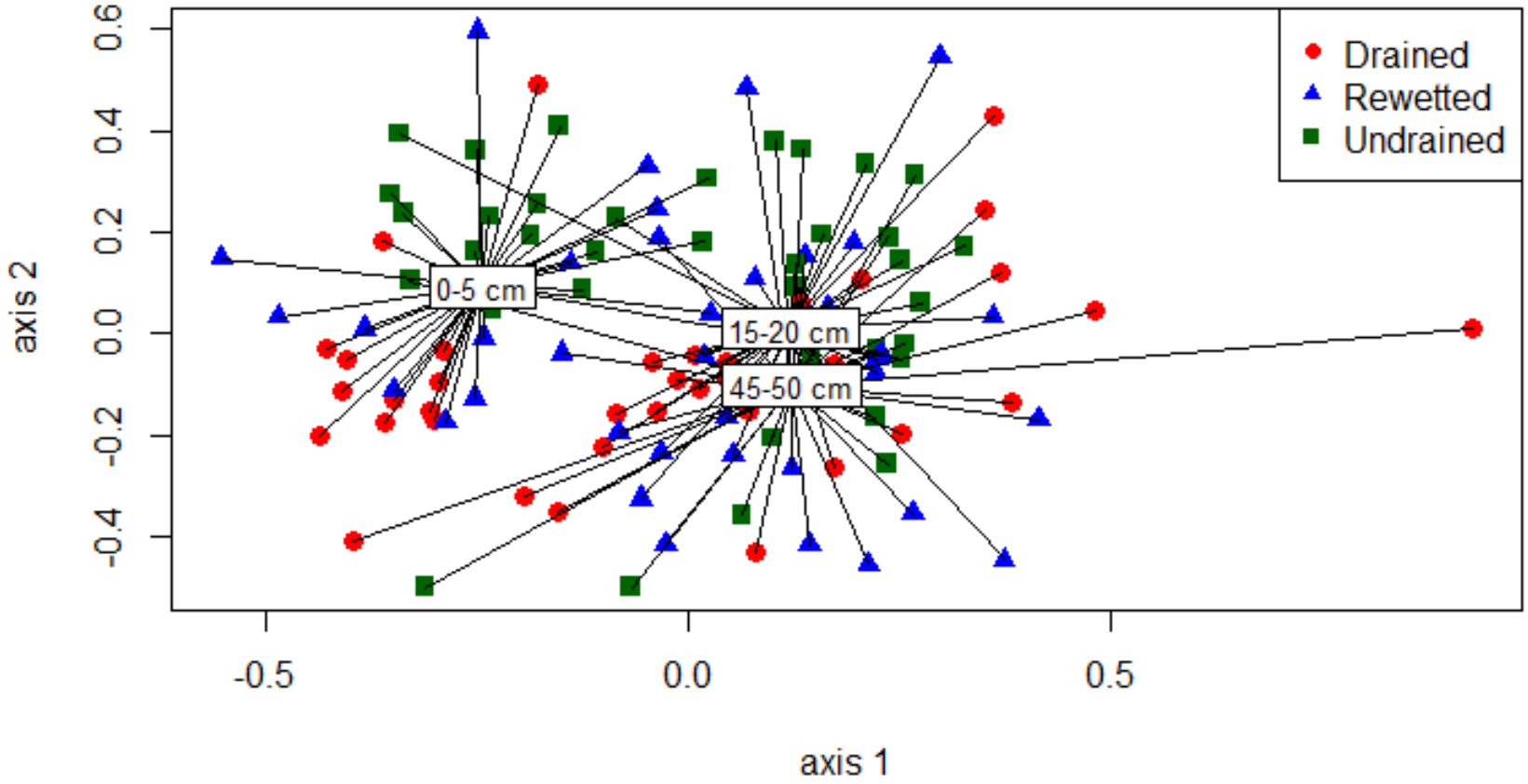
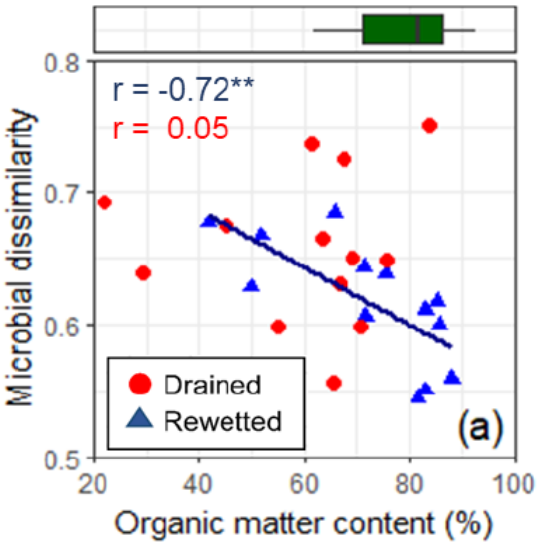
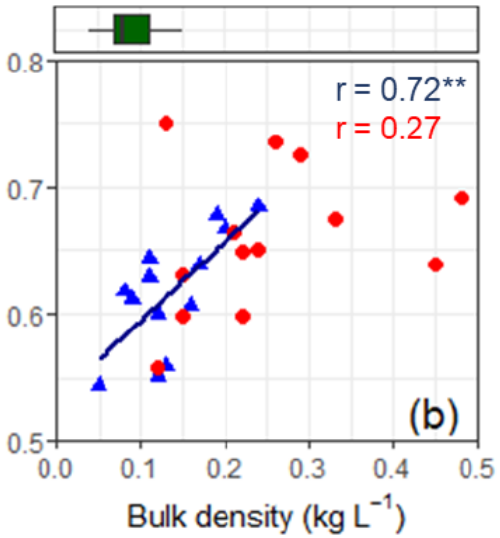
➢ Fungal diversity

