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International Peatland Society

Restoration, Sphagnum Farming and Québec RE3


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Editorial

Dr Berglund signing his work contract on paper in Jyväskylä on 8 March. Photo: Susann Warnecke

From the Desk of the new IPS Scientific Officer

Arriving in Jyväskylä on 6th March for the Executive Board (EB) meeting was an excellent start to my position as IPS Scientific Officer.

Secretary General Susann Warnecke had planned a well-organized programme, which not only allowed me to meet the EB, but also to talk with representatives from Neova Group and discuss peat research with Honorary President, Professor Emeritus Juhani Päivänen. He was also one of the evaluation committee members who assessed my dissertation many years ago.

Over the next few months, I plan to reach out to IPS' Commissions, Expert Groups and National Committees to introduce myself, understand how I can contribute to the growth of the Society and hear your thoughts on where we should focus, both in the short and long term.

There is already much to plan and prepare.

Recently, EB member Sabine Jordan and the Swedish Peat Research Association, "TorvForsk," organized a conference titled "Rewetting of drained peatlands and peat extraction sites in Sweden - consequences for climate, ecosystems, and society," which was well-attended. However, there were some security concerns beforehand due to wetland activists' actions in Sweden.

Peat soils and rewetting are gaining public and political attention.

In Scotland, the government is considering a ban on peat usage in horticulture and in Sweden, the forest agency is taking on a governmental assignment to rewet 100,000 hectares of forest by 2045.

Peat is a hot topic, and the IPS plays a crucial role in bringing science and knowledge to the table. Making decisions based on evidence is vital, and

Peatlands International is the global magazine of the International Peatland Society (IPS). It provides the more than 1,500 individual, institute and corporate members of the Society with up-to-date information on peat and peatland matters, reports and photos of conferences and workshops, background reports and publication reviews. To serve all of our members, we provide always a good balance between economic, social and environmental points of view. Opinions are those of the authors. To receive Peatlands International in your email every three months, visit **www.peatlands.org/join-us** and sign up as a member - or easily **subscribe** for € 59/year via our online shop.

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International Peatland Society
Nisulankatu 78 B 6
40720 Jyväskylä, Finland
phone: +358 40 418 4075
email: ips@peatlands.org

Editor-in-Chief & Layout:
Susann Warnecke, Secretary General

Editorial Board:
Lydia Cole, United Kingdom
Marie-Claire LaBlanc, Canada
Jean-Charles Michel, France
Juhani Päivänen, Finland
Jack Rieley, United Kingdom
Jos Schouwenaars, the Netherlands

Are you interested? Contact
susann.warnecke@peatlands.org.

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more evaluations of previous actions are needed. Valid measures should be taken to create the most benefit for the least cost.

Having been an IPS member for at least 20 years, I am still fascinated by the organization's scope, from peat and peatland perspectives to geography. I look forward to learning more and visiting more peatland areas.

Over the next few months, I will be presenting at a workshop in England, attending the MERLIN meeting in Scotland, listening to peat research at the general assembly of the European Geosciences Union (EGU) in Austria, participating as an observer on the Ramsar Scientific and Technical Review Panel in Switzerland and measuring greenhouse gas (GHG) emissions from my peat research sites in Sweden.

In the middle of June, I will be presenting details of the work of the IPS at the RE3 conference in Canada. I hope to see you there!

Örjan Berglund

IPS Scientific Officer
orjan.berglund@peatlands.org

Peatland restoration at Scohaboy SAC, Tipperary, Ireland. Photo: Gearóid Ó Foighil | Send your pics to ips@peatlands.org!

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IPS Secretariat
Nisulankatu 78 B 6
40720 Jyväskylä
Finland
peatlands.org

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Open Letter of the IPS Commission Peatlands and the Environment

To the IPS and whom it may concern

The world's peatlands are of great importance regarding the current challenge of climate change mitigation, owing to their large carbon storage capacity. The importance of peatlands is greater than is generally recognised in the public consciousness. These facts are beginning to be acknowledged at political level, thanks to the important work of many experts across different disciplines, including the IPS.

The UNFCCC Paris Agreement sets out a global framework with the aim of avoiding dangerous climate change by limiting global warming to well

Rewetted peatland in Ireland, Co Mayo. Photo: Susann Warnecke

below 2°C and striving to limit this further to 1.5°C. The agreement also aims to strengthen countries' ability to deal with the impacts of climate change and to support them in their efforts.

As a current example of the resulting developments, consider the UNEP's Global Peatland Assessment of November 2022[1], which provides a better understanding of what peatlands are, where they are found, what condition they are in and how action can be taken to protect, restore and sustainably manage them.

This goal also means a huge upheaval in terms of the use of peatlands. The consequences are already clearly visible today:

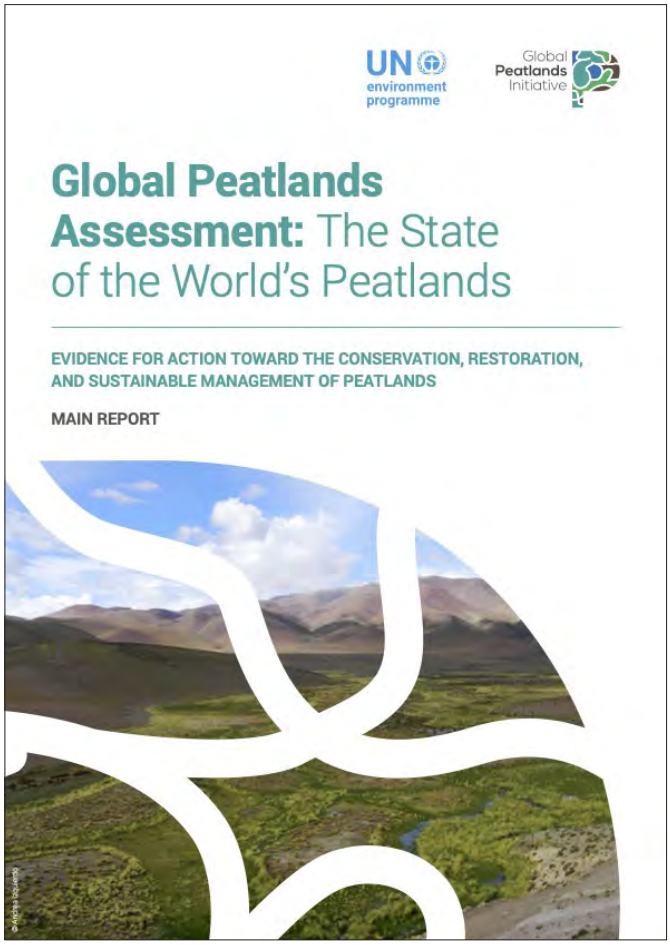
- In Northern Europe, the use of energy peat is declining dramatically[2].
- In some European countries, the end of the use of peat for growing media for the hobby market is planned in the near future.
- The extensive phasing out of peat use in professional horticulture is on the political agenda of some European countries.
- There is a need to promote prompt and active restoration, not simply rewetting impacted peatlands.

For more than 50 years, the IPS has been the leading global organisation promoting a balanced and unified path for economic stability, environmental protection, as well as social inclusion, to ensure a responsible future for the world's peatlands and their use.

The scope of the IPS is global and encompasses all types of peatlands. This is the core of the IPS' vision (Strategic Plan of the International Peatland Society 2020-2024, https://peatlands.org/document/ips-strategic-plan-2020-2024).

If this is the claim and the self-image of the IPS, then the organisation must develop a concept to achieve the goals of the Paris Agreement.

A first chapter of the IPS Concept 2050 should focus on peat extraction and peat use. Even if the GHG emissions from this peat use play a minor role, they are in the focus of the socio-political discussion, and the competence of the IPS should



UNEP's Global Peatland Assessment.

be used for the development of a scientifically based, balanced and realistic Peat Concept 2050.

The new Scientific Officer of the IPS, Dr Örjan Berglund, should work together with the Scientific Advisory Board (SAB), the Expert Groups (EGs) and the National Committees (NCs) on this concept.

Bernd Hofer

Chair of IPS Commission Peatlands and the Environment
hofer@hofer-pautz.de

Footnotes

[1] Global Peatlands Assessment: The State of the World's Peatlands | UNEP - UN Environment Programme: www.unep.org/resources/global-peatlands-assessment-2022

[2] The Russian war of aggression in Ukraine resulted in the resumption of energy peat use, but this is likely to be only a temporary development.

Up North - The IPS Executive Board's Visit to Jyväskylä

At the first dinner during the Executive Board's (EB) visit to Jyväskylä, one of our Board members asked me "Why do so many people travel here? What is going on, and why is there always a queue at the hotel desk?". I was at first puzzled by the question as this is my second hometown, 7th largest city of Finland, and it has 140,000 inhabitants, but then quickly realised that it must indeed be strange to arrive at a city that is so far north from a global point of view, and located in the middle of seemingly endless forests and deeply frozen lakes. What are people doing here?

Well, Jyväskylä is primarily a centre of education. The first Finnish teachers were trained here, after the importance of Finland's own language and culture were realised, following centuries of Russian and Swedish rule.

The University of Jyväskylä participates in domestic and international collaborations, and the Jyväskylä University of Applied Sciences as well as Gradia Educational Consortium also contribute to know-how and development. Approximately 42,000 students are learning here. We also host a number of important sporting events and conduct research

IPS Board members and staff, Marko Pomerants, Örjan Berglund, Jack Rieley, Donal Clarke, Anna-Helena Purre, Giedrius Kavaliauskas, Tuija Vähäkuopus, Bernd Hofer and Susann Warnecke (left to right), at the Harju Natural History Museum. Photo: Saija Vuorenmaa

in sport science. Rallying, skiing, hockey and baseball are only a few examples. Many international companies operate in the area, such as Harvia, Neova and Valmet. And last but not least, Jyväskylä is the home of the headquarters of the International Peatland Society, the IPS Secretariat.

Briefing of the Scientific Officer at the IPS Secretariat. Photo: Susann Warnecke

Most of the 11 Executive Board members and the new Scientific Officer (SO) thus travelled by plane, train or boat to visit the Secretary General, who had the joy of putting an interesting programme together. As Anna-Helena Purre noted, this is not easy in March when all the peatlands are covered by snow. But we did it, with plenty of time to talk, get to know each other and refresh our memories after almost three years of virtual meetings.

On 6 March, Jack Rieley, the 2nd Vice Chair, held a briefing for the SO, Örjan Berglund, which was also attended by the Secretary General as well as EB members Sabine Jordan and Giedrius Kavaliauskas. Tasks were assigned and the participants jointly considered how the enormous amount of work could be shared without losing valuable assets. The Estonian, Irish and German representatives also joined us later, for dinner at our hotel.

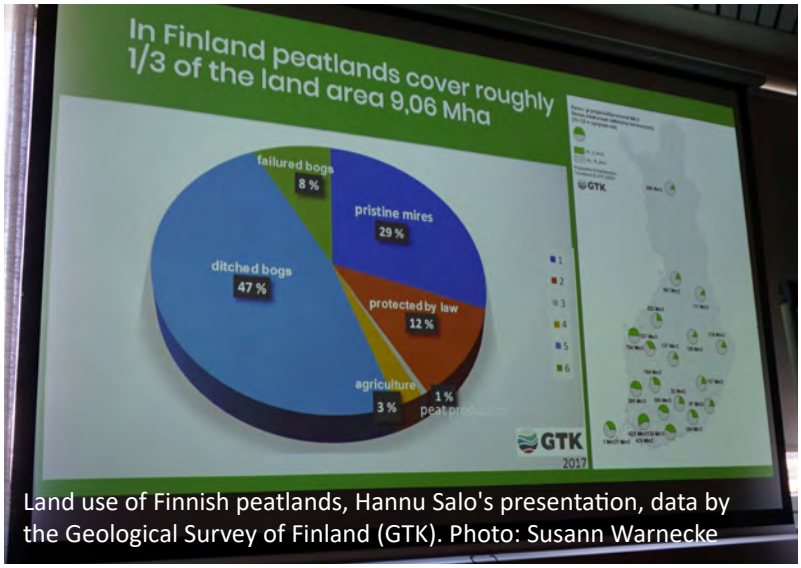
The formal EB meeting took place on the second day, 7 March. Although the whole day was available, there were so many agenda items that despite all our efforts, only 10-15 minutes were left for each item. The EB met the SO for the first time in person, discussed arrangements for the International Peatland Congress (IPC) 2024 in China, approved a move of the host city from Changchun to Taizhou and evaluated possible host National Committees for IPC2028. The Board members also agreed on details of the IPS participation in the Reclaim, Restore, Rewild (RE3) conference in Québec, approved the six winners of the Allan Robertson Grants for 2023, and took proposals by the Scientific Advisory Board into consideration.

