

Peatlands

International

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Jardin Nelson

55 Years IPS at RE3: Peatland Science Matters

55 Years IPS & RE3 Showcases the Best in Restoration
Food production in the Fens: navigating towards Net Zero?
Our mutual mires: The cultural heritage and future of mires
Linking plant-microbe interactions to carbon cycling in peatlands
MERLIN visits to the Peatland-Wetland Cluster, Forth & Komppasuo
Icelandic and Alaskan cryptotephra records in a Scottish lowland raised bog
Ecological and biogeochemical benefits of environmental enhancements at Moorlinch on the Somerset Levels
Finding an optimal nitrous oxide sampling strategy using dynamic chambers: A struggle at the detection limit

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Editorial

Busy summer times behind and ahead

We have finally reached summer in the northern hemisphere. For most people associated with peatlands, that represents a busy period. Summer is the season for field work and all kinds of activity in peatlands. It's also the one in which the mires bloom.

For some peat researchers, the field work season starts immediately after the melting of the snow and ends with the first snowflakes in the air. All kind of peatlands are under survey, involving various field experiment targets and equipment. For example, in my organization, the peat researchers are performing greenhouse gas measurements and peat sample collections as well as unmanned aerial vehicle (UAV) mapping and vegetation plotting in various locations and peatland types.

We will have new information on pristine, forested, and agricultural areas from both during and after peat harvesting, in addition to locations for sphagnum harvesting and farming and



Thriving outdoors: Executive Board member Tuija Vähäkuopus and Secretary General Susann Warnecke

everything between. Some of us will complete the surveys in just a couple of days, while others us enjoy field work throughout the whole season.

Peatland ecosystem services provide us with resources (such as fibre and fuel, as well as food), in addition to regulating (climate change mitigation and water) and cultural services (recreational, inspirational, and educational). Mires in particular are locations of high biodiversity and vast carbon storages that act as a natural carbon sink.

Climate change mitigation needs both small and large actions, and peatlands have a role in the mitigation action plan. At the “From Reclaiming to Restoring and Rewilding” (RE3) conference on 11-15 June in Quebec, Canada, participants

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Cover: Café in Montréal by Ed Vázquez

heard top-notch and novel research presentations on peatland restoration all over the globe. The conference fostered knowledge sharing and the making of new connections with other researchers in the field, as well supporting and strengthening the existing links. It was good to see each other in person and enjoy the conference centre and field trips before, during and after the conference.

One must not forget the significance of mires for our health, both body and mind! Studies show that spending time in nature has a huge impact on our wellbeing, and I encourage everyone to go out into our “outside offices” for just a couple of minutes per day. Preferably in the mires, of course, despite the huge amounts of mosquitoes and other flying friends!

With regards for the summer,

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55 Years of the IPS!

The International Peatland Society was established at the International Peat Congress in Québec in 1968, after a series of more or less informal meetings and symposia since 1954. As this is now 55 years ago, the Secretariat and Executive Board decided to have a special 55 Year Anniversary Dinner on 13 June, after the Annual Assembly.

All 12 official representatives of National Committees as well as the Board members were invited to the Bistro L'Atelier for an evening of good food and interesting discussions. Marko Pomerants, the IPS President, took the chance to hold an inspiring speech which truly highlights the importance of the IPS - in the past and hopefully also in the future. A longer report on the RE3 conference can be found on the following pages.

Speech of the President

Dear ladies and gentlemen,

It all started before the birth of the Society. After the end of the Second World War, the world power conferences of 1947 and 1950 provided a forum where some energy peat producers met.

The Irish company Bord na Móna formed an informal international group of peat experts. In 1954, Bord na Móna organised an international peat symposium which was retrospectively

named the First International Peat Congress. After the Congress, Bord na Móna set up an International Peat Committee with representatives from Ireland, Germany, Denmark, Sweden, Finland, Norway, the USA, Canada and Scotland.

In the early 1960s, Bord na Móna approached the Soviets with a view to having a second symposium in the USSR. The second congress was held in Leningrad (Saint Petersburg) in 1963. Following this, an "Executive Committee of the International Peat Congress" continued to meet between 1963 and 1968. This committee agreed the formation and rules of the International Peat Society, which was formally established at the Third International Peat Congress in Quebec in 1968 - and here we are, 55 years later.

The structure of the IPS included an Annual Assembly, a Council, and a much smaller bureau which made decisions on proposals presented by the council. The Annual Assembly was made up of representatives of National Committees. Many

National Committees consisted of, or were dominated by, large companies or institutions, such as, for example, Vapo in Finland (today Neova), Bord na Móna in Ireland, and the Academy of Sciences in Poland.

Between 1968 and the end of the 1980s, the President of the IPS was



Six of the 11 EB members during their dinner on 10 June. Photo: Guus van Berckel



IPS participants after the Assembly. Left to right: Tuija Vähäkuopus, Jack Rieley, Anna-Helena Purre, Marko Pomerants, Örjan Berglund, Asha Hingorani, Nick van de Griendt, Lulie Melling, Paddy Rowland, Meng Wang, Andreas Bauerochse, Sabine Jordan, Ilze Ozola, Hein Boon, Curtis Richardson, Michel Guay, Normunds Stivrins, Valerijs Kozlovs, Karina Abolina-Zalpetere, Oona Allonen, Guus van Berckel, Kristine Ansone, Karlis Volfs, Jean-Yves Daigle. Photo: Nur Azima Binti Busman

always Finnish and the Secretary General (SG) was appointed, and paid, by the Soviet Union. Following the end of the Soviet era, the SG was appointed on a part-time basis, shared with the Finnish Peat Producers' Association. The first such SG was Raimo Sopo. A new structure was agreed in 1996 in Bremen, with the Council and bureau replaced by the Executive Board. In 2004, the Scientific Advisory Board was established, consisting of the Second Vice President and the chairs of the (by then) 10 Commissions. In 2015, the name of the Society was changed to the International Peatland Society.

The IPS currently has 16 National Committees, 1283 individual members and 199 corporate/institute ones in 37 countries, amounting to a total of 1575 members.

What is ahead? The future, I promise, but it is dependent on members' will and efforts. On the one hand, members should be curious and interested in relevant topics because they are in both the air and in the soil, in peat soil if you wish! On the other hand, we need members' contributions. That is how, on a voluntary basis and in limited financial conditions, a non-governmental organisation should function.

The main annual worldwide peatlands event was held recently in Québec City, Canada. It

involved an extremely well-organized international conference, "From Reclaiming to Restoring and Rewilding" (RE3), as well as the IPS Annual Assembly.

The location for the meeting next year will be Taizhou in China, where the 17th International Peatland Congress (IPC) and next Annual Assembly of the IPS, including elections for the Executive Board, will be held.

I hope to see competition and passion. Meanwhile, let us expand our personal and public knowledge on topics related to peatlands and peat in these demanding times.

At one recent RE3 conference presentation the question of the difference between the western and the First Nations' approaches to science was raised. The right answer is that western scientists want to measure everything. For the First Nations peoples, the approach involves a strong element of feeling.

I think that is a wise way to move forward!

Marko Pomerants

President of the IPS 2020-2024
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RE3 Showcases the Best in Restoration

The RE3 (Reclaim, Restore, Rewild) conference was held in Québec City, Canada, on 11-15 June with the Canadian Sphagnum Peat Moss Association (CSPMA) post excursions taking place 16-18 June.

The event was a joint conference between the Society for Ecological Restoration - Eastern Canada (SER-EC) and the Canadian Land Reclamation Association (CLRA), in collaboration with other organizations including the Canadian chapter of the Society of Wetland Scientists (SWS Canada), the International Society for Horticultural Science (ISHS), and the IPS.

Most of the 750 participants were national and international scientists, consultants, academia, industry and government representatives involved in all aspects of restoration. The conference also highlighted the UN Decade of Ecosystem Restoration (2021-2030).

The weekend before RE3, 10-11 June, a Global Peatlands Initiative (GPI) workshop was held to focus on building collaborations for effective peatland management in Canada. The aim of this workshop was to mobilize multi-disciplinary

research and collaboration to compile and consolidate Canadian knowledge, data, and experience on peatlands in Canada.

The IPS also held their Executive Board Meeting and dinner during this weekend, on 10 June, which was a welcome change from the virtual setting. Decisions will be communicated via Peatland Snippets.

Delivered by the CSPMA, on Sunday, 11 June, their Peatlands Affairs and Communications Manager Marie-Claire LeBlanc co-hosted a one-day training course with François Quinty (Planirest and WSP) about Peatland Restoration through the Moss Layer Transfer Technique.

The 13 participants originated from varied fields and backgrounds, including consultant firms, provincial government, watershed organizations, European peat production and management companies as well as academia.



Main organizers Line Rochefort, Maria Strack and Asha Hingorani on the podium. Photo: Marko Pomerants



Jack Rieley, Marko Pomerants, Line Rochefort and Asha Hingorani also met the Québec Minister of Natural Resources, Maïté Blanchette Vézina. Photo: Jack Rieley



Visiting a restored peatland. Photo: CSPMA

provided thorough explanations and details. The success of the restoration method and the extent to which it is applied by the industry was also a highlight of the tour.

IPS and GME

RE3 provided an excellent opportunity to meet face-to-face with our international

partners. Members, including many from the Executive Board of the IPS and Growing Media Europe (GME), attended RE3. The IPS Annual Assembly and jubilee dinner were held on 13 June and a productive meeting of the IPS Economy Commission was held on Monday, 12 June.

Above all, these events presented an opportunity to showcase IPS' value and importance in contributing to international policy, the meetings also provided an opportunity to continue to discuss the future and importance of getting more involved in IPS both through participation and increased funding from other countries.

During the week CSPMA's Science Director, Stéphanie Boudreau, also had the opportunity to meet directly with Örjan Berglund, IPS's Science Officer, and Alexander Sentinella, GME's Science Coordinator. We will keep you informed on developments.