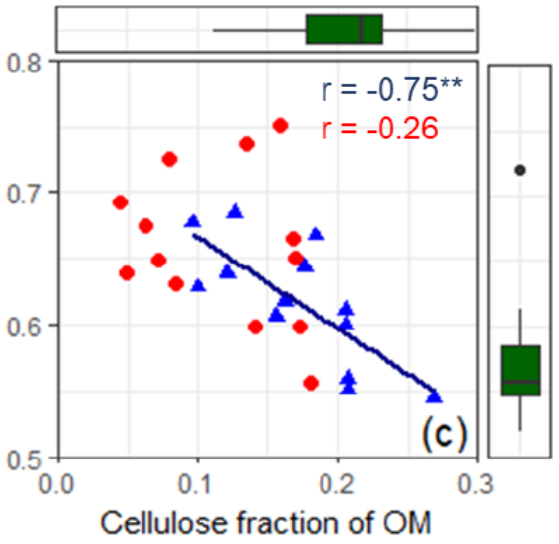


➢ **Fungal assemblages: drained ≠ undrained ≈ rewetted <u>only at surface</u>**

➢ drivers of microbial recovery







MICROBIAL DISSIMILARITY OF DRAINED AND REWETTED TO UNDRAINED FENS

➢ Fens which have been **heavily impacted by drainage** (low organic matter contents, high bulk density and low cellulose fractions) **are less restorable by rewetting**