Formally approving the annual report and finances for 2022 was also on the agenda, as well as the acceptance of the plan of activities and membership fees in addition to the budget for 2023-2024 for submission to the Annual Assembly.


During the Executive Board meeting. Photo: Susann Warnecke

Before lunch, Pasi Rantonen and Päivi Peronius of Neova Oy as well as Hannu Salo of Bioenergia ry enlightened us with interesting presentations on their current work and potential areas for cooperation.

In the afternoon, the EB decided on the agenda items of the National Committee Round Table and delegated members to participate in various peat- and peatland-related events in the course of the year. As usual, the EB also dealt with the progress of the Horizon 2020



Land use of Finnish peatlands, Hannu Salo's presentation, data by the Geological Survey of Finland (GTK). Photo: Susann Warnecke

A joint excursion took place on 8 March. The cosy minibus took us from the hotel to the IPS Secretariat, where the EB enjoyed refreshments, obtained snacks for the day and signed a few official documents. The trip then continued to Harju Natural History Museum only a few hundred metres uphill, where Saija Vuorenmaa introduced us to the Finnish flora, fauna and geology. Even a small mire was on display behind glass and the visitors could see bears, a wolverine, lynx, crane and a moose as well as many birds and fish in their true size.

Merlin project and discussed areas for cooperation with related organisations. Convention participation in, e.g., Ramsar and the UNFCCC COP28 was addressed. The EB also strengthened its Peatlands and Economy Commission by appointing new interim Chairs, and approved new members in countries without National Committees. The details were communicated via *Peatland Snippets* in March.

Inspiring discussions continued in more detail during the breaks and in the evening when most of us tested out the new Sataman Viilu sauna. Later on, a dinner with our Finnish honorary members and guests was held at the same venue. It was a joy on both sides to meet previous Secretary Generals Raimo Sopo, Jaakko Silpola and Honorary President Juhani Päivänen again, after many years!

The next destination was Viherlandia. Jyrki Tahvonen talked about the business of this popular garden centre in general, in addition to the importance of peat, bog biomass and alternatives for growing roses, house plants and summer flowers, as well as the establishment's heating, which comes from the Rauhalahti biomass plant nearby. Peat is still essential for many growers, which was confirmed during our visit. Coir and stone wool are also used, but need certain adjustments and special recycling. The visitors enjoyed a delicious lunch and were amazed at how popular that place is, especially in wintertime.

The final peat destination for the day was the Alva combined heat and power (CHP) plant at Keljonlahti. Alex Schreckenbach explained very clearly how peat, wood and other biomass, as well as small amounts of oil and coal, are co-combusted for the central heating of the city and, if prices are suitable, energy generation. The use of peat is especially important during the sometimes extremely cold months of January and February.


Dinner with honorary members and guests. Photo: Hannu Salo

However, emissions trading has caused a shift to wood and other materials as far as they are available. Alva Group plans to be carbon-free by 2030. After the discussion we were able to climb up the many floors, through the turbine room and onto the roof of the

Tuija Vähäkuopus and Bernd Hofer exchanging ideas in front of pots of young pelargonia. Photo: Susann Warnecke

Flowers waiting for the outdoor season. Photo: Susann Warnecke

plant which was very interesting (and hot!) for most of the EB who mainly deal with either pristine peatlands, restoration or horticulture.

The afternoon and evening were spent on further networking during our coffee break at Toivolan Vanha Piha, a small but beautiful old wooden house area, and at an exciting match played by the local ice hockey team, JYP vs. KooKoo from Kouvola (we won).

This was greatly needed as an incentive after many years of hard and distance work for most of the EB members. I warmly thank them for their dedicated effort and enthusiasm.

The next EB elections will be held at IPC2024 in China, nominations to come from NCs.

Susann Warnecke

IPS Secretary General
susann.warnecke@peatlands.org

On top of the Keljonlahti CHP plant. Photo: Susann Warnecke

Final coffee break on 8 March. Photo: Susann Warnecke

Launch of a New Global Standard to Measure Greenhouse Gas Emissions from Peatlands

On 21 March 2023, a new digital protocol was launched by Terra Motion and ClimaFi for the measurement and reporting of greenhouse gas (GHG) emissions from peatlands.

The Peatland Protocol is a blockchain-based platform that uses a robust and clear digital framework to establish credible emissions accounting and reporting practices, thereby helping landowners and governments develop an emissions baseline, set mitigation goals, create more targeted climate action plans and track progress over time. Adherence to the Peatland Protocol will strengthen data reporting from these areas and enable peatland restoration projects to gain improved access to public and private, local, and international, climate financing.

"From a climate perspective, [peatlands] are the most essential terrestrial ecosystem." Tim Christophersen, Senior Program Officer, Forests and Climate, United Nations Environment Programme (UNEP)

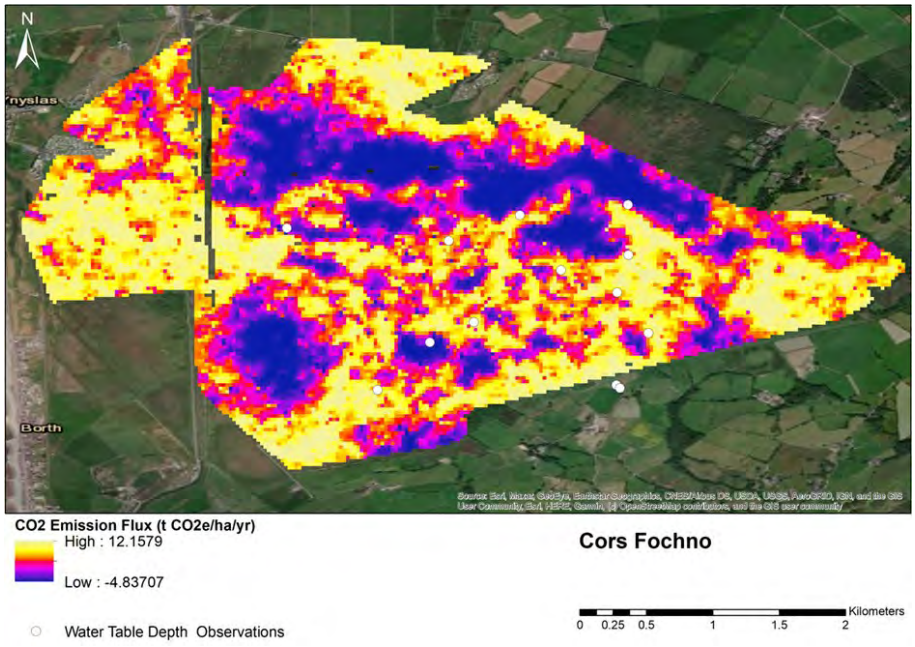


Figure 1. Carbon fluxes calculated using satellite radar observations of the Cors Fochno bog in Wales (generated in collaboration with the University of Nottingham, the University of the Highlands and Islands and the UK Centre for Ecology and Hydrology).

Peatlands can be found in almost every country and are one of the most space-effective carbon stores on the planet. Despite covering just 3% of the world's surface, they contain nearly one third of all the carbon in soil - twice as much as is stored in the world's forests.

When peatlands are drained, vast amounts of carbon re-enter the atmosphere at an alarming rate and, currently, drained peatlands are responsible for around 11% of global man-made emissions.

Restoration of peatlands, largely through a process called

're-wetting' where the water table is raised in drained areas, is a comparatively simple process and can be used to quickly, and sustainably reduce carbon loss. Re-wetting as a restoration technique, is recognised under international climate change agreements as one of the permitted activities for reducing greenhouse gas emissions.

"Restoration of peatlands is a low-hanging fruit and among the most cost-effective options for mitigating climate change." Achim Steiner, UNEP

However, peatlands have not yet met their full potential in the fight against climate change. "Until recently, there has been no consistent way to measure carbon emissions from peatlands," said Dr Andy Sowter, CTO of Terra Motion Limited. "Now that has changed. We now have a common protocol to inform strategies to cut emissions and create a better environment."

Methods used by peatland experts to estimate emissions to date vary significantly, raising questions around how common carbon principles such as those proposed by the Integrity Council for the Voluntary Carbon Market (ICVCM) and the Voluntary Carbon Markets Integrity Initiative (VCMI) can be met. With the new Peatland Protocol, restoration projects are required to measure and report a comprehensive inventory of carbon emissions. Central to the protocol is a new approach to measurement, reporting and verification (MRV).

This approach builds upon recent ground-breaking research that has successfully shown a strong correlation between the seasonal rise-and-fall ('bog breathing') of the peat as it responds to changes in rainfall and GHG emissions. Using readily available satellite radar data to measure the 'bog- breathing' and backed up by targeted observations of water table depth and surface condition on the ground, a scientifically robust, reliable, and fully auditable procedure can be implemented over large areas at low-cost.

"Innovations in MRV can help expand climate change action worldwide and unleash the potential of climate finance and the carbon marketplace to combat climate change." World Bank

The Peatland Protocol itself is a blockchain-based platform for the digital measurement, reporting and verification (dMRV) of peatland data. The Peatland Protocol is built on top of an existing L1 blockchain (Concordium) with protocol level ID that provides: a standardized validation model for verifying and managing data on the network; a geo-referenced system for quantifying and recording plots of peatland based on minting a unique Non- Fungible Token (NFT) for each project; and uses artificial intelligence (AI) to provide continuous monitoring over the lifetime of each project.

"Digital MRV will be a gamechanger." World Bank

The Peatland Protocol will finally draw attention to the powerful work that peatland restoration can do to confront climate change will help

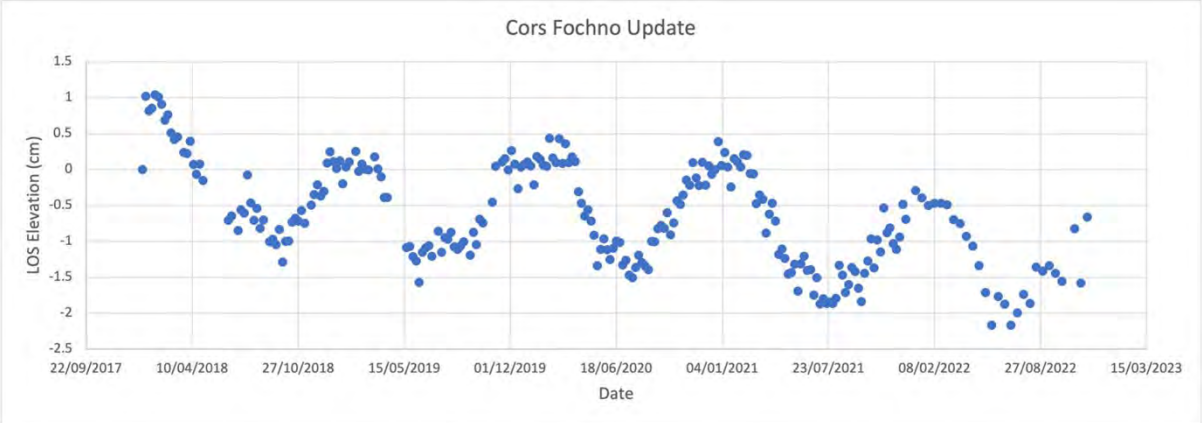


Figure 2. Typical motion on the surface of a bog ('bog-breathing') detected by satellite radar.