RE3 Mid and Post-Conference Excursions

The CSPMA hosted two excursions in the Rivière-du-Loup region to visit extracted and restored peatlands. Presentations from peat producers, as well as researchers and students from Université Laval, McGill University and Queen's University, painted a complete portrait of the Canadian peat industry and its sustainability.

On 14 June, the mid-conference excursion entitled "Responsible Peatland Management: From Peat Extraction to Peatland Restoration" brought 30 participants from 9 countries to a peat extraction site, a production plant and the Bois-des-Bel restored peatland. The objective of the tour was to present the industry with a special focus on substrates science for an ISHS crowd.

On 16-18 June, the post-conference excursion "From Horticultural Peat Extraction to Peatland Restoration: A Journey in the St. Lawrence Valley" had a more science-oriented focus. Despite the rain, 22 participants from Canada and 7 European countries visited a peat extraction site and several post-extracted restored sites following a chronological gradient.

Berger and Premier Tech hosted dinner receptions and also presented their vision of the peat industry. The tour sparked conversations about the GHG emissions associated with peat extraction and restoration as well as their calculations, to which academic collaborators

Asha Hingorani

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Participants at a peat extraction site. Photo: CSPMA

The MERLIN meeting and field visit to the Peatland-Wetland Cluster, Forth, UK, 18-20 April

Introduction

The main aim of the Mainstreaming Ecological Restoration of freshwater-related ecosystems in a Landscape context: INnovation, upscaling and transformation (MERLIN) project's work on peat soils is to investigate the possibility of rewetting or revegetating not only peat extraction sites, but also peatlands at the landscape scale. The role of the IPS is to form a link between the peat industry and the researchers involved in the project.

During the opening day of the meeting, each team presented a short pitch based on reading a pre-assigned regional scalability plan of another case

study. The most interesting case-studies for the IPS concerned Kvorning in Denmark, Komppasuo in Finland, Forth in the UK, the Kampinos wetlands in Poland and the Hutovo Blato peatlands in Bosnia, which all deal with peat and peatland restoration.

Field visit to Auchencorth Moss and Whim peatland site

Interesting environmental research is being performed by scientists of the UK Centre for Ecology & Hydrology (UKCEH) at Auchencorth Moss (Figure 1) and at the Whim peatland.

Auchencorth Moss is an ombrotrophic bog with an extensive fetch at an elevation of 270 m, lying 18 km south-southwest of Edinburgh, and can be categorized as a transitional lowland raised bog. The site is grazed with < 1 sheep ha⁻¹.

The site was originally established in 1995 to measure atmospheric concentrations of trace gases and aerosols.



Figure 1: Measuring air quality and greenhouse gas dynamics at Auchencorth Moss. Photo: Örjan Berglund

The Whim experimental bog is a globally unique study of how peatland ecosystems respond to various levels and forms of nitrogen (N) deposition (Figure 2).

In operation since 2002, the field manipulation experiment provides a quantified ammonia (NH_3) concentration/deposition gradient to an ombrotrophic bog, as well as separate wet treatments comparing levels of oxidized (NaNO_3) and reduced (NH_4Cl) N deposition.



Figure 2: Experimental set-up at Whim Moss. Photo: Örjan Berglund

Workshop

Following an insightful visit to the Whim Moss peat extraction site at Penicuik, East Lothian, Scotland, a meeting between the MERLIN project team and Westland Horticulture Ltd was held in the Pentland Room at the UKCEH Edinburgh office.

The aim was to discuss:

- Understanding the peat extraction process
- Comprehending restoration and after-use
- The financing and policy issues to consider
- Lessons and how the work links to the MERLIN peat extraction cooperation points (e.g., the influence of their activities on broader catchment issues)

The attendees introduced themselves and their respective roles within their organisations. Westland Horticulture Ltd was represented by James Spillane, Director, and Michael Scullion, lead of the company's European Union sales operations.

Jack Rieley, representing the IPS, provided an overview of the Society's objectives and its role in bridging the gap between science, industry and policy. The IPS is dedicated to promoting the responsible management of peatlands and wise use of peat through joint efforts involving partnerships with key stakeholders.

He explained that the MERLIN project is exploring the possibilities and benefits of the peat extraction

industry expanding their important peatland restoration activities after peat extraction ends to wetland restoration in the wider landscape. For this they could receive carbon credits for greenhouse gas emissions saved progressively over time. In the process of joint discussion and assessment, barriers to these changes, especially those caused by current legislation and regulation, will have to be addressed and overcome to achieve net zero emissions by 2050.

During the meeting, a constructive exchange of ideas and questions occurred, with genuine interest displayed by the Westland Horticulture Ltd representatives. They expressed their enthusiasm for the MERLIN project and engaged in meaningful discussions about potential collaboration and sustainable practices for peatland management.

Overall, the meeting fostered a positive atmosphere for future cooperation between the MERLIN project and Westland Horticulture Ltd in the shared goal of promoting responsible and sustainable peatland use.

*Örjan Berglund &
Jack Rieley*

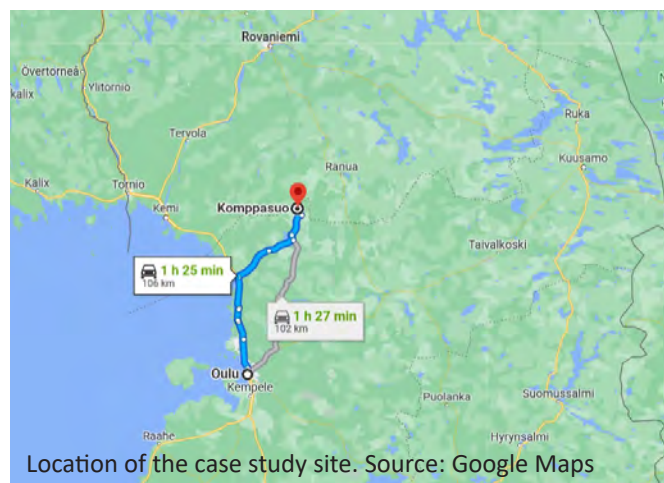
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A visit to Komppasuo

The IPS Secretary General, Susann Warnecke, attended a meeting of the Finnish Merlin project group in Oulu and visited the Merlin restoration site at Komppasuo on 23 May (see PI 1.2023 for details on the project).

The main aims were to meet the participants of the project group face-to-face, who have become familiar as a result of numerous online meetings, and to get to know the site itself, as well as sharing knowledge on similar restoration projects abroad.

These aims were fulfilled, including becoming acquainted with the offices of the Finnish Environment Centre (Syke) in Oulu, which employs around 40 people. I met key personnel from Syke (Anna-Kaisa Ronkanen, Seppo Hellsten), Neova (Sakari Jaara, Esa Laajala) and Tapio (Tiina Ronkainen, Samuli Joensuu) as well as Turo Hjerppe (Ministry of Environment) and Heidi Krüger (Ministry of Agriculture and Forestry) to name just a few.



Location of the case study site. Source: Google Maps

As you know, personal contacts are extremely important both in Finland and internationally. To my surprise, some attendees did not know much about the scope and interests of the IPS (both from a science and industry perspective) despite the fact that we have been active for more than 55 years - so each of us members is encouraged to spread the word! I also left some information material and added new contacts to LinkedIn.



Visitors starting to walk on the former extraction site. All photos: Susann Warnecke



One of the surrounding deep main ditches.



Donor plant material from a pristine peatland.



Studying the map of the site.



Participants and donor material storage.

The afternoon was dedicated to a field trip to Oijärvi, where the Komppasuo case study site is located, some 1.5 hours northeast of Oulu, near Ranua. IPS Executive Board member, Tuija Vähäkuopus, also attended the excursion, on behalf of the Geological Survey of Finland (GTK).

While some participants had excellent knowledge of boreal peatlands, the discussions showed that information, particularly from abroad, is very much needed and welcomed to keep the big picture in mind. Foreign experiences help to evaluate international developments and EU requirements from the right angle; they also apply to the Finnish situation and vice versa, especially with regard to

climate, land ownership, self-regeneration and biodiversity, etc. Information on restoration in Canada, Germany and in the United Kingdom was very welcome. Some people, especially locals, needed basic information on peat extraction and use in general, which I shared openly; moreover, cooperation with the IPS and Suoseura, our Finnish National Committee, was strengthened in this way.

Most surprising was the fact that the restoration team stores the donor material for almost a year before it is used. It also proved worthwhile to have brought binoculars, as we spotted reindeer, whooper swans and even a male hen harrier (*Circus cyaneus*) at the relatively bare site.

Overall, the visit has been very successful; the train times (2 x 6 hours) were useful for office work and reading, except when it was too hot. It will be very interesting to revisit the case study site within a few years.



The planned wetlands and forests will be important biotopes for birds and other animals.

Susann Warnecke

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News from Latvia

Latvia returns to the IPS

Latvia has returned to the IPS with a new Latvian National Committee of the IPS represented by the Latvian National Peat Society (LNPS). The LNPS was founded with the aim of promoting cooperation between organisations involved in the management and research of peatlands and peat resources for the sustainable management of peat resources in Latvia.

The return of Latvia to the IPS indicates renewed interest and commitment towards peatland conservation and sustainable management. By re-joining the IPS, Latvia will actively participate in knowledge sharing, research collaboration, and policy development related to peatlands, climate change, and other relevant topics. This move demonstrates Latvia's recognition of the importance of peatlands in climate change

mitigation, biodiversity conservation, and the sustainable use of natural resources. It also opens up opportunities for Latvia to contribute its experiences, best practices and expertise while learning from other member countries in the field of peatland management and conservation.

At the RE3 conference

A team from the LNPS participated in the “From Reclaiming to Restoring and Rewilding” conference that took place from 11 to 15 June 2023 in Canada, Québec City. The focus of the conference was the transition of degraded or exploited landscapes towards restoration and rewilding.

Team members from the LNPS - Valerijs Kozlovs (a board member of the LNPS), Kristīne Ansone, Karīna Āboliņa-Zalpētere, Kārlis Volfs (Latvia's State Forests), Ilze Ozola and Normunds Stivriņš



Latvian guests at RE3, with Nick van de Griendt (NL), Anna-Helena Purre and Marko Pomerants (Estonia) in the middle.