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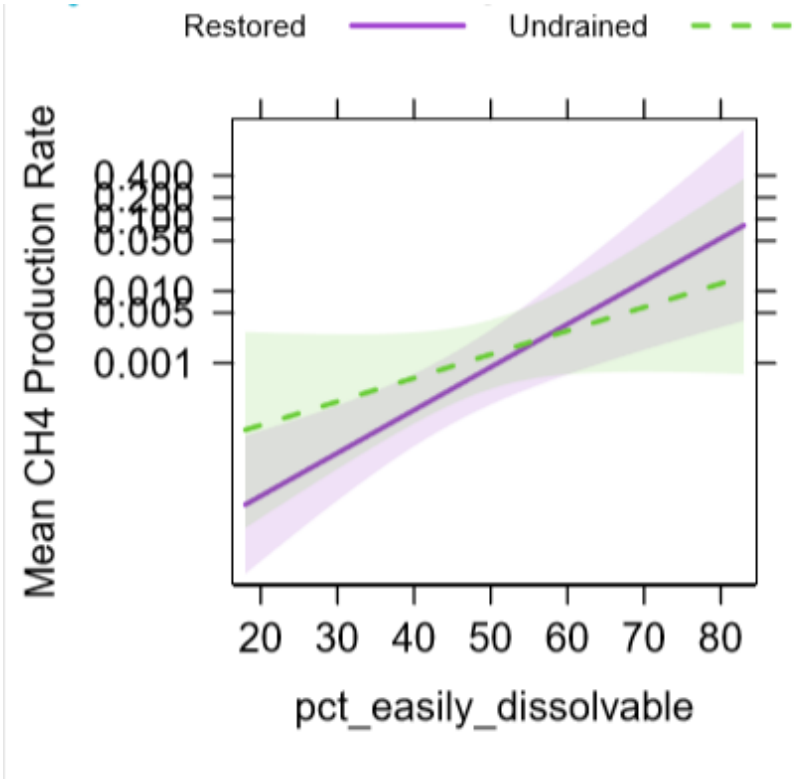
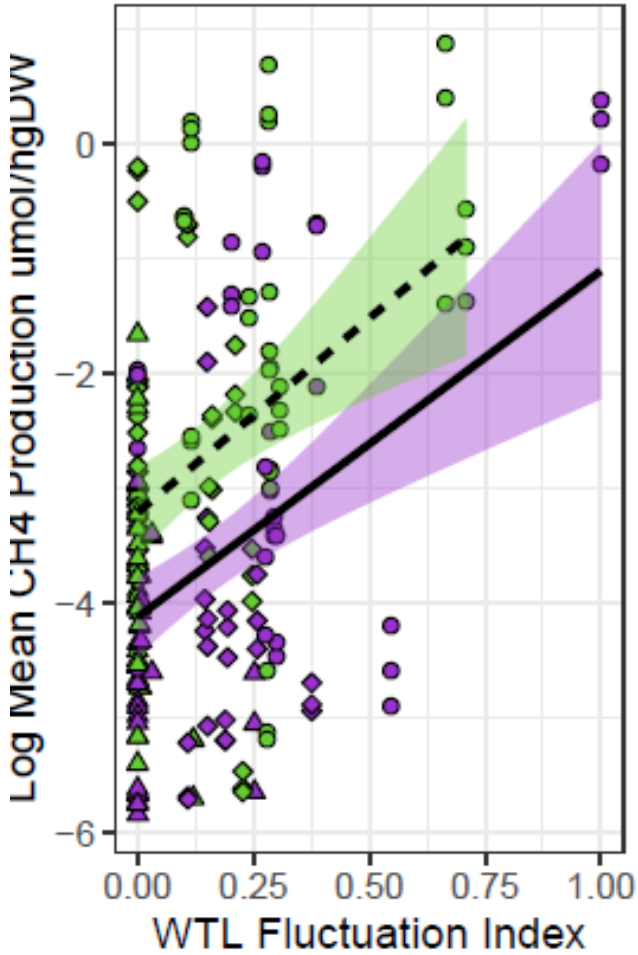
➢ methane production potential