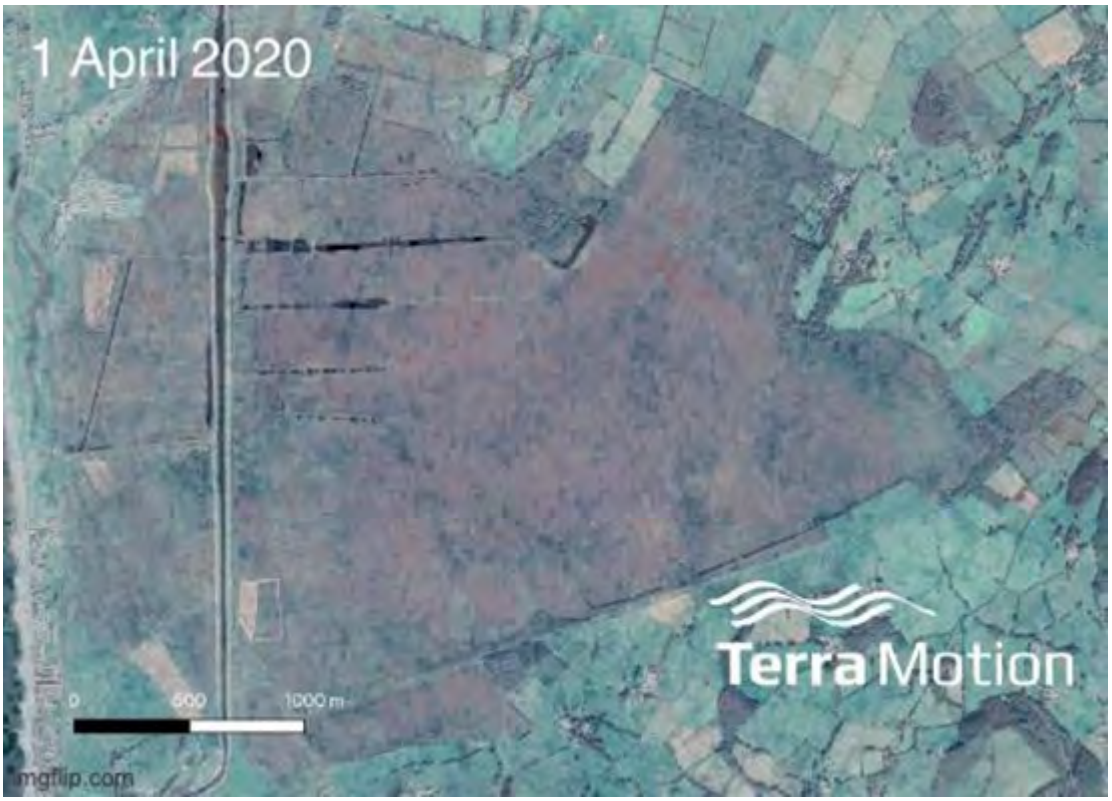


Figure 3. Animation of satellite-detected 'bog-breathing' over the Cors Fochno raised bog in Ceredigion, Wales over the course of a single year. Blue is up and red is down.

build on their progress. "The Peatland Protocol's standardised system for measuring and reporting emissions is critical to the international climate change effort," says Dave Fox, CEO of Terra Motion. "It will help peatland managers and governments see what mitigation strategies are working, better target their resources and hold themselves accountable for results. The more peatlands that use the Peatland Protocol, the greater impact they will have."

"With the launch of the Peatlands Protocol, we now have a consistent, transparent and recognised approach to measuring and reporting peatland emissions, allowing for credible comparison and aggregation across timescales and geographies," said Tim de Rosen, CEO of ClimaFi, "I strongly encourage landowners, stakeholders and investors to take up this new standard as a key step in the global fight against climate change."

Background

Terra Motion Limited is a spin-out company from the University of Nottingham. Their CTO, Dr Andy Sowter, invented a method that uses satellite radar data to measure millimetric levels of ground surface motion across all terrain types and at high resolution, including over peatlands. They have recently worked closely with the University of Nottingham, the University of the Highlands and Islands and the UK Centre for Ecology and Hydrology to jointly develop the basis for the carbon MRV approach.

ClimaFi Limited is a UK climate technology company specialised in digital, AI and blockchain solutions for carbon credit issuance, monitoring and reporting.

Tim de Rosen

ClimaFi Limited
London, United Kingdom
https://climafi.org
https://bit.ly/climafivideo
tim@climafi.org

Kevin Porter

kevin.porter@terra-motion.co.uk

Issued on behalf of the Peatland Protocol

Sphagnumfarm Barver: Lessons learned

Due to the climate debate, the waterlogging of peatlands has been gaining attention rapidly. In this context, the agricultural use of wet peatlands ("paludiculture") is also receiving increasing attention. Regarding raised bogs, the agricultural production of peatmoss biomass ("Spagnum farming") offers a new perspective for sustainable, climate friendly agriculture on peatlands, while providing high quality material for horticultural substrates or peatland restoration.

With this in mind, Interregproject CANAPE created a pilot site in 2020 (size: 1.5 ha) to trial Sphagnum farming under the regional conditions of the Diepholz district (Lower Saxony, Germany). Details on its construction and first experiences in operation have been reported in Peatlands International 02.2021 and 01.2022.

At the end of the five-year project period, many valuable experiences (but also certain technical teething problems) regarding the operation and practice of technology, as well as care and maintenance were documented. Now it is time to take stock and report on the successes and potential for improvement.

The key finding is that Sphagnum farming is possible in bog locations with suboptimal pedological and hydrological conditions. In spite of a relatively water-scarce landscape and dry, hot weather conditions, the Sphagnum lawn developed well. This gives regional agriculture the climate friendly alternative hoped for.

Of vital importance is experience with the personnel requirements with regard to the operation of a Sphagnum farm: for the

Photo 1: Production strips in the mist; waterfilled hollows showing moderate uneven microtopography. Photo: J.U. Holthuis

professional, value-preserving operation and care of a Sphagnum farm, at least two experienced or instructed persons are permanently required (part-time possible).

Under operational aspects, the permanently secured water supply (quantity and quality) plays a central role. With respect to the specific situation in Diepholz district, it is absolutely necessary to stockpile excess water in wintertime (water reservoir).

Photo 2: Small-scale differences in peat swelling. Photo: J.U. Holthuis

In addition, an active and automated hydro-management system to adjust water levels to the height of the surface (or with little and temporal flood irrigation) is necessary for the establishment and rapid growth of the peat moss lawn during the vegetation period. Despite the automated irrigation, system controls must be carried out personally (wet beds, water levels, sensor settings), especially during hot periods, since, for example, unexpected pump failures, malfunctions or damage to the system controls was experienced (e.g., a raccoon bit a sensor wire, causing irrigation to stop for several days).

Moreover, hydro-management must react quickly to seasonal meteorological conditions: active drainage of winter flooding or superficial water drains in summertime. Technical remote monitoring alone is not sufficient.

A challenge for irrigation emerged from the different lateral water permeabilities of the peat (e.g., white peat, black or compacted peat) and its dynamic response to moistening. While the planned distance of irrigation ditches in white peat (6 m) was sufficient for the complete wetting of the bed, plots with black or compacted peat obviously needed narrower trench spacings.

As this was not possible, the initial irrigation management was a trade-off between the flood irrigation of the compacted peat and the sub-irrigation of the white peat. Within the plot, the structures of former drainage ditches could help the moisture penetration of the compacted peat. However, in order to avoid water loss in the area, the underlying drainage tubes of the former ditches must be detected and deactivated completely prior to operation.

Moreover, the uneven swelling of the peat means that the polder surface rises unequally when waterlogged (Photo 2) and the peat moss does not experience the desired homogeneous moisture conditions. As this effect cannot be avoided, a moderate uneven microtopography, due to construction, is acceptable, as it promotes the naturally occurring hummock and depression gradient (Photo 1).

Regarding vegetation, the application of 50 m^3/ha is sufficient to establish the stock. The year directly after inoculation can be characterized by “survival,” followed by establishment. The visible development of the mosses’ lawn started in the second year, with only some plots showing retarded and/or patchy growth (suspected reasons: reduced water availability due to peat swelling, missing nursing plants).

With the second growing season, the management of vascular plants (predominately rushes and graminoids) became more challenging. Weed control was conducted in a time-consuming manner using a brush cutter, as there was no mowing machinery available, which could work on-site.

This weak point of care (and harvest) management illustrates the need for the development of multipurpose, high performance wetland machinery, able to act on swampy surfaces without causing damage.

The mowing of the surrounding grassland and causeways was carried out by machines. Here, the mechanical mowing of the peripheral dams proved to be more difficult (sloping surfaces), and the question of their necessity arose, as they are not required for water damming. Their absence provides more space to the culture area, facilitates site maintenance and minimizes GHG emissions at the same time.

Regarding the effects on the environment, the rate of CO_2 emissions of the entire system almost halved after rewetting from 31.5 t CO_2/ha/a to 17.9 t CO_2/ha/a (estimated by the modified GEST 2.0 approach). This proves that wet farming offers enormous opportunities for peat-rich regions to meet their commitment to reduce GHG emissions.

The outflow of the adjacent receiving watercourse could be reduced by approx. 12,000 m^3/a by using it to irrigate the mosses. In this way, otherwise "lost" water is kept on site, thus increasing the local water cycle. This is of special interest in the context of increasing droughts, endangering drainage-based farming. Additionally, whilst still a monocultural agricultural field, the Sphagnum polders have quickly developed to become a man-made habitat of highly endangered or red list moor species. This is also appreciated by the neighbours for the purposes of local recreation and by nature guides who bring interested tourists.

The most significant failure of this project concerns its unrealistic original funding, which made time-consuming corrections/reductions necessary. Orientating the preliminary price enquiries of individual budget items and planned reserves would have helped this and estimations should not be accepted (here: construction costs soared, when it was discovered that the actual removed topsoil was significantly more than estimated).

In addition to investment costs, operating and management costs, as well as contract expenses, must be guaranteed. These are the typical setbacks of a R&D system operating without any previous experience and should be communicated without discrimination to the network and colleagues working on this project.

To conclude and to give an overview of the project, it can be said that the demonstration of Sphagnum farming under the regional conditions of the Diepholz district has been successful.

With current experience, future systems will probably be designed in a simpler way: reduced topsoil removal (saving money and GHGs), dispensing with the surrounding causeways (easier access and vegetation management, reduction of GHGs) and fewer and shallower troughs (easier maintenance and harvest management, reduction of GHGs).

During the course of the project, public awareness of paludiculture and climate-related issues has been stimulated. Know-how and a network of regional stakeholders, companies, authorities and academic institutions have been established, which will significantly speed up processes in the future and make them cheaper.

Although the CANAPE project was wrapped up last year, this will not be the end of the road for our work at Barver Moor. The site will continue to be used as a scientific testbed and practical demonstrator in a forthcoming project, as part of the growing paludiculture movement around the world.

Dr Jens-Uwe Holthuis

Foundation for Nature Protection in
the Diepholz District
Project manager of Sphagnumfarm Barver
Europäisches Fachzentrum für Moor und Klima
Auf dem Sande 11
D-49419 Wagenfeld-Ströhen, Germany
jens-uwe.holthuis@diepholz.de

GHG emissions from the extraction and use of peat in mushroom casing soil

Compared to the agricultural use of peatlands and their direct rewetting

Introduction

This study compares three different scenarios comparing greenhouse gas (GHG) emissions from peatland and peat under different uses[1]. These are (1) the continuation of agricultural use[2] (red line), (2) the rewetting of agricultural used peatland (blue lines) without removal of the topsoil and (3) the extraction and use of peat in mushroom casing soils, followed by its subsequent use as champost[3] (on-site: green line, off-site: brown dotted line).

Results of the study

The main finding is that the extraction and use of peat in casing soils, with its subsequent use as champost, released significantly lower GHG emissions than the continuation of agricultural use.

Direct rewetting of agricultural peat soils without the removal of the upper topsoil layer is also inferior from a climate-ecological point of view,

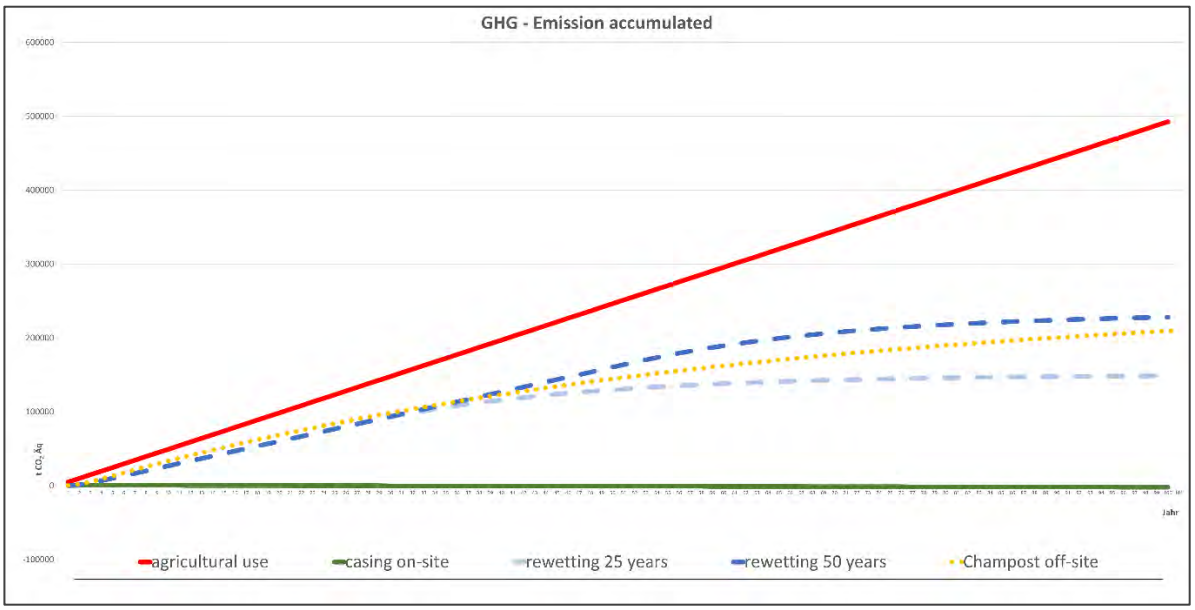


Figure 1: GHG-emissions accumulated over 100 years in relation to the different uses of a peatland site (calculated on a sample area of 100 ha)

owing to the high emissions of methane and nitrous oxide in the short to medium term. The duration of these emissions has not been researched. Therefore, two scenarios are presented: a decrease after 25 years and after 50 years.