(Lake and Peatland Research Centre) - gained new knowledge and shared their expertise and experiences in peatland restoration during the conference field trips, workshops and networking events.

By exchanging ideas and experiences, the society can enhance its own practices and contribute to broader efforts aimed at reclaiming and restoring degraded landscapes, including peatlands, for the benefit of biodiversity, ecosystem services, and climate change mitigation.

The conference provided an excellent platform for fostering collaboration among various stakeholders, offering an opportunity for the LNPS to lay ground for new potential peatland restoration projects and the development of innovative techniques.

New IPS honorary member Valerijs Kozlovs

The IPS Executive Board granted honorary membership to Valerijs Kozlovs during its meeting in Canada. Valerijs Kozlovs is an ambassador for IPS values and ideas in the Latvian peat community. He was the initiator of the first meeting of representatives from the Baltic peat producers' associations in 2000 that was a starting point of the Baltic Peat Producers' Forum.

Valerijs Kozlovs was an Executive Board member of the IPS from 2006 to 2014. Amongst other duties on the board, he has been the main bridge not only between the Baltic countries, but also between Russia, Belarus and Ukraine. The IPS Latvian National Committee was renewed in 2022 on the initiative of Valerijs Kozlovs.

Other new honorary members awarded at the conference were Paul Short from Canada and Anne Jelle Schilstra from the Netherlands. Congratulations!

Ilze Ozola

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New Members of the IPS

New members (or new contact persons for corporate, NGO and institute members, and industry partners, in brackets) are mainly approved by our National Committees. For all other countries, the approval is made by the Executive Board of the IPS.

Each National Committee is asked to compare their membership list to that of the IPS at least once a year (status below as of 20 June). In some countries, IPS has both a National Committee and an industry association as a member.

In countries without a National Committee, member applications can be sent directly to the IPS Secretariat or online via www.peatlands.org/join-us. Members are currently not accepted from Belarus and Russia. Membership fees are invoiced for the first year immediately, after that in June/July after the Annual Assembly. Beware of scam emails.

Students

Norway: Miyuru Gunathilake

Individual members

Ireland: Alessandra Accogli

Latvia: Normunds Stivrins

Corporate, institute & NGO members

Belgium: Nele Ameloot, Geoffrey Bennett, Cecilia Luetgebrune, Alexander Sentinella (Growing Media Europe)

Ireland: Hugh Cushnan, Ciaran Higgins, Francis Mackin, Amber McFarland (RPS)

More info and membership form:

www.peatlands.org/join-us

Membership benefits:

4 issues of Peatlands International / year | 12 issues of Peatland Snippets / year | Significant discounts at IPS events, congresses and symposia & IPS online store. | Excellent networking possibilities with peatland science and peat-related industry. Supporting the **only** peatland organisation worldwide that involves members from all sectors. Welcome!

Food production in the Fens: navigating towards Net Zero?

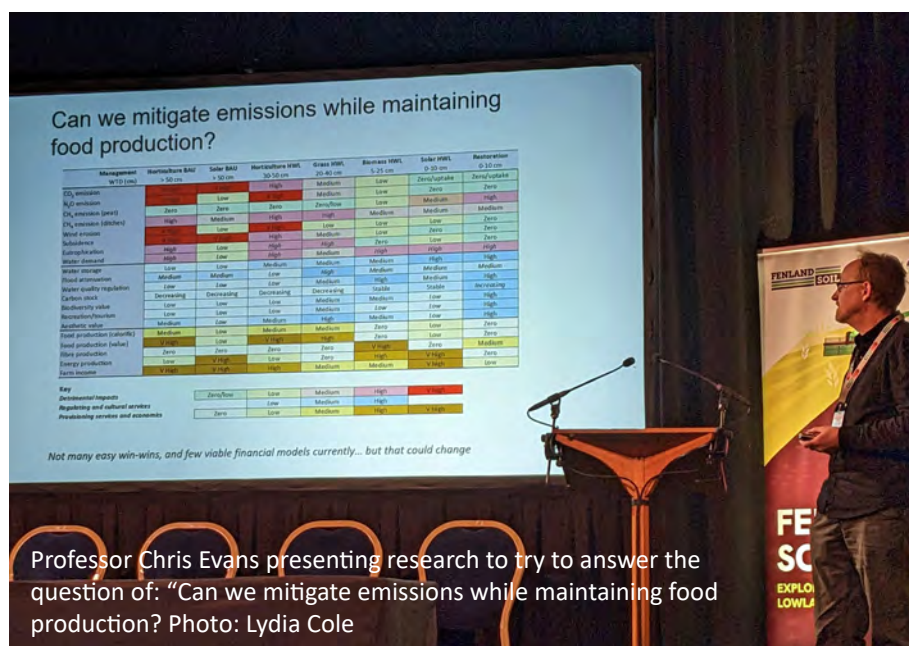
If you have ever enjoyed a fresh salad grown on English shores, it is likely to have comprised ingredients harvested from the Fens. A third of the country's fresh vegetable produce comes from this region; an area of c. 3,900 km², rich in peat.

The Fens, situated across the counties of Lincolnshire and Cambridgeshire, and small parts of Suffolk and Norfolk, comprise lowland agricultural peat soils, the working of which generates some £3 billion each year and employs over 80,000 people. These people and resident communities share this region with 13,000 species of plants and animals, which live within and outside of the agricultural matrix. Another key characteristic of the Fens is that its use in food

production is “an obstacle” to achieving Net Zero by 2050. Centuries of farming in this peat-rich landscape has led to vast, largely unquantified carbon emissions and to extensive wastage of the peat soil.

With United Nations Framework Convention on Climate Change (UNFCCC) signatory nations now required to measure, report, and reduce their greenhouse gas emissions across different sources in line with their Nationally Determined Contributions (NDCs) to mitigating climate change, emissions from farming peat soils need to be addressed.

Cue the formation of FenlandSOIL: a cross-sectoral group tasked with exploring how farming in the Fens can be achieved in a carbon-neutral way. This farmer-led consortium was established in 2021, and now has over 80 members from the farming community, academic institutions, and multiple other public and private sector organisations.



Professor Chris Evans presenting research to try to answer the question of: “Can we mitigate emissions while maintaining food production? Photo: Lydia Cole

One of the FenlandSOIL associated partnerships is that between the World Wildlife Fund (WWF) and UK-based supermarket chain, Tesco. The goal of their collaboration, and of the FenlandSOIL consortium, is to answer the billion-dollar

question: can we mitigate emissions whilst maintaining food production?

On 17th and 18th April, 2023, over 200 delegates gathered to explore this question, in the small city of Ely in East Cambridgeshire, perched on an island of hard sandstone within a fenland scape.

Over the two days, attendees had a chance to mix with individuals from UK Government agencies, universities (including the key collaborators from the University of Cambridge), the National Farmers Union of England and Wales, Wildlife Trusts, supermarket chains, farm equipment suppliers, and an inspiring mix of others.

Alongside the incoming Scientific Officer, Dr Örjan Berglund, I was fortunate to attend this fascinating, inspiring, and at times frustrating meeting of minds on behalf of the IPS.

After attending the two days of presentations, observing smaller group discussions and conversing with a range of different stakeholders in the conference breaks, I identified some common themes that seemed to emerge in this cross-sectoral space. Here are some of my learnings from the event:

No 'one size fits all' when it comes to developing interventions that will reduce emissions whilst enabling the food production to continue across farms in this peat-rich landscape. We need a framework to support the development of local solutions, which are bottom-up...

...and farmer-led. Of course, there is no one size of farmer, with each having a different relationship with the landscape they are farming, but every farmer will have knowledge and experience of that multidimensional space, which must feed heavily into each stage of intervention planning and practice. The depth of knowledge, understanding and passion of farmers attending the meeting was evident. Their voices must be present and centred in policy-facing discussions.



One skill-set farmers are often lacking is that required to carry out effective carbon management, being a relatively new role that the already hyper-skilled individuals are being tasked to take on. One farmer I spoke to was confused as to what the best approach to reducing emissions was for his farm - with his particular production system and land cover - after listening to multiple presentations advertising different emissions outcomes of different interventions for diverse production systems on different farms. An evidence-based approach is needed.

There was a call for that evidence-base to focus on "field-scale trials and innovations"; a continuation of the no 'one size fits all' principle. When evidence is often place-specific, incomplete, and associated with many uncertainties, packaging it into useful guidance for farmers is one of the ultimate challenges.

But whatever specificity of interventions are proposed, monitoring the changes in emissions, food production, soil health, species abundance, etc., and reporting those verified changes is essential, i.e., MRV - a feasible and effective Monitoring, Reporting and Verification procedure.

We need to have standard, transparent, and feasible ways of assessing whether interventions are going any way to reducing GHG emissions over time, whilst not jeopardizing food production, livelihoods and other emergent properties of these systems.



Örjan Berglund presenting his research. Photo: Lydia Cole

also reminded that water-level management in drains is not the same as water-table management in fields; each process plays a separate, yet interconnected role in peat soil conservation and food production.

The IDBs are, of course, not acting independently but in line with national legal frameworks for water management. When it comes to policies, Government intervention, be it through legislation or financial support, is seen as a double-

The somewhat unpredictable elephant in the room - which could undermine even the most well-designed peatland carbon management plans - is climate change. This is seen as a large risk to food production and to climate change mitigation interventions. We need to understand more about how future climatic drying and erratic weather patterns may influence peatland ecosystem health, in order that current and near-future investments in restoring wasted peats are not themselves wasted.

The best way of climate-proofing any peatland is to manage the water table. There were plenty of discussions on storage, sharing, and managing risks associated with water across the Fens. From being a resource in abundant supply in this wetland-scape in the past, the lack of water resulting from hundreds of years of drainage is now a significant risk. Internal Drainage Boards (IDBs) are now the institutions who wield the power in these agricultural landscapes; they are in charge of decisions that can determine the economic and literal productivity of farms through water abstraction licencing. Although with transformative consequences on farming, imminent reform in licencing to reduce the exploitation of river water may create opportunities for peatland restoration.