➢ CH4 PRODUCTION POTENTIAL INCREASES WITH % OF EASILY DECOMPOSABLE C AND WATER LEVEL FLUCTUATION

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WP LEADER
J. Kreuling
UG

WP5: PRODUCERS DIVERSITY

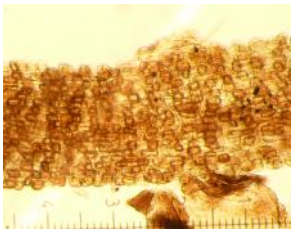
ROOT TRAITS

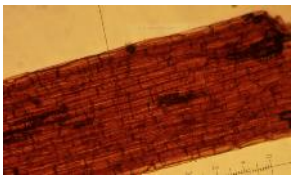
ROOT GROWTH & DECOMPOSITION

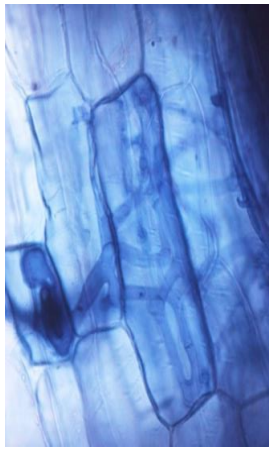
BRYOPHYTE GROWTH & DEC.

MYCORRHIZAL STATUS

D. Michaelis (UG) *F. Tanneberger (UG)* *G. Li (UW)* *E. Seeber (UG)* *W. Kotowski (UW)* *E. Jabłońska (UW)* *I. Jaszczuk (UW)* *M. Wilk (UW)*







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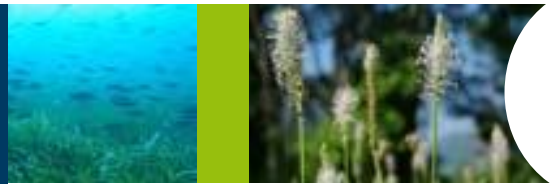

➢ sedges in response to nutrient availability


MESOCOSM EXPERIMENT IN GREIFSWALD

REPEAT

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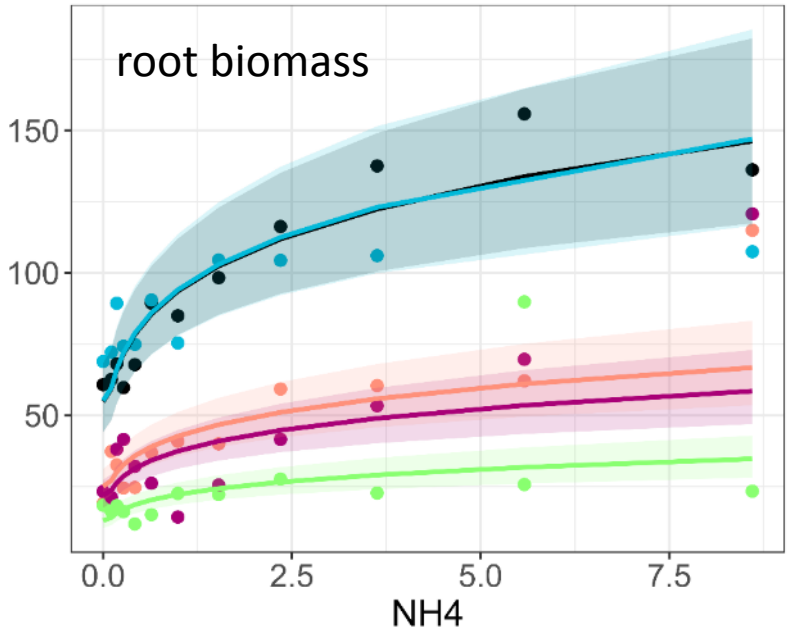
➢ sedges in response to nutrient availability