The third option embraces both peat extraction, rewetting and external climate compensation, in addition to the introduction of casing soils, used several times as champost on mineral agricultural soils. In the model, extraction proceeds in three sections and is completed after three years. External climate compensation foresees the rewetting and restoration of the drained peatlands, according to defined factors by the federal state (Lower Saxony). As a result of these measures, the peat extraction site is either climate-neutral or develops into a carbon sink in the long term (green line).

The graph shows that the peat extracted for use in the casing soil, with subsequent rewetting and incorporation into champost to be applied to agricultural land, is the optimal use of agricultural peatlands in terms of efficient resource use. In addition to the economically necessary food supply, rewetting of the extracted areas is achieved, high emissions of methane and nitrous oxide emissions are avoided and the organic matter content of the mineral soil is increased at the champost site.

As agricultural use continues, GHGs are continuously released. This variant emits by far the largest amount in the model.

Immediate rewetting, without removing the agricultural topsoil, would reduce carbon dioxide emissions. However, this would lead to significantly higher methane and nitrous oxide emissions, which effectively would not result in significant GHG mitigation, relevant to climate policy.

In the modelling, casing soils, which have been used up to three times for the cultivation of mushrooms, were not given to gardeners or farmers as was previously the case. The champost (mixture of casing soil and compost), however, was incorporated into mineral agricultural soils, resulting in a greater reduction of emissions.

Mineral soils can store carbon; humus-poor (sand) soils have a particularly high absorption potential. A shift to deeper soil layers leads to the long-term storage of carbon. Owing to its high organic matter content, the use of champost will maintain and even improve soil structure and soil fertility in the long term.

Uncertainties in the modelling are:

- the behaviour of methane emissions from the rewetted agricultural topsoils in the long term.
- the release rates of the champost in the long term.

Long-term studies are lacking for both parameters.

However, the following conclusions are important:

- The high CO_2 emissions from conventional agricultural use is the worst-case scenario.
- The extremely negative climatic impact of methane emissions on a timeline is relevant for the climate policy up to 2050.

The global warming potential $(GWP)_{20}$ of methane is 84 times higher than CO_2, according to the IPCC Fifth Assessment Report. The decrease of GWP_{100} to 28 times is considerable but will only take effect at a time when, according to the Paris Agreement of 2015, far-reaching climate neutrality is achieved.

Bernd Hofer

Hofer & Pautz GbR
Buchenallee 18
D-48341 Altenberge, Germany
hofer@hofer-pautz.de

Footnotes

[1] Modelling of GHG emissions for the extraction and use of cover soils, compared to the agricultural use of peatlands, Hofer & Pautz GbR, engineering company for ecology, environmental protection and landscape planning.
[2] Use distribution on arable land and various intensive grassland uses according to the average.
[3] Used mushroom casing compost.

Discussion on peat reduction at IPM fair

As part of the „Innovation Centre for Horticultural Technology“ at IPM Essen in Germany, a panel discussion on peat reduction took place on Wednesday, 25 January 2023.

Eva Kähler-Theuerkauf, Vice President of Zentralverband Gartenbau (ZVG), Ulrike Wegener, General Manager of Gütegemeinschaft Substrate für Pflanzen (GGS), Melanie Bank, Landwirtschaftskammer NRW, Thomas Kramer, Chairman of the IVG Committee on substrates, soil, constituents as well as Simon Busse, Fachagentur Nachwachsende Rohstoffe (FNR), exchanged views on successes, obstacles and opportunities in peat reduction.

Among other things, the current state of the art on peat reduction in substrates and soils and the different challenges for horticulture and industry were discussed. All participants agreed on one thing: it is necessary to reduce peat in substrates and replace it with renewable constituents in order to diminish CO_2 emissions.

There was also unanimity that much has already been achieved, but that all those involved must continue to work closely together to be successful on the way forward. However, there was controversy about the timeline at which peat can be reduced and the ambitious targets set by the German government to be achieved through voluntary measures.

In the past, ZVG recommended to the horticulture industry to increasingly use peat-reduced growing media. "We adjusted our recommendation last year, but we also emphasise that the reduction of peat depends on the availability and quality of substituents," said Eva Kähler-Theuerkauf. "The crop safety of the companies, which also have to deal with many other problems, such as the energy crisis, has the highest priority."

For further press releases (in German) visit https://ivg.org/presse/neues-vom-ivg.

Stefan Pohl

Industrieverband Garten (IVG)
pohl@ivg.org

Melanie Bank, Simon Busse, Ulrike Wegener, Eva Kähler-Theuerkauf and Thomas Kramer (from left to right) discussed the topic of peat reduction. The event was chaired by Philip Testroet, Head of Horticulture and Environment at IVG. Photo: IVG

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Taking responsibility:

Our peat raw materials with RPP certification

“For all our ADVANCED Substrates, we only use peat raw materials from responsibly managed peatlands with RPP certification. The independent certification system “Responsibly Produced Peat” (RPP) serves us here to ensure responsible peat extraction and better protection of natural peatlands.”

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

www.klasmann-deilmann.com

The MERLIN project is mainstreaming restoration in former peat extraction sites in Finland

Biodiversity loss, the poor ecological status of surface water bodies and climate change have fuelled the need to find economically and socially sustainable restoration solutions for freshwater ecosystems in Europe. Peat extraction for energy production and horticulture has been one way in which Finland has utilised natural peat resources, although most of the drainage has been for forestry purposes.

Drainage, in general, has led to the deterioration of these unique peatland ecosystems, which have great potential to provide ecosystem services, such us flood and drought regulation, the retention of nutrients/suspended sediments/ metals and carbon sequestration. The restoration and rewetting of former peat extraction areas would help us to gain biodiversity, support human wellbeing and achieve climate targets. However, more demonstration, testing and monitoring of the impact of restoration are urgently needed to transform the land use sector.

The former Komppasuo peat extraction area, owned by Neova in North Ostrobothnia, is one of the case studies of the MERLIN project (https://project-merlin.eu/cs-portal/case-study-14.html), in which different after-use alternatives will be demonstrated and 120 ha will be restored over the course of the project.

This site is located in Oijärvi, in the catchment area of the Kuivajoki River in the municipality of Ii. Forestry is the main land use (69%) in the catchment and 25% of the catchment area is classified as peatland. The region is one of the

Figure 1: Timeline of the Komppasuo peat extraction area. The MERLIN project was started in October 2021 and the baseline monitoring was conducted in the year 2022. This contained measurements for greenhouse gas emissions, biodiversity, and nutrient loads to the downstream river.

richest peatland areas in Finland and part of the extensive Oulujoki-Iijoki River Basin management area.

Peat extraction started in Komppasuo in the year 1987; and some 34 years later, the area entered the post-conversion phase (Figure 1). In total, 3 to 1.5 metres of peat were extracted, whereas the remaining peat ranges from a very shallow layer (0.1 m) to more than two metres at the site. This is a challenge for restoration and rewetting, as there is very little previous experience of rewetting areas with a thick peat layer.

In the first year of the MERLIN project, monitoring and implementation plans were carefully drawn up, collaborating with different stakeholders (landowners, environmental agency, local citizens, etc.) to develop socially sustainable solutions and to consider the opinions of local people.

One of the critical aspects of rewetting is whether sufficient water can be brought to the area, as the site is on the water division in the North.

This means that the runoff from the pristine peatland in the North (Figure 2) discharges to another river (Simojoki) rather than discharging to the runoff from the Komppasuo peat extraction area, the outlet of which is in the South. From there, the runoff discharges to the Kivijoki River and from there to the Oijärvi Lake until it reaches Bothnia Bay via the Kuivajoki River.

The Kuivajoki River is of great importance in terms of nature, as it is one of the few potential migratory fish rivers in Northern Ostrobothnia, which has not been constructed and has a naturally reproducing stock of grayling, trout and salmon populations, among others. In order to control water balance in the area, the runoff from the surrounding area will be redirected to the Komppasuo peat extraction area, and four different submerged dams will be constructed in 2023.

Generally, intensive drainage of the peat extraction areas by pumping has intensified runoff generation and discharging to downstream rivers, which has further increased river flow fluctuation. Flow conditions lower than the minimum accepted levels, as well as rapid maximum flow peaks

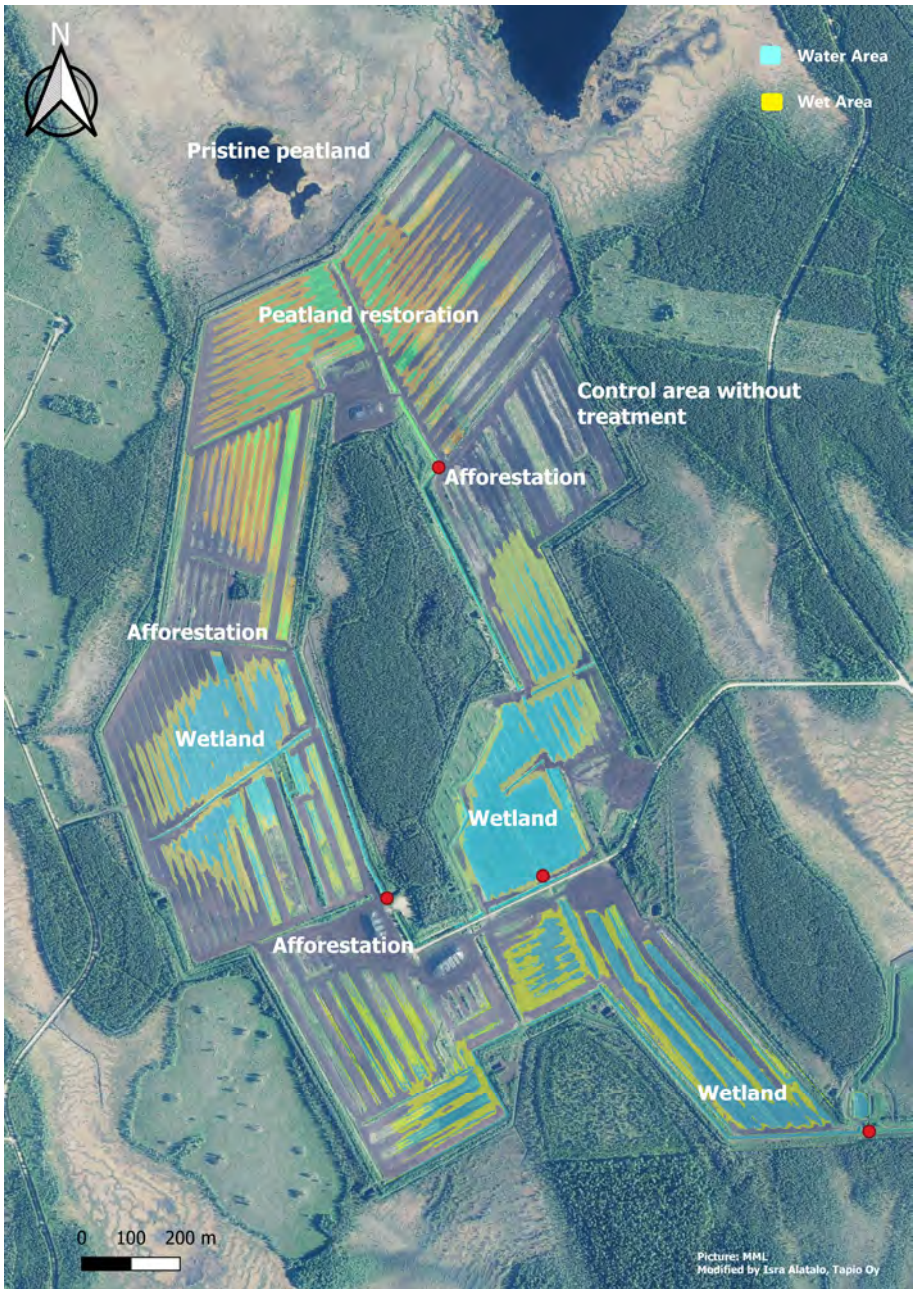


Figure 2. Implementation plan for the Komppasuo area with estimated water level variation, based on high-pulse laser scanning data of the ground elevation. There will be three different open water wetlands, where water depth will vary. Red circles represent submerged dams to regulate sufficient water levels and water storage in the area.

Figure 3. Ash fertilization applied at the Komppasuo peat extraction area in February 2023. Photo: Esa Laajala

in rivers have created poor conditions for the aquatic ecosystem, especially for spawning. This is particularly the case at the catchment, where large areas are under intensive drainage.