However that reform manifests, a short-term reduction in demand for water is needed across the Fens, alongside long-term local planning of water resource management, where the restoration of rivers to “good ecological status” is set as the achievable goal. As an aside, we were

edged sword. Although it may not be clear how the Government could support a strategy for food production in the Fens and the variety of lowland peatlands across the UK, there were proposals for how top-level support could reduce barriers to farming in these landscapes.

There were discussions relating to England’s reformulated agricultural payment schemes, e.g., the post-Brexit Environmental Land Management scheme (ELMs), and how multiples of these could be ‘stacked’ together on one farm to increase the resources available to farmers to manage these complex landscapes. Where do farmers get the equipment, the seed-stocks, and other materials and expertise (in some cases) necessary for



Ely scenery. Photo: Örjan Berglund



Ely is famous for its medieval cathedral which dates back to 1083.
Photo: Örjan Berglund

calculations and modelling for restoration. Lowland peatlands themselves come in a wide range of shapes and sizes...

Nuance matters. Variability in soil characteristics, water availability, and management practices across space and through time in the Fens need to be accounted for in any planning and practice. For example, the volume of nitrous oxide emissions resulting from

restoring their peatlands? Could logistical barriers also be reduced through policy change?

Or ultimately, is the lack of financial support the key challenge? Certainly, comments were made about the current lack of financial models that account for low-emissions farming practices on peatlands. We need a financial vision and framework, to accompany a logistical one.

One of these frameworks is carbon financing, and more specifically, the Peatland Code 2.0. The IUCN UK Peatland Programme has worked to revise this standardised procedure for valuing the carbon held in peatlands under protection, with areas of the Fens now eligible for financial investment through the voluntary carbon market under this scheme.

Regenerative agriculture is the future, we are told! I would like to believe this. But I am unsure what this is, exactly, and what it might look like in lowland peatland settings. I was reminded of the need to carefully define the terms we are using, lest they become straw men and lose their meaning, and thus power.

Whilst sharing learning and experiences across peatland regions can be valuable, we also need to appreciate the unique nature of the Fens. Lowland peatlands behave differently to those in the uplands; the latter being the subject of the majority of financial

agriculture on peatlands may depend on the crop being cultivated and its in-field management; this detail matters.

To enable continued food production from the UK's lowland peatlands, whilst mitigating (to some extent) carbon emissions from damaged peat soils, we need action now. We need a framework for local solutions. We need a field-scale, mosaic approach to interventions. We need to connect up communities and sectors across IDBs, and landscapes. And we need to create opportunities for social innovation. The FenlandSOIL gathering made an inspiring start.

Dr Lydia Cole

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The Great Ouse river running out into the Fens surrounding the town of Ely.
Photo: Lydia Cole

STACKS - Hidden peatland riches brought to life

The STACKS project - which uses creative approaches to uncover the hidden wonders of peatland landscapes - has been released on Friday 2nd June.

STACKS is an interactive website which allows visitors to curate their own gallery of films exploring the tones, textures and patterns of peatlands across scales. You can watch an introductory film on the project here: https://youtu.be/7WzMCYKB_0o



The films are accompanied by an 18 minute audio piece narrated by Rose Ferraby featuring the voices of people who live and work in peatland landscapes across South-West England.

The audio piece is soundtracked by unusual field recordings made underwater, in Sphagnum moss, and along moorland fence wires made by Rob St John, alongside ambient music made by Tommy Perman.

STACKS is intended to offer visitors an immersive environment to curate their own creative landscapes, whilst gaining new understandings of the vital role peatlands play in mitigating the climate and biodiversity crises.

STACKS was commissioned by the South West Peatland Partnership (SWPP), which is working across West Penwith Bodmin Moor, Dartmoor and Exmoor in South West England to undertake ambitious peatland restoration projects.

A new creative collaboration

Major new creative commission explores cultural, climatic and environmental change across three UK peatlands through film, sound and voices.

Peatlands are vital to human lives: they lock up carbon, buffer floodwaters, naturally filter drinking water, and provide rich biodiversity habitat.

However, their importance is often overlooked and underappreciated. In an era of ecological loss and climate crisis, peatland restoration is a vital activity. How do understandings of past change in these remarkable environments help us imagine and prepare for the future?

STACKS - a new creative project by the South West Peatland Partnership in the UK - aims to highlight the hidden richness, beauty and importance of peatlands. Produced by artists Rose Ferraby, Tommy Perman and Rob St John between 2021 and 2023, STACKS is an interactive website featuring film, sound and voices. It is intended to celebrate the often-unseen worlds of peatland landscapes, and the importance of their past, present and future in addressing environmental change. It highlights the importance of sharing the voices of those living and working in peatlands.

Visitors to the website can shuffle three film windows to create their own visual landscapes. Many of the films were shot across Bodmin Moor, Dartmoor and Exmoor to capture abstracted peatland tones and textures. Others were created using photographic film buried in peat and bogs for months on end to degrade, then sliced into tiny frames and animated. Another set of films documents archive images of peatlands projected through the water column of moorland streams in the middle of the night.

The films are accompanied by a soundscape of field recordings, music and local voices. Ambient microphones pick up bird calls, insects and the sound of water and wind. Hydrophones lowered beneath the surface of peatland pools record the squelch and crackle of Sphagnum and humming stridulations of bog pool insects.

A collage of voices from peatland landscapes across the South West of England delve into the rich histories and complex natures of peatlands. These voices are drawn from environmental managers, peatland restoration practitioners, landscape archaeologists and poets to form an experimental 'radio

play' tuning into the peat. Archive recordings of local people from The Dartmoor Trust Archive trace the extraction and use of peat through the 20th Century.

STACKS was released on 2nd June 2023 to coincide with World Peatlands Day. It was commissioned by the South West Peatland Partnership (SWPP), which is working across West Penwith Bodmin Moor, Dartmoor and Exmoor in South West England to undertake ambitious peatland restoration projects. These actions will help keep water on the moors, and keep these unique and special peatlands functioning for people and nature.

Formed from a unique artistic collaboration between Rose, Tommy and Rob, STACKS is intended to help these issues and activities find new audiences. The work aims to bring new understandings of how these often invisible environments have changed through time, setting peatland restoration work - both in England and across the world - in the context of broader environmental change. It is intended that STACKS will be presented as an art exhibition and installation in galleries in late 2023 and 2024.

About the South West Peatland Partnership

The South West Peatland Partnership is working together to restore over 2,500 hectares of degraded peatland across West Penwith, Bodmin



The STACKS artistic trio made film, images and sound recordings across UK peatlands. Photo: Rose Ferraby

Moor, Dartmoor and Exmoor by 2025. In 2021, the South West Peatland Partnership received £9 million of funding from Natural England's Nature for Climate Peatland Grant Scheme (NCPGS) for the work for a 4-year project. Alongside NCPGS funding, significant additional funding comes from South West Water, the Duchy of Cornwall, the National Trust, the Environment Agency and Cornwall Council, with support in kind coming from many other vital partners involved in the project.

The moors of West Penwith, Bodmin Moor, Dartmoor and Exmoor hold significant regional and national deposits of peat in the form of blanket bogs and valley mires. These wetland habitats are complex ecosystems that support diverse and unique ecology of national and international importance.

Over centuries, human interventions have and still are impacting upon the overall quality and distribution of wetland mire habitats and upland moors. The demise of such wetlands across extensive swathes of the moors has resulted in changes in the moorland ecology, including the impact on iconic species such as dunlin, golden plover, and Sphagnum mosses.

The challenge is to prevent further losses and halt the decline, while improving and restoring these habitats. The project is being delivered by a partnership including government agencies, non-governmental organisations, landowners, commoners, contractors and farmers. Contact: southwestpeatlandpartnership@gmail.com

About the artists

Rose Ferraby is an archaeologist and artist based in North Yorkshire. Her transdisciplinary work often explores our relationship with landscape, drawing together past and future narratives. She has worked as an archaeologist on peatland restoration projects on Exmoor, and more recently with the National Trust researching the use of archaeology in nature recovery projects. Her creative practice includes printmaking, painting and collage, as well as working in sound and film to create narratives of people and place. Her work has been commissioned and exhibited in the British Museum, University of Cambridge and the

Weston Park Museum. She writes and presents for Radio 3 (Cornerstones and EarthWorks) and Radio 4 (Open Country). (www.roseferraby.com)

Tommy Perman is a Scottish artist, designer, and musician who seeks to blur the boundaries of these three disciplines through collaboration. Based in rural Perthshire, much of Tommy's work is themed around the built environment, documenting the growth and decay of cities and urban nature. Since his debut record came out in 2002 he has since released over 50 records (albums, EPs and singles). His artworks are held in public collections at the National Museum of Scotland, Edinburgh and McManus Art Gallery, Dundee. His visual design work has been seen across numerous high profile books, websites, record sleeves, and even projected on the Sydney Opera House. (www.surfacepressure.net)

Rob St John is an environmental artist and writer based in Bowland, Lancashire. His award-winning creative practice explores overlaps between art and ecology in British landscapes. His work, which spans sound, moving image, text and installation, experiments with the potential of key concepts in contemporary ecology and conservation as catalysts for site-specific art, and has been seen/heard at Tate Modern, The Barbican and V&A London, amongst others, and profiled on BBC Radio 3, 4 and 6 Music. (robstjohn.co.uk)

Links

STACKS: <https://peatstacks.uk>

The South West Peatland Partnership:

<https://southwestpeatlandpartnership.co.uk/>

Apple Podcasts: <https://podcasts.apple.com/us/podcast/stacks/id1694293358>

Spotify: <https://open.spotify.com/show/3WfLb8T67TvK2nyRrnijs>

STACKS audio radio edit excerpt:

<https://www.dropbox.com/s/ljpux4ifzxeayjd/STACKS%203%20minute%20Radio%20Excerpt.wav?dl=0>

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Bert von Seggern, Director Production & Sustainability & Chairman of RPP

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Our mutual mires: The cultural heritage and future of mires

A very interesting seminar on peatland culture was held at the Joensuu campus of the University of Eastern Finland on 12 May, organised by Kirsi Laurén, Pauliina Latvala-Harvilahti and their colleagues.