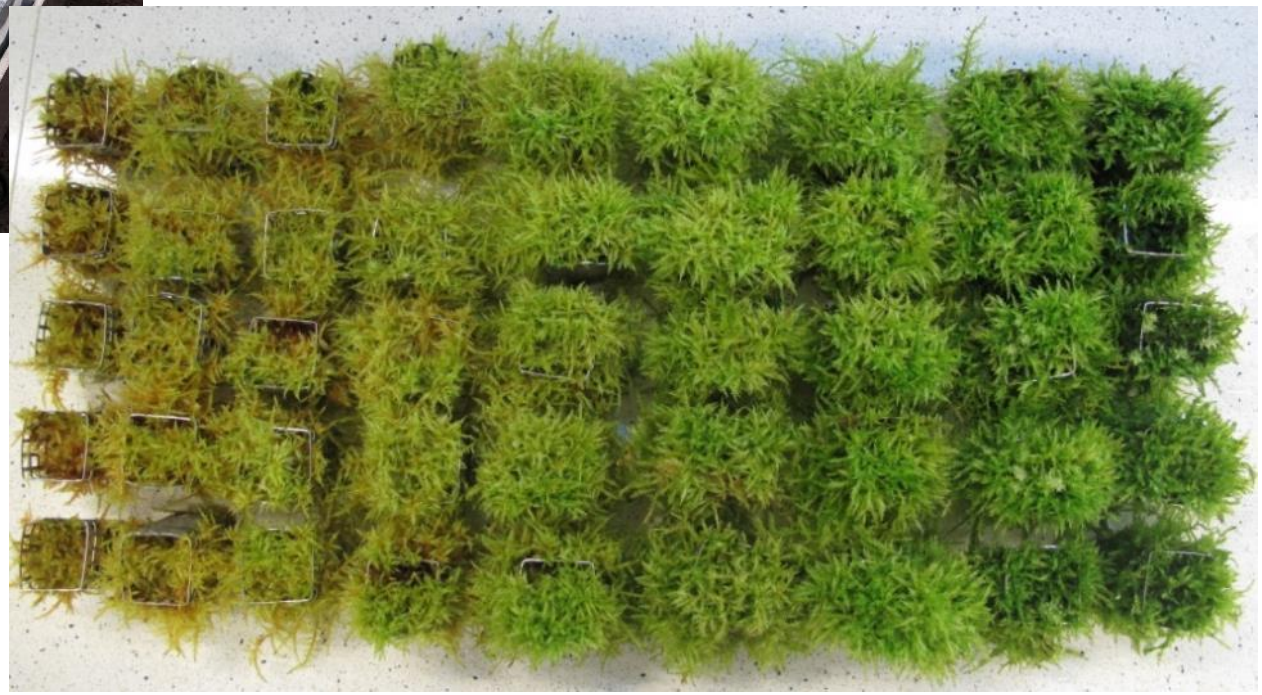


➢ SEDGE SPECIES LARGELY DIFFER RE. GROWTH RESPONSE TO NUTRIENT GRADIENTS

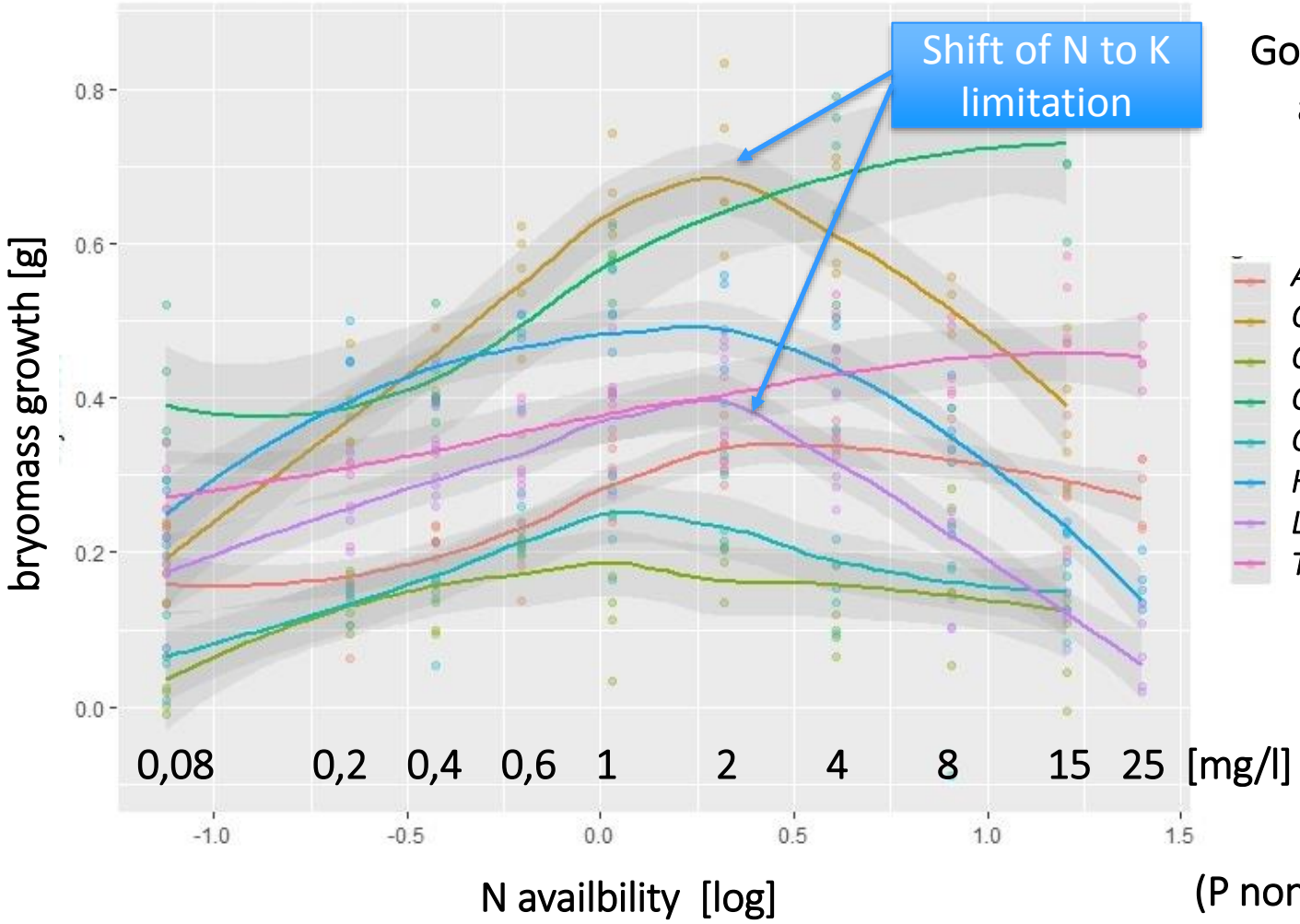
C. acutiformis
C. rostrata
C. appropinquata
C. lasiocarpa
C. elata

- mosses in response to N availability

Calliergonella cuspidata




➢ mosses in response to N availability



Gowth of mosses along N availability gradient

- *Aulacomnium palustre*
- *Calliergonella cuspidata*
- *Climacium dendroides*
- *Calliergon giganteum*
- *Campylium stellatum*
- *Hamatocaulis vernicosus*
- *Limprichtia cossoni*
- *Tomentypnum nitens*

(P non-limiting, constant K)