Increasing water storage and extending water residence time at the catchment, by rewetting and restoring, will also stabilize the river flow and improve ecosystem services. Furthermore, wetlands and restored peatlands have been known to purify the runoff, which will further support better habitat conditions, especially for spawning and restocking areas of salmonid in the river.

At Komppasuo, the main restoration aims are to recover peatland flora and fauna in the North (peatland restoration), create three different wetlands, and afforest and implement game pastures in the dry areas (Figure 2).

The key targets focus on gaining biodiversity, controlling greenhouse gas (GHG) and water emissions and improving carbon sequestration. Wetlands will play an important role in supporting sufficient moisture gradient in their surrounding areas, to create stable moisture conditions for the Sphagnum species, which are kept as a pioneer species of the restored peatlands and an indicator for restoration success.

Furthermore, both the peatland restoration area and the wetlands will work as important water reservoirs, balancing the river flow. In addition to these, the restoration plans will also create better conditions for hunting and reindeer husbandry, which are key activities in the area. Construction of the area started with soil preparation and ash fertilization in the winter of 2022-2023. Fertilizer is usually applied in the spring on top of the snow cover, and this is common practice to improve afforestation success in peatlands with originally low pH and potassium content (Figure 3).

The construction of the submerged dams, pine planting, ditch blocking and the finalizing of the area will be completed by the end of 2023. Submerged dams are dimensioned and designed to optimize the shallow water depth of the wetlands in relation to the extent of the catchment and their structural design, while also considering the extreme weather conditions in the region. To prevent high suspended solid loads from the wetland area, the water table will be raised after re-vegetation (late summer 2023). Plant roots are expected to bind the peat in place.

The success of rewetting and restoration is monitored following the well-known, before-after-impact-control method used in the MERLIN project. Monitoring before the restoration stage was completed in the summer 2022.

This included five monitoring stations with intensive water table monitoring and 10 manual GHG measurement plots for CO_2 and CH_4 fluxes, one weather station, as well as continuous flow rate measurement at the outlet of the area. Moreover, runoff water quality at the outlet

was monitored and the first bird inventory was conducted. There is one monitoring station, located at the control block of 1.5 ha, where no treatment or construction will be carried out (Figure 2).

This will enable a comparison of monitoring data between different treatment/construction work in the Komppasuo case. Overall monitoring plans have been updated, and monitoring plots for the vegetation inventory were designed at the beginning of 2023 to consider changes related to forthcoming construction in the area. The restoration stage will be monitored in 2024 and 2025 as part of the MERLIN project.

Although general implementation plans for Komppasuo are ready, there are several open issues requiring further discussion. The Komppasuo case is one of the first large-scale restoration cases in Finland to recover the original Sphagnum species. Therefore, we will develop and test best practices for this in the MERLIN project. Different seeding methods for Sphagnum cultivation have been designed in an expert workshop, organized in March 2023 and implemented in the late summer of 2023.

In addition to this, the recreational potential of the area requires further planning and co-designing with the local residents. The natural value of the area was highlighted in the bird inventory of 2022 where, e.g., bean geese and whooper swans were observed. The co-designing of recreational places will be conducted in the stakeholder event in the spring of 2023.

Komppasuo is only one single restoration case, but it has great value, as it will provide data currently lacking, so as to ensure a better understanding of the effect of restoration and rewetting on climate, biodiversity and water bodies at former peat extraction areas. The case will also serve as potential to mainstream best practices and upscale impact evaluation, as these are some of the targets of the MERLIN project.

Anna-Kaisa Ronkanen,
Seppo Hellsten,
Katri Rankinen,
Kaisa Pietilä,
Kristian Meissner

Finnish Environment Institute (Syke)
Helsinki, Finland
anna-kaisa.ronkanen@syke.fi
www.syke.fi/en-US

Isra Alatalo,
Tiina Ronkainen,
Samuli Joensuu

Tapio Oy
Helsinki, Finland
https://tapio.fi/briefly-in-english

Esa Laajala

Neova Oy
Jyväskylä, Finland
www.neova-group.com

The MERLIN project (https://project-merlin.eu) has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 101036337.

Sphagnum farming in Canada: a first synthesis of knowledge

Thirty years after the first attempts at cultivating Sphagnum mosses in Canada, the first synthesis of knowledge on the topic has now been published. Presented in accessible and practical language, the document aims at reviewing the knowledge that has been acquired since the first Sphagnum farming sites were created in Eastern Canada.

It brings together the expertise developed over that period, and summarizes the concepts needed to establish and operate a Sphagnum farming site. The synthesis is essential for anyone aiming at growing Sphagnum mosses in a cyclical and renewable way.

The synthesis first introduces basic concepts relating to Sphagnum farming, including its benefits and the potential uses of Sphagnum fibres. This is followed by the various aspects to consider when planning a farming site, namely, the site characteristics and the sourcing of plant material. Then, the topic of the active management of hydrological conditions within basins with an automatic irrigation system is explored.

The research conducted in the past decades indicates that this was a crucial element in the success of Sphagnum farming installations. The following chapter addresses the preparation of the farming site, encompassing all aspects of basin development, such as the implementation of the irrigation system and the reintroduction of plant

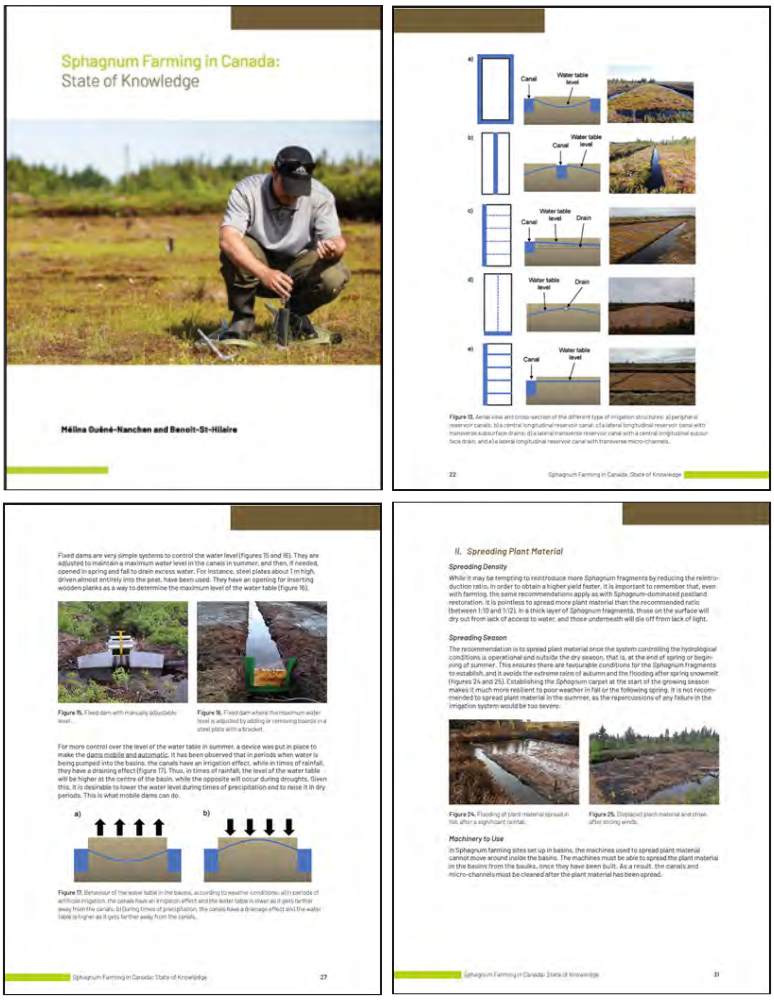
Sphagnum farming basin surrounded by a reservoir irrigation canal. Photo: Peatland Ecology Research Group (PERG)

Drone view of an experimental Sphagnum farming site in Eastern Canada. Photo: Sebastian Gutierrez Pacheco

material. The maintenance and monitoring of the farming site is then explained, followed by Sphagnum harvesting, fibre conditioning and the various resources needed. The conclusion provides an overview of the key elements along with useful references.

Sphagnum farming is defined as the sustainable production of non-decomposed Sphagnum fiber biomass, on a cyclical and renewable basis. The efforts made to restore peatlands in Canada over the past three decades have confirmed the feasibility of the large-scale multiplication of undecomposed Sphagnum fibers, and their productivity can be optimized by more advanced management of the cultivation sites.

Potential uses for cultivated Sphagnum fibers include its use as a new ingredient in growing media. Sphagnum farming could also become a source of donor material for peatland restoration purposes, in regions where donor sites are scarce or absent.



Cover and examples of content.

Fibers are already utilized in the horticultural sector to produce hanging flowerpots or seedling containers made of Sphagnum. Given the Sphagnum's high absorbency, it could also be used to make hygiene products such as diapers, sanitary napkins and paper towels, or as an absorbent material for use with toxic product spills, as insulation in the construction sector or as a filtration agent for wastewater.

The Sphagnum Farming in Canada Synthesis is published jointly by the Peatland Ecology Research Group (PERG), VALORES, the Canadian Sphagnum Peat Moss Association (CSPMA), the Québec Peat Moss Producers Association (APTHQ) with the financial support of the Québec Ministry of Economy and Innovation (MEI) through a structuring project of the ACCORD Peat and Substrates Cluster and the New Brunswick Innovation Foundation (NBIF).

It is available for download in English and French. The document was launched in February 2023 during a webinar, available on the Cluster YouTube channel (in French).

About the authors

Mélina Guêné-Nanchen, PhD (Plant Ecology)

Mélina Guêné-Nanchen is a biologist, specialized in peatland ecology. She completed her PhD with Dr Line Rochefort at the Peatland Ecology Research Group (PERG) in 2018, focusing on the regeneration trajectory of bryophytes in disturbed peatlands.

Her research has led, among other things, to the formulation of recommendations regarding the management of donor sites for the restoration of Sphagnum-dominated peatlands.

Since then, she has worked as a consultant for environmental firms and has held a postdoctoral position at Université Laval, studying biological crusts and their potential use for the restoration of disturbed mineral features. She has written or participated in the writing of several scientific papers on peatland ecology and restoration,


Mélina Guêné-Nanchen.
Photo: Noémie Roux


Benoit St-Hilaire.
Photo: Noémie Roux

and was involved in the preparation of the North American chapter of the Global Peatland Assessment (UNEP, Global Peatland Initiative).

Benoit St-Hilaire, MBA

Benoit St-Hilaire is the operations coordinator for field and greenhouse work at VALORES. He holds a bachelor's degree in biology from Université Laval and a master's degree in business administration from Université de Moncton. During his time at VALORES, Benoit has acquired substantial experience in peatland ecology, but more particularly in the development and monitoring of Sphagnum farming sites, where he excels, in particular, on the technical aspects of implementation.

The Canadian horticultural peat industry

The CSPMA is an association of Canadian horticultural peat producers, responsible for approximately 90% of the yearly extracted peat across Canada. The 14 CSPMA producer members are devoted to promoting the responsible management of Canadian peatlands and the wise use of peat. Hosted by the Québec Peat Moss Producers Association (Association des producteurs de tourbe horticole du Québec; APTHQ), the mission of the Peat and Substrates Cluster is to bring together the driving forces of the horticultural peat sector, so that they can work together to address their common issues.

The activities implemented are aimed at supporting the development of companies in the sector, both in the regions and at national and international scale. The Peat and Substrates Cluster focuses on strengthening industrial synergy, implementing new and innovative technologies, maintaining and increasing social responsibility and developing the sector's identity.

Mélina Guêné-Nanchen

Peatland Ecology Research Group (PERG)
Université Laval
melina.guene-nanchen.1@ulaval.ca

Benoit St-Hilaire

VALORES
benoit.st-hilaire@umoncton.ca

Marie-Claire LeBlanc

Peatlands Affairs and Communications Manager
Canadian Sphagnum Peat Moss Association (CSPMA) and Peat and Substrates Cluster
mcleblanc@peatmoss.com

Sphagnum fiber as a tool to mitigate coastal erosion

Climate change impacts have grown in frequency and intensity over the last few decades, in particular, in recent few years. While climate change has many impacts on the environment, one stands out: coastal erosion.

As the second biggest country in the world, Canada has approximately 244,000 km of coastline and 6.5 million people living near coastal zones. All these people are affected or are at risk of being affected by erosion and could see their property damaged or destroyed. Most will lean towards grey infrastructures, such as seawalls or breakwaters.

Nevertheless, these methods are not without consequences. These types of infrastructures will most likely cause end-wall effects and damage the natural habitats of many coastal bird species. Moreover, the economic burden of these solutions is out of reach for most people, therefore, it is essential to develop new eco-friendly and accessible solutions to coastal erosion.