The event marked the closing of the open Mire Trend (Suotrendi) research project, which examined long-term changes in bog culture and considered the future prospects of the cultural relationship with nature and the use of peatlands.

The seminar started with the screening of Robert Aitken's eco-poetic film, *Dreaming Bog* (see PI 3.2022 for more details) and a virtual discussion on its contents with the artist himself. He was actually amazed at how the Finns use their peatlands for recreation, berry picking, music and sports, which to date, seems to be relatively uncommon in his home country Scotland.

The participants were also invited to visit the poster and photo exhibitions of the Mire Trend research project and *Planeetan rajat*, which were located in the Carelia building, during the breaks.

The most impressive part of the seminar was probably the performance of *Crying at Mother's Grave* by musician-singer Noora Kauppila, who sang and cried in the yard in front of dozens of participants who were deeply touched. This kind of ritual is especially well-known in Karelia but also in other countries. It was very interesting not only to watch Noora but also the reactions of the students and families who passed by.

The lunch and coffee breaks enabled the guests, as



The audience during the video conference with Robert Aitken; Kirsi Laurén standing on the left. Photo: Susann Warnecke



View from the exhibition to the yard. Photo: Hannu Salo



Group of participants at the Alkukivet statue before the performance. For many it was the first warm summer day. Photo: Susann Warnecke



Noora Kauppila with a kantele, a traditional Finnish and Karelian string instrument. Photo: Susann Warnecke

usual, to exchange further ideas and meet old and new friends, as well as promote Suoseura and the IPS. In addition, Käärijä and the Eurovision Song Contest were a popular topic; some of us were even dressed in bright green for the next day's finals in Liverpool.

The afternoon presentations included (in Finnish):

- Kirsi Laurén (Suotrendi): Are we protecting our heritage? The direction of peatland culture.
- Maarit Similä (Metsähallitus nature services): The peatland ecosystem in a state of change - the rise of restoration.
- Marjukka Piirainen (Suotrendi): For body, mind, language: peatlands as a source of well-being.
- Pauliina Latvala-Harvilahti (Suotrendi): From footprint to handprint: taking a stand on filter art in nature.
- Noora Vikman (Suotrendi): The ringing bog - experience of and imaginary auditory angles.
- Virpi Kaukio (Suotrendi): In the bog with a hoe: literary bogs in the 21st century.
- Kirsi Laurén (Suotrendi): The communal peatland sports culture and relationship with nature.

- Simo Häyrynen (University of Eastern Finland): Peatland's political change: perspectives from Ireland and Finland.

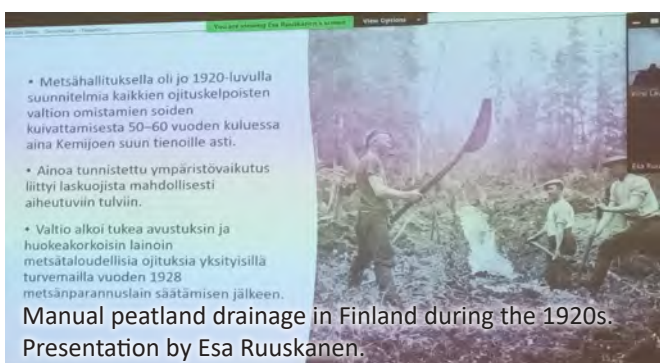
All of these were very interesting to watch. Personally, the second presentation, "Values and trends of the state's relationship with bogs from the 18th century to the present" by Esa Ruuskanen (University of Oulu) provided in depth knowledge of history, which I so far was unaware of - this really was a spectacular journey examining differing approaches, depending on the political and economic environment, and many participants took photographs of the slides.

Unfortunately, due to the waiting train to Jyväskylä, I was unable to see the presentations after 3pm but hopefully there will be another opportunity. I warmly encourage our other National Committees and Commissions to engage in similar projects; clearly, peatlands are not only for bugs and bags.

My heartfelt thanks to the organisers! For more information visit: <https://uefconnect.uef.fi/tutkimusryhma/suotrendi-tutkimushanke>.

Susann Warnecke

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• Metsähallituksella oli jo 1920-luvulla suunnitelmia kaikkien ojituskelpoisten valtion omistamien soiden kuivattamisesta 50-60 vuoden kuluessa aina Kemijoen suun tienoille asti.
• Ainoa tunnistettu ympäristövaikutus liittyy laskuojista mahdollisesti aiheutuviin tulviin.
• Valtio alkoi tukea avustuksin ja huokeakorkoisin lainoin metsätaloudellisia ojituksia yksityisillä turvemailla vuoden 1928 metsänparannuslain säätämisen jälkeen.
Manual peatland drainage in Finland during the 1920s. Presentation by Esa Ruuskanen.

Icelandic and Alaskan cryptotephra records in a Scottish lowland raised bog

I started my PhD research at the University of St Andrews in 2019, under the supervision of Dr Ian Lawson, Dr Althea Davies and Dr Katy Roucoux. My PhD research site, Bankhead Moss, is a Scottish lowland raised bog. It lies 10 km southwest of St Andrews and is currently protected by the Scottish Wildlife Trust.

In my project, I used multi-proxy and multiple core palaeoecological methods to provide insights into peatland development history of Bankhead Moss. One important chronological method in this project is cryptotephra chronology.

Tephra consists of a variety of silicate glass shards formed by the cooling of magma droplets, and lithics of different mineralogy and sizes originating from the vent. Once injected into the atmosphere, tephra can be carried into the stratosphere and remain there for days to weeks before deposition.

A WRAe/AD860B cryptotephra shard (Mount Churchill, Alaska) found from Bankhead Moss. All photos: Li Wang



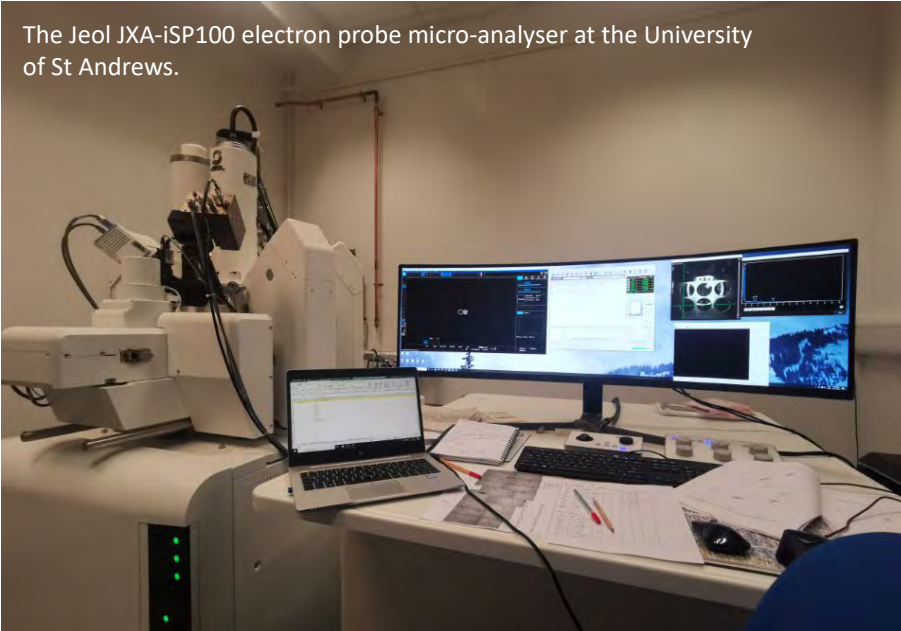
Therefore, small fragments might be transported for thousands of miles, even circumglobally.

Visible tephra layers (typically tens of kilometres from the vent) have been found preserved in a variety of depositional settings. However, in distal regions, tephra layers are not visible to the naked eye, due to a combination of their small size and their very dilute glass shard concentration within the deposits, e.g., marine and lake sediment, peatlands, soils, loess and ice masses. These invisible tephra layers are known as cryptotephra. The utilization of invisible tephra layers as a chronological tool is called cryptotephra chronology, which is very useful and has been widely applied in the British Isles.

I greatly appreciate the support from the IPS Allan Robertson Grant (2022), which helped to fund the electron probe micro-analysis (EPMA) of my cryptotephra samples from Bankhead Moss. This is a technique applied to analyse the elemental composition of tephra samples. It involves using

Allan Robertson was the First Honorary President of the IPS and one of its founding members. The €500 Grants are awarded to: a) young peatland and peat researchers carrying out research or practical work or b) young professionals in early stages of their career in managing peatlands or peat industry. Grant recipients are normally under the age of 30. Undergraduates are ineligible. The next deadline is 31 January 2024.

The Jeol JXA-iSP100 electron probe micro-analyser at the University of St Andrews.



The EPMA results show that six cryptotephra layers are found in Bankhead Moss. They originate from Icelandic (Hekla 1947, Askja 1875, Hekla 1845, Hekla 1510) and Alaskan eruptions (the Lena tephra and WRAe/AD860B). It is notable that the Askja 1875 tephra at Bankhead Moss is the first recorded example in the British Isles.

These cryptotephra layers will help to construct a chronological framework for my peat cores, and therefore help to analyse how climate change and human activity

a focused beam of electrons to excite the atoms in the sample, causing them to emit characteristic X-rays. These X-rays are then detected and their intensity is measured, which can be utilized to determine the elemental composition of the sample. In this project, glass shard major element geochemical analysis was performed with a Jeol JXA-iSP100 electron probe micro-analyser at the University of St Andrews, Scotland.

(e.g., drainage, afforestation, peat cutting, grazing, burning, drain blocking and atmospheric deposition) have affected the development of this bog.