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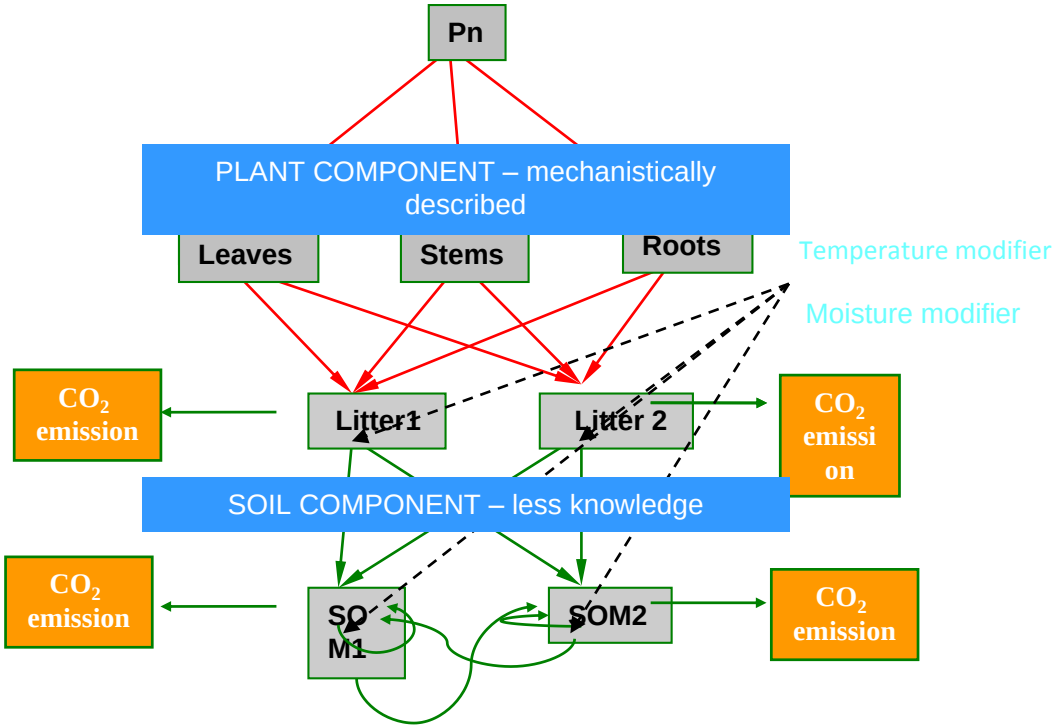
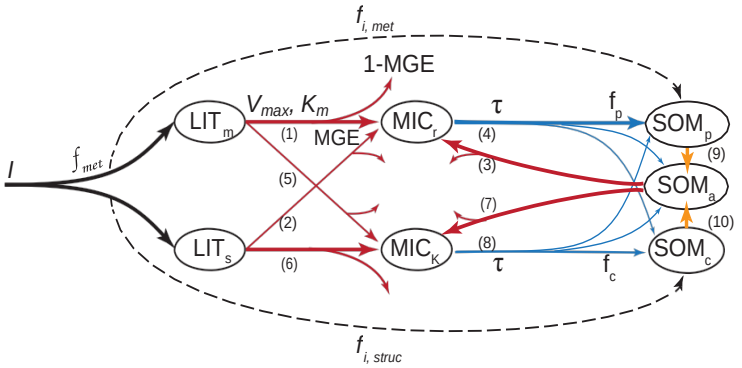
WP LEADER
B. Foreid
NIBIO

WP6: MODELLING

ROOT PROCESSES IN PEAT MODELS



ADAPTATION & PARAMETRISATION OF MIMICS MODEL



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WP LEADER
W. Kotowski
UW


WP7: SCIENTIFFIC INTEGRATION


PUBLICATIONS

In. press. / in prep. – c. 6-8 manuscripts

Published wiith input from REPEAT:

Emsens W.-J., et al. (2017): Restoration of endangered fen communities: the ambiguity of iron-phosphorus binding and phosphorus limitation. Journal of Applied Ecology. doi:10.1111/1365-2664.12915

Foereid B. et al. (2018): Photo-exposure affects subsequent peat litter decomposition. Geoderma 315: 104–110. doi: 10.1016/j.geoderma.2017.10.059

SCIENTFIC CONFERENCES

REPEAT conference „Fens across ecological gradients” in Tulcaea (Romania); June 5-8, 2019

European Geosciences Union, Wien: special sessions in 2018, 2019

WETSCAPES, Rostock, 10-13 Sept. 2019 keynote, 7 presentations

REPEAT

WP LEADER
F. Tanneberger
UW

WP8: OUTREACH TO POLICY

VISUALISATION

F. Tanneberger (UG)

GUIDELINES

H. Joosten (UG)

STAKEHOLDER WORKSHOPS

W. Kotowski UW) J. Hangau (DDNRI)

MAINSTREAMING to POLICYMAKERS

C. Gryffin (WI) L. Appulo (WI)

WEBPAGE

(www.repeat-project.com)

T. Dahms (UG)

Set of maps for each project area showing peatland restoration potential (in prep.)

Leaflet about fen restoration in Romanian about peatlands, GHG emissions, CAP and restoration (in prep.)

Guidelines: input to a Global Peatland Restoration Manual commissioned by the Ramsar Convention (in prep.)