In the wake of natural infrastructure, a new tool composed of a renewable resource has been developed by VALORES: the Sphagnum roll. Due to their advantages as a growing medium and their ability to regenerate, Sphagnum mosses, which are common bog plants, are a uniquely interesting genus of bryophyte in the *Sphagnaceaegenus* family.

A Sphagnum roll prototype, installed in 2020 in the northeast of New Brunswick (Figure 1), was

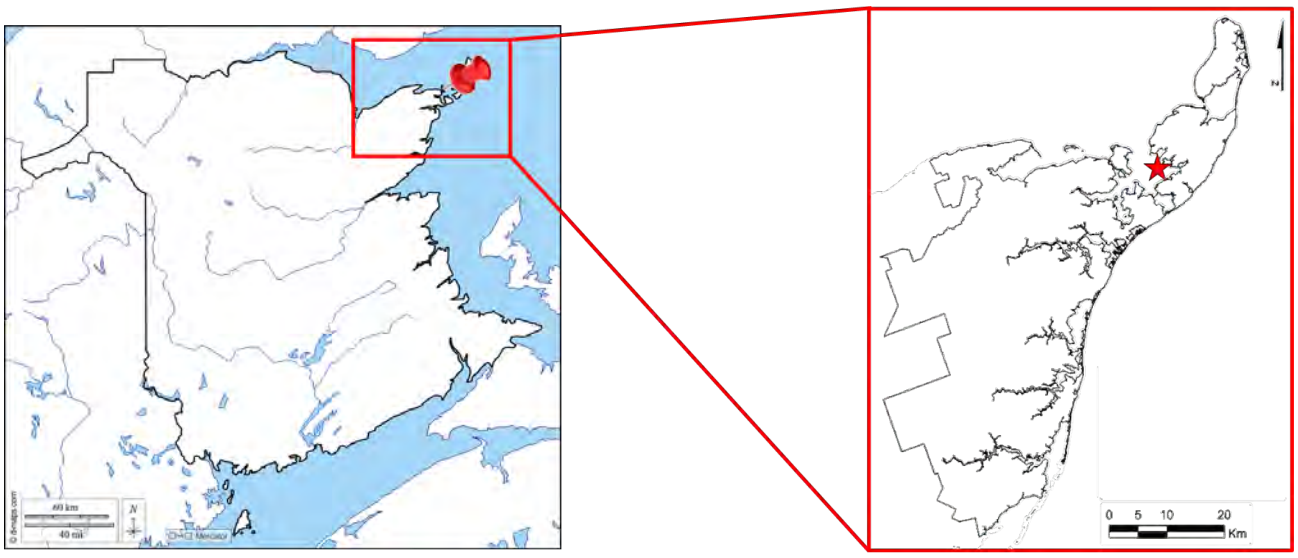


Figure 1: Site location for the prototype test.

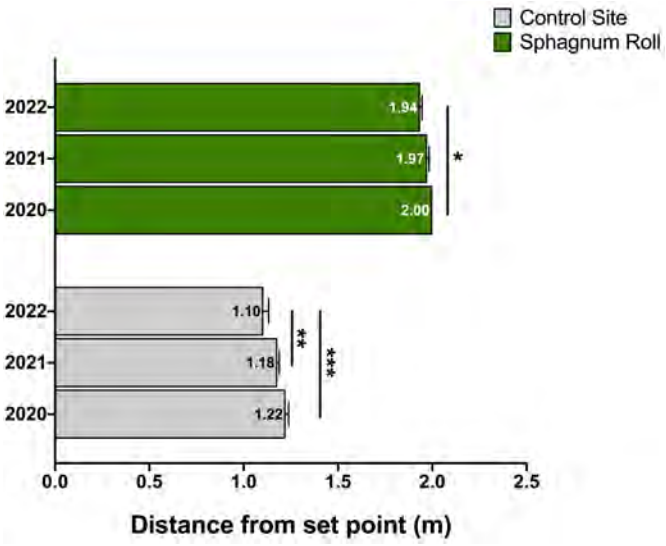


Figure 2: (A) Erosion of the bank at the experimental site: monthly measures of the distance of the bank from a standard set point in meters, both at the Sphagnum roll site and the control site.

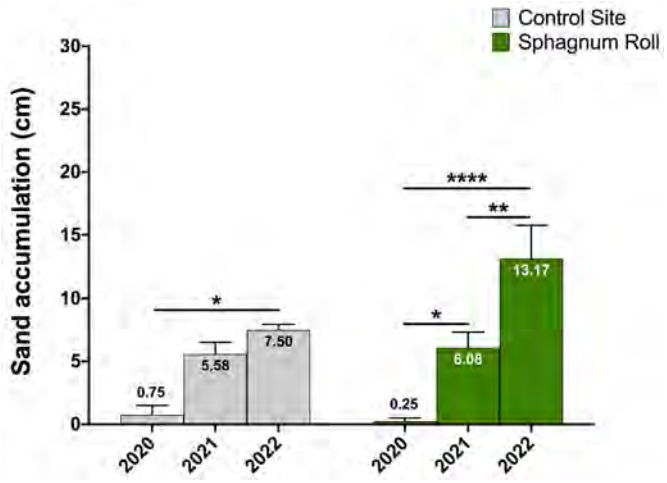


Figure 2: (B) Sand accumulation at the experimental site: monthly measures of the height of the bank from beach level at both the Sphagnum roll and the control site. Values are expressed as the mean: n = 4 (2020), n = 6 (2021) and n = 6 (2022). Two-way ANOVA was carried out, followed by Tukey's multiple comparison test where *p < 0.05, **p < 0.01, ***p < 0.001 & ****p < 0.0001.

monitored monthly to assess the evolution of erosion and the potential impact on the landscape. After 26 months, the prototype reduced the erosion by twice the original figure and increased the accretion on the beach five-fold, compared to the control site (Figure 2).

Overall, this study provides a preliminary insight into the use of Sphagnum, a natural and renewable resource, as well as a new, nature-based and eco-friendly tool to mitigate coastal erosion.

Authors: Andréa A. Lebel, Frédéric Haché, Nadler Simon, Thibaut Peterlini and

Marion Tétégan Simon

PhD, Research Director
VALORES RESEARCH INSTITUTE
232B Avenue de l'église
Shippagan E8S 1J2, Canada
+1 506 336 6600
marion.tetegan@umoncton.ca
www.valores.ca

Activities 2022 of the IPS Commission Peatlands and Society

An addition to the IPS Annual Report 2022

As Jack Rieley, Chair of the Scientific Advisory Board (SAB) maintains, “We have been operating under the cloud of Covid-19 for more than two years. [...] As peat people we depend on communication, interaction, discussion, and activity. We can Zoom, Team, and Skype, but these are no substitute for what we need and do best - interface personally, network, personally, socialise personally, and visit bogs personally." This has not only affected the work of the IPS but also of our Commission.

Nevertheless we have been active. For instance, we are happy to announce that the Commission is part of the important research projects below:

Digital Aestheticization of Fragile Environment Research Project

The way nature is perceived today has changed with digitalization and media technology, which also affects ways of life, as well as the way in which people see themselves within their environment. The Finnish mires are included in the international research project, *Digital Aestheticization of Fragile Environments* (DigiFREN) led by Assistant Professor of Cultural Anthropology, Blaž Bajic, University of Ljubljana, Slovenia (see also PI 4.2022).

This research explores how digital media technologies are influencing new understandings, ideals, concepts and practices relating to the environment. DigiFREN is the first ethnographic project to carry out a large-scale comparative study of the digital aestheticization of natural environments in Europe. Five sites in Slovenia (alpine areas), Croatia (coastal national parks), Finland (protected mires), Norway (urban forest) and Poland (river valley) will be studied. The Finnish sub-project is carried out at the University of Eastern Finland (see: https://uefconnect.uef.fi/en/group/digital-aestheticization-of-fragile-environments-digifren).

The sub-project is led by Associate Professor of Cultural Studies, Juhana Venäläinen and one of the researchers is Senior Researcher of Cultural Studies, Kirsi Laurén (1st Vice Chair of the Commission). The research focuses on the protected Viiankiaapa in Finnish Lapland and Patvinsuo in Eastern Finland, both mires representing fragile habitats.

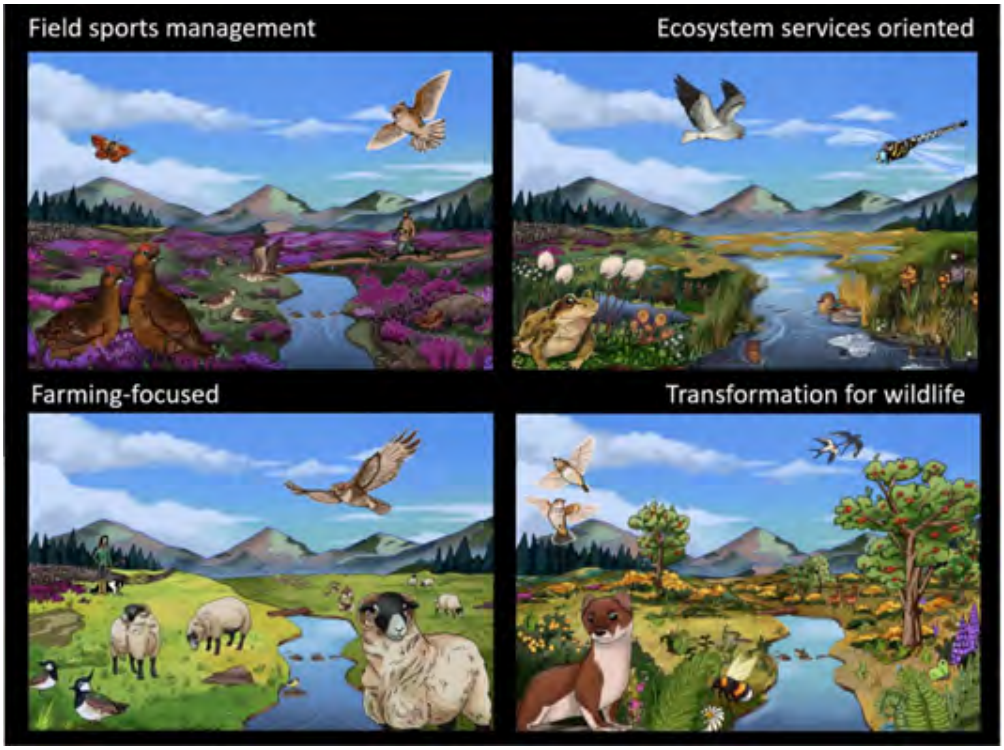
The Peatlands and Society Commission draws on interdisciplinary fields of studies to explore the cultural meanings of mires and peatlands in everyday life, individuals and collective experiences, values and attitudes. Therefore, the Finnish research team of the DigiFREN project cooperates with the commission.

These collaboration activities could entail, for example, participating in and organizing international seminars and workshops, publishing articles in the media or making posts on social media related to cultural and social research

on peatlands. The collaboration aims to bring the latest research-based findings to as many people as possible.

Mire Trend Research Project

The University of Eastern Finland also hosts the research project, *Nakedness, puddles and critical comments: mire trend as changing the cultural heritage* (Mire Trend) (2020-2023), led by Senior Researcher, Kirsi Laurén (see: https://uefconnect.uef.fi/en/group/mire-trend-research-project).



Drawings by artist, more information can be obtained from the authors.

The research project examines changes in the ways that mires and peatlands are utilized today, and how these changes affect the human-environment relationship. According to the trend of the 2000s, environmental, commenting art, as well as various culture and sport events related to mires have increased. Leaving mires in their natural state and the restoration of ditched mires are also representations of the trend that emphasizes a protective use of nature. These ways of using mires reflect significant changes in the cultural relationship with nature, and the cultural heritage associated with mires. The central research questions of the project are: What is the mire trend and how does it influence the construction of a new cultural heritage?

Throughout 2022, project researchers have published scientific articles and presented their findings at national and international conferences and seminars, including, e.g., the Suopäivä (National Peatland Day) organised by the Finnish Peatland Society on 20 May 2022 in Helsinki.

Research on the Perceptions of Stakeholders Concerning the Management of Peatlands for Carbon and Water

Rachel Carmenta, 2nd Vice Chair, has supported the development of research in collaboration with the University of Exeter, the Yorkshire Peat Partnership and the Heather Trust to explore what different sets of stakeholders consider to be the costs and benefits of managing peatlands for carbon and water. The results were shared at the IUCN Peatlands Conference and are submitted for review in the journal, *Ambio*.

The paper is called *Protecting peatlands requires understanding stakeholder perceptions and relational values: A case study of peatlands in the Yorkshire Dales*. The work explores the ways in which peatlands mean different things to different people and is, therefore, directly related to the work of the commission. We collaborated with an artist to provide representations of the aspirations of people for the future of peatlands.