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A 50cm peat core of Bankhead Moss

Linking plant-microbe interactions to carbon cycling in peatlands

Peatlands, including ombrotrophic raised bogs, are one of the densest types of carbon stores in the world. Metre for metre, carbon has been locked away as plant production rates surpass decomposition. In northern peatlands alone, 545 to 1055 Gt of carbon is stored in the peat soil (Nichols & Peteet, 2019; Yu et al., 2010; Gorham, 1991), in the form of storage that has been built over the last millennia.

The current climate, with rising temperatures and increasing weather extremes such as prolonged drought, progressively threatens this carbon stock. To safeguard a positive carbon balance in the future, it is key to understand the carbon dynamics in peatland ecosystems.

The functioning of peatlands as carbon sinks hinges on a dynamic interplay of abiotic and biotic factors. Notably, waterlogged, anoxic conditions limit the microbial conversion of organic matter into CO₂, while peatland plants contribute to the mitigation of microbial decomposition through producing recalcitrant litter and anti-microbial compounds found in (root) exudates. In peatland research, there is a significant emphasis on exploring the impacts of abiotic influences such

as temperature increases, nutrient input, and drought on carbon cycling. However, it is crucial to recognize the important role of biotic players in this cycle. It is widely acknowledged that plant and microbial communities often work in tandem, influencing decomposition and carbon dynamics cohesively (Lindo et al., 2013). Nonetheless, the complex nature of their interactions is still not fully understood (Robroek et al., 2021).

Changes in enviro-climatic conditions have the potential to induce significant shifts in the composition of both the plant (Norby et al., 2019; Robroek et al., 2017; Dieleman et al., 2015) and microbial communities (Seward et al., 2020) within peatlands. These alterations in biotic assembly often have profound impacts on carbon-related processes (Rillig et al., 2019; Bardgett et al., 2013). However, it is important to recognize that the responses of plants and microbes are not independent, but rather intertwined within a broader ecological community, where species are interconnected in networks of interactions (Schleuning et al., 2016; Hagedorn et al., 2019).

The structure of these networks can have a substantial impact on their resilience and stability, which ultimately influences the ability of ecosystem functions to maintain robust in the face of enviro-climatic changes (de Vries et al., 2018; Morriën et al., 2017; Allesina et al., 2009). When considering plants and microbes as cooperative partners, it may be crucial to focus on the co-response of plant and microbe communities rather than solely examining individual community responses. This perspective is essential for understanding the consequences of environmental and climatic changes on peatland processes.

Figure 1: A part of the vascular plant removal experiment located in Store Mosse National Park. The installed boardwalk provides access to the experimental plots. Photo: Yvet Telgenkamp



Figure 2: Vascular plants on the raised bog: graminoids (*Trichophorum cespitosum*) and ericoids (*Calluna vulgaris* and *Andromeda polifolia*)
Photo: Yvet Telgenkamp



In the Store Mosse National Park (57°17'54 N, 14°00'39 E), situated in the south of Sweden, the Radboud Institute of Biological and Environmental Sciences, in collaboration with the Jönköping Country Administrative Board, is running a long-term vascular plant removal experiment which was established in 2011 (Figure 1).

The experiment was set-up with the aim of studying the role of the main vascular plant functional groups - ericoids and graminoids (Figure 2) - on ecosystem functions such as carbon and nutrient dynamics. More recently, its emphasis has shifted towards examining the interplay between vascular plant functional types and the microbial community, and its consequential effects on carbon dynamics.

The IPS Allan Robertson Grant enabled me to make use of this infrastructure. Specifically, it allowed me to travel to the site for urgent maintenance of the research plots.

Additionally, I performed vegetation analyses (Figure 3) and took samples for microbial analyses that will serve as a springboard for upcoming sampling campaigns as part of my postgraduate research.

I am particularly interested in delving into the mechanisms of plant-microbe interactions and how apparent changes in such interactions play out on the carbon cycle. Here, I build on previous work (Robroek et al., 2021) that suggests

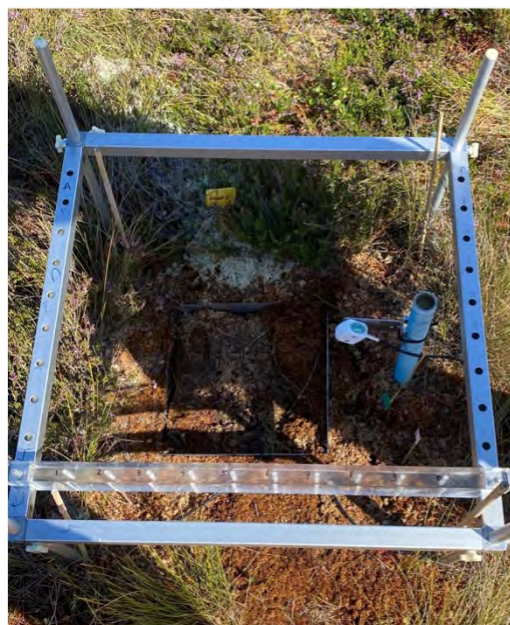


Figure 3: A pinpoint quadrant placed over a plot for the vegetation survey. The plot is covered by peat mosses (*Sphagnum medium* and *Sphagnum rubellum*). The vascular plants are removed. Photo: Yvet Telgenkamp

that environmental climatic changes alter the composition of plant and microbial communities. Moreover, plant-microbe interactions change faster due to environmental and climatic changes than alterations in the respective communities (Robroek et al., 2021).

In my investigation, I aim to study the impact of these altered interactions and will concentrate on the functional aspects. Hence, I will regularly monitor plant and microbial functional composition, which I hope to link to CO₂ and CH₄ fluxes using state-of-the-art techniques. I intend to build a predictive framework for plant-microbe interactions in peatlands, the changes therein, and how this affects the carbon cycle in these fascinating ecosystems.

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Literature

- Allesina, S. et al. (2009). Functional links and robustness in food webs. *Phil. Trans. R. Soc. B* 364: 1701-1709.
- Bardgett, R. D. et al. (2013). Hierarchical responses of plant-soil interactions to climate change: consequences for the global carbon cycle. *J. Ecol.* 101: 334-343.
- Dieleman, C. M. et al. (2015). Climate change drives a shift in peatland ecosystem plant community: implications for ecosystem function and stability. *Global Change Biol.* 21: 388-395.
- Gorham, E. (1991). Northern

peatlands: role in the carbon cycle and probable responses to climatic warming. *Ecol. Appl.* 1: 182-195.

Hagedorn, F. et al. (2019). Above- and belowground linkages shape responses of mountain vegetation to climate change. *Science* 365: 1119-1123.

Lindo, Z., Nilsson, M. C., & Gundale, M. J. (2013). Bryophyte-cyanobacteria associations as regulators of the northern latitude carbon balance in response to global change. *Global Change Biol.* 19: 2022-2035.

Nichols, J. E., & Peteet, D. M. (2019). Rapid expansion of northern peatlands and doubled estimate of carbon storage. *Nature Geoscience* 12: 917-921.

Norby, R. J., Childs, J., Hanson, P. J., & Warren, J. M. (2019). Rapid loss of an ecosystem engineer: sphagnum decline in an experimentally warmed bog. *Ecology and Evolution* 9: 12571-12585.

Morriën, E. et al. (2017). Soil networks become more connected and take up more carbon as nature restoration progresses. *Nat. Comm.* 8: 14349.

Ratcliffe, J. L. et al. (2020). Northern peatland depth and lateral expansion is inconsistent with a 1055 GtC estimate of carbon storage. *EarthArXiv*.

Rillig, M. C. et al. (2019). The role of multiple global change factors in driving soil functions and microbial biodiversity. *Science* 366: 886-890.

Robroek, B. J., Jassey, V. E., Payne, R. J., Martí, M., Bragazza, L., Bleeker, A., ... & Verhoeven, J. T. (2017). Taxonomic and functional turnover are decoupled in European peat bogs. *Nat. Commun.* 8: 1161.

Robroek, B. J., Martí, M., Svensson, B. H., Dumont, M. G., Veraart, A. J., & Jassey, V. E. (2021). Rewiring of peatland plant-microbe networks outpaces species turnover. *Oikos* 130: 339-353.

Schleuning, M., Fründ, J., Schweiger, O. et al. (2016). Ecological networks are more sensitive to plant than to animal extinction under climate change. *Nat. Commun.* 7: 13965.

Seward, J., Carson, M. A., Lamit, L. J., Basiliko, N., Yavitt, J. B., Lilleskov, E., ... & Bräuer, S. (2020). Peatland microbial community composition is driven by a natural climate gradient. *Microbial Ecology*, 80: 593-602.

Yu, Z., Loisel, J., Brosseau, D. P., Beilman, D. W. & Hunt, S. J. (2010). Global peatland dynamics since the Last Glacial Maximum. *Geophys. Res. Lett.* 37: L13402.