Five stakeholders workshops (BE, DE, PL, NO, RO), documentary movie + TV

Workshop in Brussels and side events to UNFCCC COP

REPEAT

➢ Side Event to UNFCCC
COP24 Katowice 06.12.2018

THE TRACE OF HAZE: PEAT FIRES AS LOCAL AND GLOBAL CHALLENGES

SIDE EVENT AT UNFCCC COP24
THURSDAY, 6 DECEMBER 2018
15.30-17.00
German Pavilion

Global Peatlands Initiative

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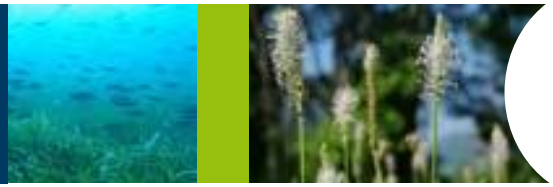

- Side event at UNFCCC COP24 Climate Hub Katowice 11.12.2018

Did you know that peatlands are among world's most important climate regulators?

They store twice more carbon than all forest biomass of the world.

We are destroying this function. By draining peatlands and turning them into agricultural land, they become hotspots of CO_2 emissions.

Palm oil from SE Asia, as well as dairy or beef from Europe often have a large peat-carbon footprint.

Not any better are vegetables grown in greenhouses on peat-based substrates.

WE DON'T NEED TO DRAIN PEATLANDS TO PRODUCE FOOD.

Peat-carbon-free lunch conference

Food - Peatlands - Climate

Understanding the connection to save peatlands

11th Dec from 12hrs to 14hrs

Climate Hub, Klub Królestwo, Rondo im. gen. Jerzego Ziętka 1

Stop eating peat!

Protect natural peatlands!

Restore (rewet) drained peatlands!

Our guests:

Hans Joosten, professor of peatland science at the University of Greifswald in Germany,

Tatiana Minayeva, associate expert of Wetlands International

Wiktor Kotowski, professor of vegetation ecology at the University of Warsaw

will share with you their knowledge and hope to engage in an open discussion on the values, threats, conservation and restoration of peatlands - for climate, people and nature.

Climate Hub

GREIFSWALD MIRE CENTRE

Wetlands International

REPEAT

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➢ Workshop with DG Agri 09.04.2019 Brussels

GREIFSWALD MIRE CENTRE

Wetlands INTERNATIONAL

Exchange of views on post 2020 CAP and its effect on farming on organic (peat) soils

9th April 2019 From 10am -1pm
Rue de Treves, 59 (2nd floor) – 1040 Brussels

Agenda

Wetlands International European Association together with Greifswald Mire Centre invites you to an exchange of views on post 2020 Common Agricultural Policy (CAP) and its effect on farming on organic (peat) soils. A shift to 'wet' agriculture (paludiculture) on such soils is needed to reach the EU's climate protection goals. Interestingly, such shift would provide plenty of additional ecosystem services to society.

The main aim of the exchange is to make clear what paludiculture is and to feed the current policy discussions, in particular with regard to the CAP national strategic plans.

10.00 – 10.05	Opening **Cy Griffin**, Wetlands International European Associati
10.05 – 10.25	The state of play of the current discus[illegible]s and ambition on environmental and climate action **Zelie Peppiette**, DG AGRI
10.25 – 10.35	Food and peatlands **Wiktor Kotowski**, University of W[illegible]saw
10.35 – 11.00	Paludiculture - showing environmental damage of drainage, environmental benefits of paludiculture, land use opportunities **Franziska Tanneberger**, GMC
11.00 – 11.20	Peatland agriculture, CAP and other EU policies **Jan Peters**, GMC
11.20 – 11.40	The green architecture of the CAP **Olivier Diana**, DG AGRI

Introductory video by W. Kotowski about peat-carbon footpring of dairy products

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➢ Stakeholder workshop Germany

Synergies on peatlands between Multi-lateral environmental agreements (MEAs), Vilm Island, Germany, 21.-24.05.2019

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Thank you

&

Could you

REPEAT, PLEASE?