During 2023, we are considering focusing on:

- Ecosystem services related to communities.
- Social acceptability.
- The role of peat as a growing medium, forming part of the food security needs of society.

Marie Kofod-Hansen

Chair of the Commission Peatlands and Society
marie.kofodhansen@gmail.com

Degradation classification - and fire on peatlands

Time seems to fly during a pandemic and while completing a PhD and becoming a new mom. Due to the circumstances, I was not able to spend my grant on one particular field, but invested it in several: the first being an ergonomic keyboard that allowed me to heal my tendonitis, as well as a series of much needed and loved books for my PhD project.

My research has progressed from investigating global peatland fires to developing a peatland degradation classification system and mapping degradation-focused land cover classes in northern Germany. In the densely populated country, an estimated 95% of all peatlands have been significantly affected by people, but a system to classify and map the extent of degradation is lacking.

Developing this classification includes getting to know the different land cover types and learning about the history of peatlands, which have been drained and converted into agricultural areas or peat harvesting sites. One of the reference sites is the “Friedländer Große Wiese” in Mecklenburg-Western Pomerania, a large peatland area that has been used for centuries and was extensively converted in the 18th century, when ditches and canals were constructed to drain the area and increase agricultural use.

While parts of the original fen area around the lake, “Galenbecker See,” have been rewetted, large areas of the 100 km² fen remain under intense use. Locals claim that the peat areas were only being used as extensive grassland to produce fodder, but during our visit we were able to prove that, indeed, corn fields were planted on peat that had been artificially mixed with sand.

Figure 1: Books and keyboard. Photo: Farina de Waard

We were able to collect peat point data and took soil samples for further analysis to assess the degree of decomposition in areas of different degradation classes.

I am very grateful for having received

the Allan Robertson Grant, which has allowed me to delve deeper into my research field, while reading and holding a sleeping baby in my arms on the one hand and getting to know my study area together with my colleagues on the other.

Figure 2: Alexandra Barthelmes, Farina de Waard (kneeling) and Fabian Thiel investigating degraded peat on harvested corn field. Photo: Bernd Bobertz

Summary of my virtual talk at the International Peatland Congress 2021 in Tallinn: "Peatland Fire Regions as a means of analysing global peatland fires"

Peatlands all around the world are impacted by humans and climate change. In addition to emissions caused by drainage and deforestation, peatland fires cause strong emission peaks. Peat fires can burn uncontrollably for weeks or months and result in rapid ecosystem degradation, excessive CO_2 emissions and health risks.

As part of my studies on peatland degradation, I analysed the global occurrence of peatland fires using 'Peatland Fire Regions' (PFRs), the Global Peatland Map of Greifswald Mire Centre (publication in prep) and active fire detections from the Moderate Resolution Imaging Spectroradiometer (MODIS).

Results indicate that over the 10-year analysis period (2008 to 2018), approximately 8% of global peatlands have been affected by fire. The extent of the fire-affected peatland area in Boreal North America and Boreal Eurasia both exceeded 80,000 km². At the same time, over 120,000 km² were fire-affected in Equatorial Asia.

Overall, this study highlights the significant impact of peat fires on global peatlands and the urgent need for better management and conservation practices. By improving our understanding of peat fires, we can take more effective steps towards mitigating their impact on the environment, reducing greenhouse gas emissions and protecting public health.

A paper regarding this research is currently in preparation.

Farina de Waard

Peatland Studies and Palaeoecology/
Remote Sensing and GIS
University of Greifswald
Greifswald, Germany
farina.dewaard@uni-greifswald.de

Figure 3: Peat core with degraded peat on high intensity grassland. Photo: Farina de Waard

Early-stage vegetation dynamics of rewetted peatlands

The aim of this Master's thesis was to assess and compare the carbon-related regulation and provisioning of the ecosystem functions of rewetting and afforestation, two common after-uses of extracted peatlands in nemo-boreal Sweden. As one of the first studies that directly compares both approaches at the same site, its findings should serve as a base for further investigation and decision-making. The results will be published in a scientific journal in the next year.

The thesis was conducted at the Swedish University of Agricultural Sciences (SLU) under the supervision of Dr. Sabine Jordan and the financial support of the Swedish Peat Research Foundation (TorvForsk), SLF and Hasselfors Garden. Part of this thesis was funded by the Allan Robertson Grant of the IPS, namely, investigating the early stages of revegetation of a rewetted site in Ekeby Mossen, a former extracted peatland (originally a bog) in south-central Sweden.

Peat extraction creates an artificial depression in landscapes. Revitalization projects as after-use measures can easily be started by closing the ditches, which were used for drainage, and thereby rewetting the area. Peat moss reintroduction to enhance revegetation can be directly carried out after rewetting.

Hence, it is a climate-smart and cost-efficient solution to restore terminated extracted peatlands promptly. The recolonization by peat-forming plant species after rewetting is crucial for the restoration of terminated extracted peatlands.

Methods

Before rewetting the site at Ekeby Mossen in the autumn of 2018, Sphagnum fragments were spread as propagules on reference surfaces. From that time on, general vegetation mapping was carried out continuously and data were additionally collected from drone flights.

Vegetation surveys were carried out along a transect throughout the vegetation periods from 2020 to 2021 (May to October).

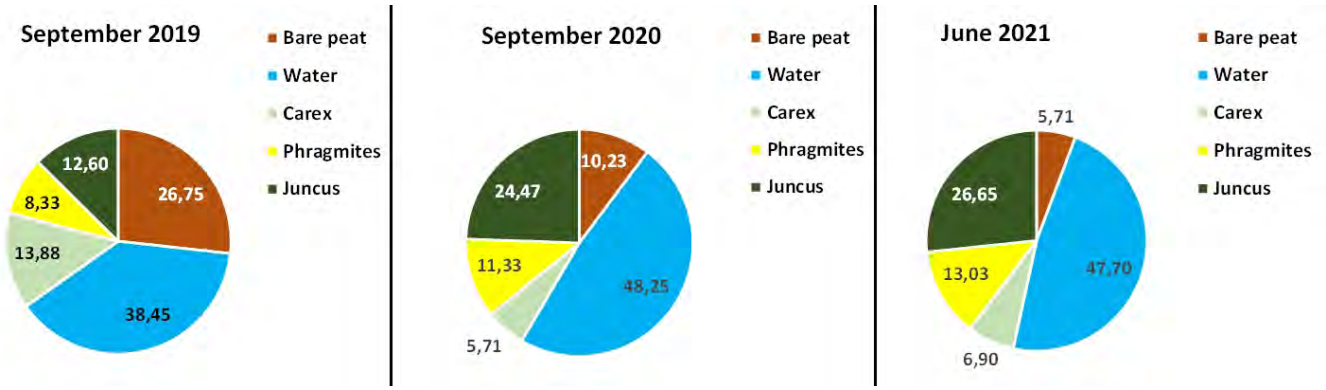


Figure 1: Vegetation development in Ekeby Mossen from 2019 to 2021.

Results and Discussion

Almost half the area was covered with water by the second year after rewetting. Consequently, the proportion of bare peat, neither covered by water nor vegetation, reduced from 27% to only 6% during the first three years. The ground coverage of plants increased steadily from 2019 until 2021.

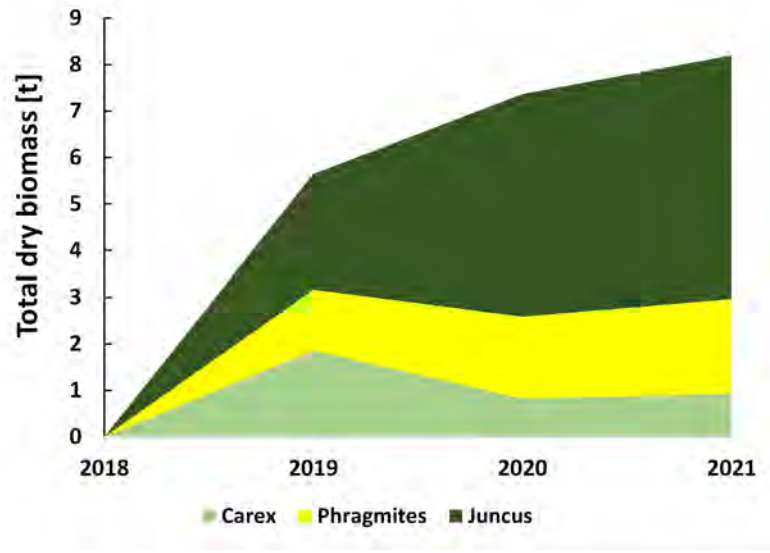


Figure 2: Total dry biomass held by the rewetted site from 2018-2021, with a contribution of each constructed vegetation class.

A proportional area of approx. 35% in 2019 was recolonized by vegetation; two years later, this proportion increased by 12%. In 2019, *Carex* dominated most of the vegetation, but was rapidly replaced by *Juncus*, which already dominated more than one quarter of the whole rewetted site in 2021. *Phragmites*-dominated patches expanded to open water surfaces, with an increase of 4.7%, from 8.3 to 13%, in three years (Figure 1).

Combined with their total coverage, *Juncus*-dominated areas contributed the most to the overall dry biomass across all years (Figure 2), even in 2019, when *Carex*-dominated vegetation covered a larger area. A maximum amount of 5.23 t in 2021 was estimated for *Juncus*-dominated vegetation. This value is lower, but close to the combined dry biomass of all vegetation classes of the whole area in 2019. In total, the rewetted site had a stand biomass of approx. 8 t in the third year after rewetting (Figure 2).

Presuming that the current development will continue linearly for the next years, the rewetted site will be completely covered with vegetation by 2030, with an annual increase of 5.9%. If the proportion of *Juncus*-, *Carex*- and *Phragmites*-dominated vegetation stays constant as well, then the rewetted site will produce roughly 7.4 t of dry biomass ha^{-1} a^{-1} from 2030 onwards, which equals an annual harvest of 4.9 t ha^{-1}.

By 2030, twelve years after peat harvesting will have stopped, a total amount of ca. 40 t of dry biomass ha^{-1} could be harvested. From 2021 on, Sphagnum mosses have established exponentially around and in the stands of *Juncus*, *Carex* and *Phragmites*. They will have reached a measurable size and area in the coming years.

Figure 3: Drone images from Ekeby Mossen in 2018 (left), before rewetting, and three years later in 2021 (right). Photos: Örjan Berglund

Conclusion

A common value for comparing the profitability of different crops for energy production is the minimal heating value in joules per kilogram.

The calorific value observed for *Phragmites* ranged between 14-15 MJ/kg

and between 18.2 and 18.7 MJ/kg for *Carex*.

Both are, therefore, comparable with the minimal heating value for spruce wood, approx. 19.5 MJ/kg.

Hence, the yield of a rewetted cut-away peatland is economically relevant. The significant benefits of this after-use include reduced GHG emissions and the contribution to long-term carbon storage through peat formation. On the other hand, it represents an agricultural land-use that has yet to be fully understood.

Eva Marie Weber

Swedish University of Agricultural Sciences (SLU)
eva.marie.weber@hotmail.de

CSPMA successful partnership with Environment and Climate Change Canada

The Canadian Sphagnum Peat Moss Association (CSPMA) applied for funding in January 2022 under the ECCC Nature Smart Climate Solutions Fund: Placed-based Actions program. This program aims to restore and secure high carbon ecosystems across Canada. Candidate sites cannot have existing obligations for restoration. The CSPMA was successful in obtaining the full requested amount of $6.7 M over 5 years (2022-2027). The funding formula is a 50:50 split, with $3.37 M cash from ECCC and $3.37 M from the CSPMA and companies as cash or inkind amounts. The CSPMA will administer the program, and companies will apply to the CSPMA for restoration projects. The program has three principal components: (1) inventory of peatlands to be restored; (2) their restoration back to peat-accumulating ecosystems and associated monitoring; and (3) securing them in perpetuity.
For more information please reach out to CSPMA President, Asha Hingorani asha@peatmoss.com.