New articles in Mires and Peat

Effects of electron acceptors on CH₄ emission in alpine wetlands by Y. Yang, B. Niu, X. Yang, G. Huang, Y. Li, H. Jiao, A. Yasin, W. Hou, G. Zhang

Outline of the new palaeo plotting program P4 by A. Blundell

Effect of soil properties on soil respiration in cultivated soils with varying organic matter content by K. Lång, V. Hetmanenko

Effects of human disturbance on above-ground carbon stocks in north-west Amazonian *Mauritia flexuosa* peat swamp forests by Y. Quinteros-Gómez, M. Zarco-González, D. Gómez Ticerán, Á. Endara-Agramont, O. Monroy-Vilchis

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Ecological and biogeochemical benefits of environmental enhancements at Moorlinch on the Somerset Levels

This project aims to develop a comprehension of the biogeochemical changes caused by the addition of environmental enhancements and wetland creation, to provide a better understanding for

future restoration plans on the Somerset Levels lowland peatland. The Somerset Levels are an area of degraded lowland peatlands that have been drained for agricultural uses such as lowland grazing or crops. The drive for peatland restoration

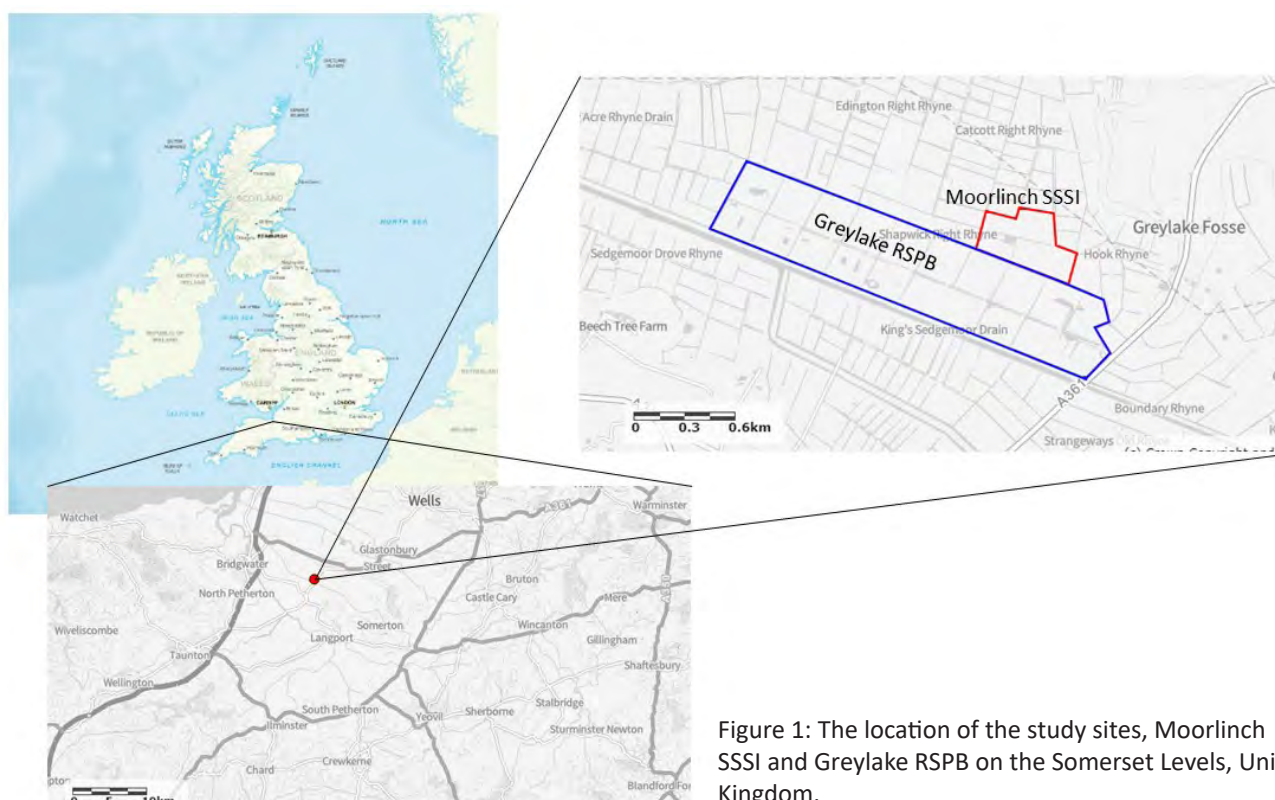
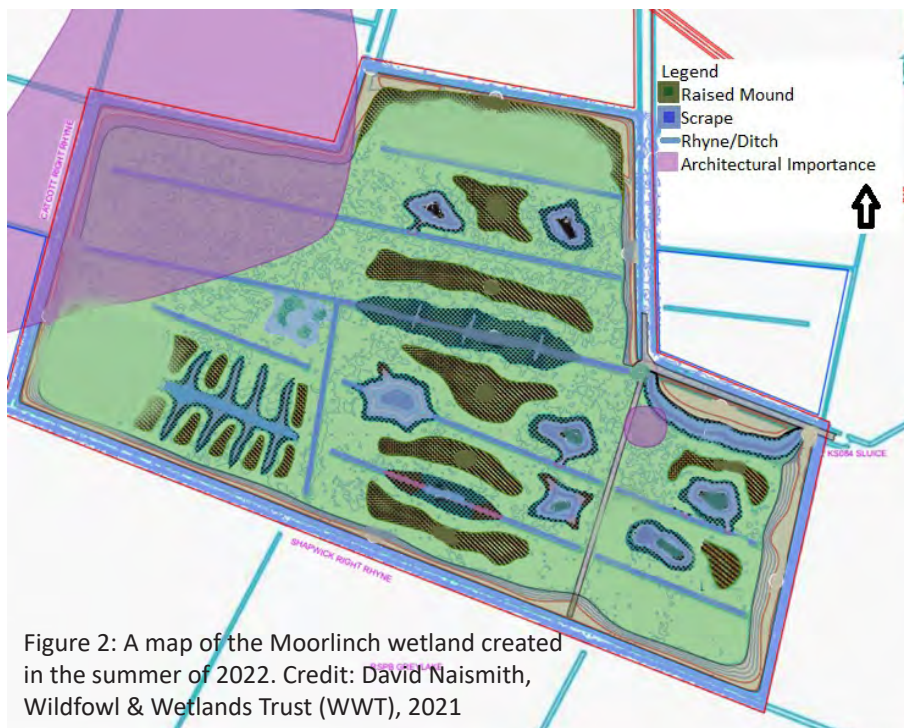


Figure 1: The location of the study sites, Moorlinch SSSI and Greylake RSPB on the Somerset Levels, United Kingdom.

has grown due to increasing climate change pressures such as the need for carbon storage, natural flood management and water quality improvements.

As the Somerset Levels are only a few metres above sea level, the area is prone to flooding, and in the winter of 2013 it experienced extreme flooding events. The water quality across the Somerset Levels is considered to be “in unfavourable decline”, particularly due to the high phosphorus concentrations from agricultural pressures and sewage effluent overflow.



This project is exploring how the creation of a wetland located on drained agricultural lowland with high phosphorus concentrations would respond to raised water levels and the addition of different wetland features, such as scrapes and pools. The study focuses on two lowland peatland sites on the Somerset Levels, including Moorlinch, a Site of Special Scientific Interest (SSSI) (16 ha) and Greylake, a Royal Society for the Protection of Birds (RSPB) reserve (110 ha).

Both the Moorlinch and Greylake sites are drained with a series of ditches called rhynes which are utilized to control the water levels across the Somerset Levels. The Greylake site is situated next to Moorlinch and separated by the Shapwick Right Rhyne (Figure 1).

Moorlinch underwent a wetland creation in 2022 and Greylake has been employed as a control site throughout the project. Greylake has 20 drained fields with varying water levels, with some that are comparable to the Moorlinch site pre-wetland creation. There are several components to this project which involve analysing the changes in vegetation biodiversity, monitoring water quality pre- and post-wetland creation, exploring phosphorus contamination removal potential using paludiculture, and examining the gas exchange.

The water quality parameters (starting in 2021, pre-wetland creation) were measured monthly

on Moorlinch and once per season on Greylake to reduce disturbance to the birds using the RSPB site during overwintering and breeding seasons. Ten dipwells were installed on Moorlinch and 18 on Greylake to sample porewater alongside sampling the rhynes and any pools or scrapes. The dissolved oxygen, redox potential, temperature, pH, water level, and monthly rainfall were recorded. We investigated soluble reactive phosphorus, total nitrogen, and iron (both Fe²⁺ and total iron) and included the spectrophotometric determination of iron/soluble reactive phosphorus/nitrates with colorimetric analysis.

Between July and November 2022, the wetland creation took place on Moorlinch, which involved constructing three connected scrapes, three unconnected scrapes, four ditch expansions, more than seven raised areas, and a raised bund around the site to improve water storage on site and raise the water levels (Figure 2).

Water monitoring will continue into 2023 to provide post-wetland creation data. The results so far have supported that the water quality is poor across both sites, exceeding the water quality standards of 0.1mg/l by more than 10x during the summer periods. The topography of the site has also influenced nutrient accumulation in the lower-lying areas where water levels are higher all year round and it is predicted that the anoxic conditions in these more waterlogged areas are



Figure 3: The gas monitoring equipment installed onto Greylake RSPB. Picture A is the collars in the field with higher water levels, the ground is poached from people and cattle so a fence has been installed around both collar sites to reduce disturbance. Picture B is the collars in the field with lower water levels.

potential paludiculture wetland species currently suggest that *Typha latifolia* is one of the most efficient species in terms of phosphorus storage and potential removal if cropped.

Funding from the IPS Allan Robertson Grant has been used to supplement the project resources by assisting with transport costs and most importantly helped fund gas

causing more phosphorus to be released from the reduction of Fe³⁺ to Fe²⁺. Water quality data collected in 2023 will be used to test whether the raised water levels all year round will increase soluble reactive phosphorus concentrations across the site.

These data have also been combined with soil nutrient profile data on Moorlinch to investigate how much phosphorus is stored within the peat soil and the depths at which it is stored. Soil samples were taken across the Moorlinch site 10-20cm, 30-50cm, and 100cm below ground level in addition to ten 40cm soil cores. Carbon, hydrogen, and nitrogen (CHN) and X-ray fluorescence spectroscopy (XRF) analysis was used on the soil samples. The results suggested that the phosphorus contamination remained predominantly in the top 30cm of the soil and from this the estimated phosphorus storage potential in the top 30cm in the soil was calculated. Vegetation surveys have taken place in 2021 and 2022 looking at the effects of water fluctuations on the vegetational species and how sensitive these species are to changes. A total of 90 quadrat samples taken from both Moorlinch and Greylake were paired up with water level data collected from the dipwells over the 2021-2022 survey year to test for any differences in vegetation whether the water levels were above or below ground level.

The results so far imply that some species, such as *Mentha aquatica* and *Oenanthe sarmentosa*, are sensitive to water level fluctuations, whereas *Glyceria fluitans* and *Juncus effusus* showed resilience. This can help with providing data on the appropriate water levels needed to reach the vegetation community restoration goals. Further nutrient analysis using CHN and XRF methods on

monitoring equipment that was installed on Greylake in November 2022 (Figure 3).