New articles in Mires and Peat

Using 3D models to quantify aboveground biomass in the cushion-forming species *Plantago rigida* in an Andean páramo peatland by R. Jaramillo, A. Marmol-Guijarro, L.G. Doskocil, S. Chimbolema, E. Suárez

Ratio vegetation indices have the potential to predict extractable protein yields in green protein paludiculture by C.K. Nielsen, L. Stødkilde, U. Jørgensen, P.E. Lærke

Tropical peat deposits undergoing land-use change: the case of Buhandanda and Lushala peatlands (Democratic Republic of Congo) by P.M. Senga, J. Talbot, S. Bonneville

A simple field method for estimating the mass of organic carbon stored in undisturbed wetland soils by G. Magnan, M. Garneau, J. Beaulne, M. Lavoie, S. Pellerin, L. Perrier, P.J.H. Richard, N. Sanderson

Water, soil and vegetation under the influence of high atmospheric nitrogen deposition in a cutover and rewetted raised bog in Northwest Germany by S. Nachtigall, K. Mohr, L. Giani

A 3000-year multiproxy palaeoclimate record from Killorn Moss, Stirlingshire, Scotland by A.C. Blundell, P.G. Langdon

Measuring response of photosynthetic rate of *Sphagnum palustre* L. to water content: Importance of adjustment of the water content to the habitat condition by H. Itabashi, T. Yazaki, Y. Hoshi, K. Yabe

A review of greenhouse gas emissions and removals from Irish peatlands by E. Aitova, T. Morley, D. Wilson, F. Renou-Wilson

Water-table responses to storms in forested, drained and ditch-blocked tropical peatlands, Sebangau, Kalimantan, Indonesia by S.S. Putra, J. Holden, A.J. Baird

Aspects of microbial communities in peatland carbon cycling under changing climate and land use pressures by C.H. Robinson, J.P. Ritson, D.M. Alderson, A.A. Malik and 29 others

Millennium-scale changes in mire vegetation reconstructed from plot-based pollen and vegetation analysis and their implications for conservation by C. Yonebayashi

An IPS-IMCG journal: www.mires-and-peat.net

Perspectives and Perceptions: The Art of Peatlands in Time

With the financial support of the Allan Robertson Grant 2021, I was very pleased to be able to support the commission of a poem by the Irish poet Annemarie Ní Churreáin. This piece was commissioned to celebrate the cultural and historical value of peatlands, an often-overlooked element of peatland ecosystem services (Gearey et al., 2014; Gearey and Everett, 2021).

The aim was to launch this piece at COP26 in November 2021 at the Culture at COP peatland session hosted jointly between Historic Environment Scotland and the WetFutures Research Group (EU Horizon 2020 JPIC funded, University College Cork) celebrating peatland cultural heritage (https://www.cultureatcop.com/events/peatlands-climate-change-and-cultural-heritage-global-perspectives-problems-solutions-2021).

But with ongoing challenges with COVID-19, the poem was launched at a joint event with the WetFutures Research Group and Irish artist Johnny Flynn celebrating cultural arts as a tool for engagement in peatland restoration projects in June 2022. The final printed publication of Annemarie's piece, titled 'A Curse upon the men who tried to steal our bog' will be released in 2023.

I was first introduced to Annemarie's poetry with a gift of her debut collection 'Bloodroot' (Doire Press, 2017). It is in this collection that 'Bog Medicine' stood out as a dark testament to human use of boggy landscapes for historical medicinal practices and it was clear that she knew these landscapes well. As a highly celebrated and commended poet in both Ireland and internationally, Annemarie was the only choice to take on the challenge of writing a poem that balanced the longstanding rich cultural history of bogs and the need reengage with these landscapes to address contemporary environmental and socioeconomic societal issues.

Why poetry you may ask? We know from past literary scholars to songwriters that peatlands are a source of inspiration and have contributed to many famous works such as the Irish bog poet Seamus Heaney's *Digging* (1966) to the Emily Brontë/Kate Bush inspired *Wuthering Heights* (1847/1978).

As the voice of contemporary poetry, Annemarie's poetry deals with a range of challenging topics, including the mother and baby home scandal - a dark corner of Irish modern history. But Annemarie once said, "I believe poetry has the potential to unbury us and restore us back into the landscape to which we truly belong" (Irish Times, 2017) and it is with that literary embodiment and process that I wanted to engage with poetry to discuss the challenges we face with global peatlands.

I don't need to tell readers of the IPS magazine that peatlands are drying out in response to human-induced climate change, and we must take responsibility to restore them. We also know that this restoration requires scientific data (water quality, vegetation status) to do so, but how, when peatlands are often a community-based

landscape, engage the community? The answer is culture - art, literature, poetry - objects from the past and present to visualise and discuss best practices moving forward for peatland restoration. This approach challenges the perception of climate science as a data-driven discipline when peatlands have as much culture buried in them as the art that has been inspired by them.

Born and raised in northwest Donegal on a bog called Cnoc Na Naomh, Annemarie spent her childhood being recounted the legend of this bog and of the four men who met on the hill to decide who would convert the area from paganism. Annemarie talks of it a "good story" with "conflict, strong characters and, of course, the divine intervention of God" (Irish Times, 2017).

"A Curse upon the men who tried to steal our bog" explores this relationship through the eye of Annemarie's young niece and battles with the ongoing identity crisis that many nations have with their past cultural affiliations with peatlands and the changing attitudes in the next generation. It is beautiful and challenging and is a reminder to this peatland scientist to leave the words to the real poets.

After the poem's launch, myself and my colleague Dr Ben Gearey, visited Annemarie in her home county of Donegal in August 2022 (picture below) to experience the wildness of her peatland landscapes. And it is as truly captivating as her poetry.

I would like to thank the IPS for their financial support in this project and to Anne Ní Churreáin for embracing this challenge and producing a piece that I shall cherish as a career highlight.

Dr Rosie Everett

University of Warwick, United Kingdom
r.everett@warwick.ac.uk

References

Gearey, B., and Everett, R. (2021). Running out of time? Peatland rehabilitation, archaeology and cultural ecosystem services. Mires and Peat 27 (31): 6 pp.

Gearey, B.R., Fletcher, W., Fyfe, R. (2014). Managing, valuing and protecting heritage resources in the 21st century: Peatland archaeology, the ecosystems services framework, and the Kyoto Protocol. Conservation and Management of Archaeological Sites, 16(3): 236-244.

Heaney, S. (1966). Death of a Naturalist. Faber and Faber, London.

Ní Churreáin, A. (2017). Bloodroot. Doire Press, Co. Galway.

Ní Churreáin, A. (2017). Irish Times. https://www.irishtimes.com/culture/books/i-was-raised-in-the-shadow-of-men-who-wanted-to-conquer-wildness-1.3268313.

Peatland landscape in Donegal. Photo: Rosie Everett

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 14 April). 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
Canada (CSPP): Marc-Frédéric Indorf
Finland (Suoseura): Iida Höyhtyä
Ireland: Alessandra Accogli
Portugal: Miguel Geraldes

Individual members
Australia: Gareth Chalmers
Canada (CSPP) Nicole Sanderson, Marion Tetegan Sim Valores
China: Lius Shunsheng, Valentina Ivanova
France: Cédric Abriat, Roxane Chatel
Iceland: Idunn Hauksdottir
Ireland: Ellen O'Carroll
The Netherlands: H.J.K. Beuker, Michel Krol
South Korea: Eunji Byun
Sweden: Claes Bohlin, Tomas Merlöv, Stefan Östlund
USA: Steven Apfelbaum, Neal Flanagan, Jamie Lamit, Dorothy Peteet, Dave Runquist, Scott Winton

Corporate members
Canada (CSPMA): Aquatrols Corp. (Wesley Hamm), Hi-Point Industries (Mike Butler), John Deere Limited (Myles Deacon), Sun Gro Horticulture (Richard Jungkind), Turftech International Ltd. (Chris Greenwood)
Denmark: Pindstrup Mosebrug A/S (Jens Jørgen Hjortshøj)
Estonia: Eesti Turbaliit (Merilin Kalmaru)
Finland (Bioenergia ry): Aula Europe (Sami Tulonen), Kuopion Energia Oy (Matti Voutilainen)
Germany (DGMT): Ing.-Gesellschaft Heidt + Peters mbH (Timo Krüger)
Ireland: RPS (Hugh Cushnan, Ciaran Higgins, Francis Mackin, Amber McFarland
Lithuania: UAB Renavo durpynas (Dalius Pupenis)
The Netherlands: Apollo ISC
Sweden: BMR Produkter (Mattias Andersson), Econova Garden AB (Mats Andersson, Elsa Bertils, Jens Hoffren, Mattias Persson, Jeanette Tretten, Jonas Wallin), Emmaljunga Torvmull AB (Johan Funke), Fagerhults Torv (Ann-Britt Gilmore, Henrik and Oscar Johansson, Jocke Quist), Hasselfors Garden (Katja Börjesson, Stefan Jacobsson, Jeanette Klahr, Dennis Nilvér, Fredrik Räms), Holmen Skog (Ellinor Edvardsson, Mats Larsson, Ingrid Michelsson, Tomas Sjölund, Ingela Toljamo, Anders Åström), Jiffy Unitorv (Samuel Steen), Kommunbränsle i Ådalen (Anne Temin), Krontorps gård (Christian and Johan Sundby), Neova (Mats Henriksson, Rita Larsson, Carl-Eric Lindquist, Hans Lundvall, Henrik Oja, Peter Persson), Rölunda Produkter (Axel, Henrik and Magnus Nobel, Niklas Vestin), Ryd Torv (Jan Kulakowski), Scanpeat (Anders and Eric Hjalmarson)

Research Institutes
The Netherlands: Ben de Jong (Stichting RHP)

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!


17th International Peatland Congress
Mark the date!
Taizhou, China
4 - 9 August 2024
www.ipc2024.com
Photo. Getty Images

Peat and Peatland Events

H2020 MERLIN WP4 Field Meeting
River Forth catchment, Scotland, UK
17 - 21 April 2023
https://project-merlin.eu

Grow23 Festival: Future of Plant Based Food Production
Webinar
20 April 2023
https://www.kekkila-bvb.com/growfestival-2023

EGU 2023
Vienna, Austria & Online
23 - 28 April 2023
www.egu23.eu

German National Committee (DGMT)
Seminar and Excursion on Mires and Peat
Zeven, Germany
24 - 25 April 2023
www.dgmtev.de

Off the peat path - Wood fibres as an alternative to peat in substrates
Online workshop
25 April 2023
https://veranstaltungen.fnr.de/off-the-peat-path/welcome

IPS Executive Board Meeting
MS Teams
26 April 2023

H2020 MERLIN 2nd peat extraction roundtable
Zoom / Webex
2 May 2023
https://project-merlin.eu

Suotrendi Final Seminar: Our mutual mires: The cultural heritage and future of mires
Joensuu, Finland
12 May 2023
https://bit.ly/41A9LYO

4th World Peatlands Day
2 June 2023
#worldpeatlandsday

United Nations Climate Change Conference SB58
Bonn, Germany
5 - 15 June 2023
https://unfccc.int/sb58

IPS Executive Board Meeting
Québec City, Canada
10 June 2023

IPS Annual Assembly of National Representatives
Québec City, Canada
13 June 2023

RE3 Conference: Reclaim, Restore, Rewild
1st International Symposium on Growing Media, Compost Utilization and Substrate Analysis for Soilless Cultivation
Québec City, Canada
11 - 15 June 2023
https://re3-quebec.org/en

Baltic Peat Producers Forum
Tallinn, Estonia
10 - 11 August 2023
https://balticpeatproducersforum.eu

Climate Resilient and Sustainable Forest Management (with focus on peatlands)
Helsinki, Finland
28 - 31 August 2023
www.ibfra2023.org

Power to the Peatlands - A European Peatland Conference
Antwerp, Belgium
19 - 21 September 2023
https://bit.ly/41FPNMp

H2020 MERLIN All-Partner Meeting
Virtual, hosted from Germany
20 - 21 September 2023

German Peat and Humus Day
Bad Zwischenahn, Germany
21 September 2023
https://ivg.org/veranstaltungen/deutscher-torf-und-humustag

More at: www.peatlands.org/events

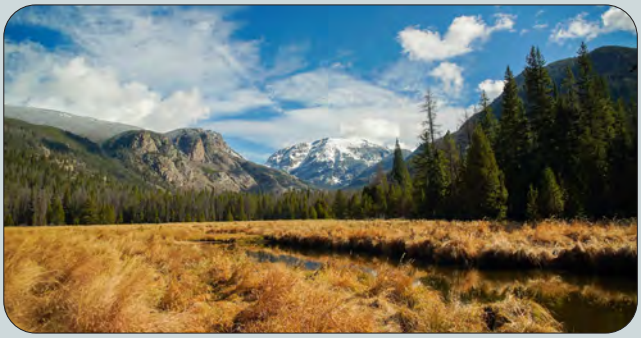
Next issue...

A few instructions for authors

Articles should be sent as text file (500-2,000 words, no pdfs, no full cap lines, no embedded links) with author contact details; photos and illustrations (jpg files with the names of the photographers, you need to have copyrights & persons' consent) and advertisements (pdf, prices according to Media Kit) to susann.warnecke@peatlands.org. Proofreading will be carried out via **www.englishproofread.com**

Submission deadline: PI 2.2023: 30 May

IPS is also blogging for you. Click here to read!



RE3 in Québec: Results, Experiences and Fun

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