Six of the nine collars have been installed onto “wet” (water level above ground level) and “dry” (water level below ground level) peatland fields in Greylake. The remaining three collars will be on floating rafts on open water pools. These will be involved in the next stages of the project looking at CO₂ flux data which will be collected over the next year, 2023, to examine the influence of the water level fluctuations across the Somerset Levels and the impact on carbon loss and climate change.

These lowland agricultural peatlands are at risk of degrading further, and with climate change pressures continually increasing, the need for natural flood management, water storage and carbon storage has become even more important. The findings from this project will assist in future lowland peat restoration project strategies, recommend suitable plant species for paludiculture as a solution for phosphorus removal, and deliver solutions to improve water quality and storage, plant biodiversity, and carbon storage across the Somerset Levels.

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(2021).

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Programm:

09.30 UHR	Besucherregistrierung und Begrüßungskaffee
10.00 UHR	BEGRÜSSUNG Philip Testroet , Referatsleiter Gartenbau und Umwelt, IVG
10.10 UHR	BEGRÜSSUNG Vertreter*in des Bundesministeriums für Ernährung und Landwirtschaft
10.30 UHR	POLIT-TALK zu wirtschaftlichen Auswirkungen der Torfreduktion
11.30 UHR	Kaffeepause
12.00 UHR	SCIENCE SLAM 6 Expertinnen und Experten stellen ihr Forschungsfeld innerhalb von 10 Minuten anschaulich vor
13.00 UHR	Mittagspause

	SUBSTRATINDUSTRIE DER ZUKUNFT Tom Huijs , Kekkilä-BVB, „Innovation Paludikultur von Torfmoosen“
14.30 UHR	Marco Zevenhoven & Hein Boon , RHP & Responsibly Produced Peat, „Sustainable sourcing of components for growing media? Make it transparent and communicate!“
	Dr. Dieter Lohr , Hochschule Weihenstephan-Triesdorf, „Torfverzicht bei Blumenerden – Herausforderung für Hersteller, Handel und Verbraucher“
16.00 UHR	SPONSORENBLOCK (ELEVATOR PITCH) Die Hauptsponsoren stellen sich kurz vor
16.30 UHR	KEYNOTE Rüdiger Maas , Institut für Generationenforschung, „Generation Thinking am Beispiel der Generation Z“
17.00 UHR	Ende der Veranstaltung

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Finding an optimal nitrous oxide sampling strategy using dynamic chambers: A struggle at the detection limit

Introduction

When performing nitrous oxide (N_2O) flux measurements on a non-fertilized grassland located on a drained fen, we observed very low emissions. Since the time in which we could use our gas analyser for chamber measurements was shared with a relaxed eddy accumulation system and thus limited, we wanted to optimise the sampling strategy by utilising a short measurement duration that still ensures that flux measurements are above the system's detection limit.

Many studies have evaluated the sources of flux estimation uncertainties in manual chambers. The roles of chamber design, manual chamber placement, sampling strategy, sampling frequency, and model selection with regard to flux measurement uncertainty are among the topics widely discussed.

However, less attention has been directed to how the duration of each individual measurement influences the uncertainty of the flux estimate or the implications of the number of gas concentration measurements taken per chamber measurement. Both are highly relevant for the

system's detection limit. In our examination, we set out to investigate the interaction between the measurement duration, the detection limit and the concentrations taken per flux estimate by using actual N_2O flux measurements and comparing them to simulated fluxes.

Methods

We used a gas analyser to measure 500 gas concentrations of N_2O per

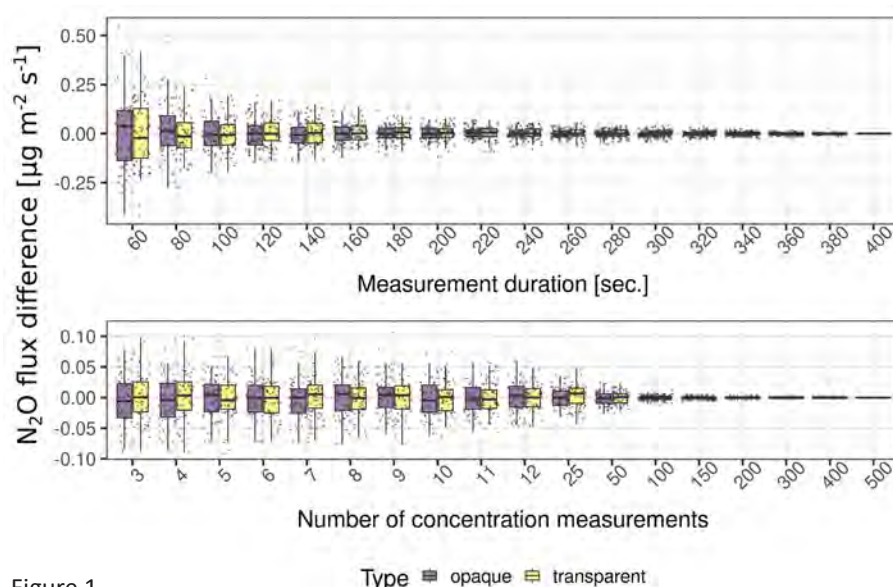
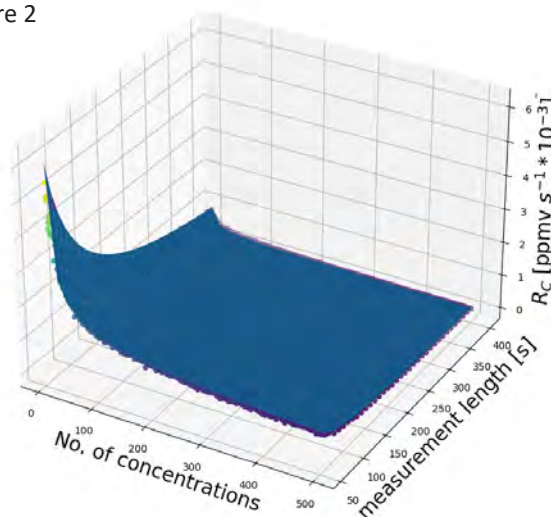


Figure 1



Figure 2



measurement duration of 400 seconds for transparent and opaque chamber measurements. We then reduced the full data set by (i) the measurement durations or (ii) the number of concentration measurements, in order to estimate the uncertainty and bias introduced by the respective reduction. Additionally, we proposed a simple and convenient method based on Monte Carlo simulations of flux data to calculate the minimum measurement duration necessary for flux measurements and the minimal number of concentrations per flux while considering the analyser's precision and the system's detection limit.

Results

In Figure 1, one can see how the precision of the N_2O flux estimates decreases with shorter measurement durations and with fewer concentrations per flux estimate.

In Figure 2, the simulated data are plotted and reveal the relationship between the measurement duration, the system's detection limit and the number of concentrations per flux. A simple three-dimensional (3D) surface model could be fitted to the data: $z = a * x^b * y^c$.

With additional information about the analyser's precision and the effective chamber height, we can now calculate the chamber system's detection limit, the minimal measurement length or the number of concentrations that need to be used to obtain a desired flux magnitude. Since the shape of the 3D surface is the same for methane, this method can also be utilised to optimise methane measurement strategies.

Conclusion

Our findings allow for improvements in study designs to achieve efficient gas flux monitoring. By using our method to optimise the measurement duration and number of concentration measurements per flux in relation to the system's detection limit, important decisions concerning resource allocation (i.e., the time and number of chambers) can be taken more efficiently.

Acknowledgements

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For further information, please refer to our submitted article:

Keck, H., Meurer, K.H.E., Fiedler, J., Grelle, A., & Jordan, S. (Submitted). Optimisation of sampling strategy for greenhouse gas flux estimations using dynamic chambers and fast analysers.

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Accelerating Substrate Production with the Wood Fiber Machine

Press release: Amidst the growing demand for wood fiber to complement soil mixes, Premier Tech introduces right now its brand new BPE Series Wood Fiber Machine.

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For more information, visit our product page at <https://www.ptchronos.com/wood-fiber-machine> or email us at info@ptchronos.com.

Premier Tech



Photo: Wood Fiber Machine courtesy of Premier Tech System and Automation

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<https://suopotkupallo.fi/in-english>

Swamp Volley Championship
Haukivuori, Finland
28 - 29 July 2023
<https://swampvolley.com>

Baltic Peat Producers Forum
Tallinn, Estonia
9 - 11 August 2023
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Prospects for Mire Protection in Lower Saxony
with focus on forest peatlands
Uslar/Volpriehausen, Germany
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www.dgmtev.de

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Excursion: Svaeland's Peatlands along the Limes
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25 August - 1 September 2023
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Management (with focus on peatlands)
Helsinki, Finland
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19 - 21 September 2023
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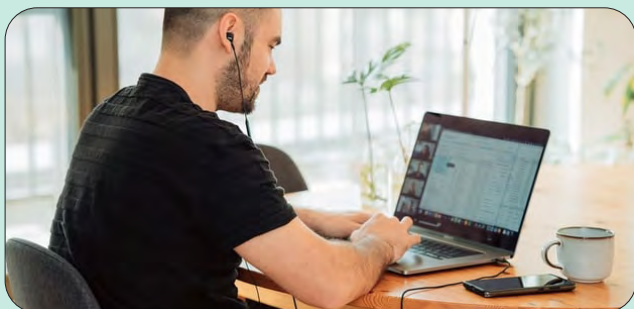
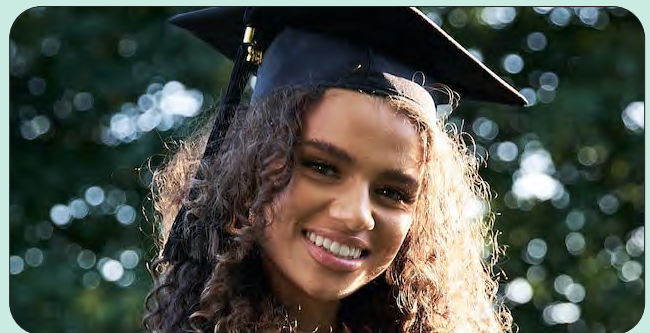
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