13 June 2016

# Peatlands International

issue 1.2016

International Peatland Society

Welcome to the

# 15th International Peat Congress

## 15 - 19 August 2016

## Kuching, Malaysia

ipc2016.com

# Editorial

## IPS and beyond...

Peat, wood and IPS members in Ireland, June 2015. Photo: Susann Warnecke

The 15th International Peat Congress is almost here. It will be a cornerstone in the history of the IPS in many respects – and not only because of its location. The Congress, this time held in tropical Southeast Asia, symbolises the change and transition the Society is going through, with its new horizons and challenges.

I am enthusiastic about the widening range of activities and meaning of the IPS in Asia, where population, economy and markets still grow rapidly compared to those of the traditional IPS member countries. This poses a positive challenge for the whole organization and current membership of the Society. Looking towards a new dawn and welcoming more and more participation and initiatives from Asia could trigger a new era during this second half-century of IPS history.

However, before reaching beyond the horizon, we have to conquer the challenges of the near future. This concerns especially our current members and our existing social capital. I dare say that never in the past has the role of peatlands and peat changed so fast as it has in the last few years. And never in the past 50 years has the need for a well-functioning international organization to actively participate in the dialogue and interpretation of this change been as great as it will be in the

Peatlands International is the global magazine of the International Peatland Society (IPS). It provides the more than 1,400 corporate and individual 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. To receive Peatlands International in your email every three months, visit www.peatlands.org/join-us and sign up as a member.

coming few years. In the current climate of more and more polarizing, black and white discussions, which we see in many areas today, there is an urgent need for a bridge building, neutral and science-based communication, for which the IPS can offer an effective forum and network. This is sometimes forgotten in daily routines, but it remains one of the main pillars of why our organization exists.

We have in our hands a worldwide membership, committed individuals and also a developing, lean organization which benefits from a new Strategy as a basis for our positioning. In order to secure the future of the Society and to actively implement its Strategic Goals, i.e., to network, participate and communicate the vision and mission of the Society, we appeal to all members to carry out the important functions of the Strategy. Our members are the backbone of IPS as a volunteer organisation and you are one of them – use this possibility to promote the ideas of Wise Use, responsible peatland management and a global fact-based dialogue on all peatland matters.

In addition, I have to ask all members for understanding and creative thinking to solve the acute funding questions of the IPS. This is important to keep even the basic functions of the organization alive, and this comes into sight already in 2016 and 2017, after we have lost some of our important National Committees and industry association partners during the previous years, especially in Eastern Europe. Without funding, the ambitious and balanced Strategic Plan will suffer very soon and the gap between global needs and our ability to provide a solution for them will be too wide to bridge.

The contents of this Peatlands International once again showcase the variety of interesting subjects and scopes of our field. From cultural and natural heritage of Scottish peatlands to modern growing media, from France to the Nordic countries, this issue beckons you again to explore, apply and network!

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password: ipsmember16

This will give all IPS members reading access during June 2016 - March 2017

Mire lake near Keuruu, Finland. Photo: Susann Warnecke

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# THE BLACKLAND CENTRE: Valuing the Neglected

## *Agricultural Research and Practice in the Outer Hebrides, Scotland*

Thousands of hectares of land in the islands and coastal areas of western Scotland are now derelict. Until the 1960s, small fields supported generations of crofting* families through a mosaic of productive, diverse uses - here some potatoes, there a bog, here a half-acre of corn, there a hayfield. Today, the agricultural productivity of much of this land has been significantly damaged by overgrown drains and unmanaged grazing by sheep; fields are now often waterlogged, with rank grasses and mosses which conceal their history and potential. Their unique character and management techniques have been overlooked - even disparaged - by agriculture and science alike.

These observations gave rise to a research project beginning in 2011, aimed at discovering the properties and potential of these anthropic, relict agricultural soils, in the context of both social and climate challenges. The Blackland Centre is a partnership between Hebridean crofters, local investigators, and research scientists from Scotland's Rural Colleges (SRUC) and the University of Edinburgh, investigating both soils and management on a group of crofts totalling 80 ha. on the east side of the Uists in the Outer Hebrides.

'Blackland' is a term that has been developed to describe the highly organic, wet, acidic soils common in the islands and west of Scotland; in the Uists; they range from heavy, deep fields along the eastern coastline to shallow, rocky strips bordering the machair in the west. Until the mid-20th century, productivity was developed through application of shell sand, manure and seaweed; crofters refer to blackland as 'built'.

Research at the Blackland Centre aims to characterise blackland as an agricultural system through identifying and investigating its component sub-systems (including past use, topography, hydrology, soil chemistry, soil structure, and vegetation) and their interactions.

The first problem was one of definition and clarification of terminology. Are the observed fields 'peat'? While accepting the Soil Survey of England and Wales' use of the term 'earthy peat' to indicate anthropic transformations, the researchers have come to believe that the term 'blackland' together with its still-being-developed sub-groupings is a more precise and useful term.

Secondly, investigation of agricultural potential on an historic, complex terrain in an Atlantic climate must be holistic, taking into account not only soil conditions and crops but also investigating legacies of past use, cultivation strategies and community needs, as well as contemporary scientific questions. A structure of five levels is used to refine the problem.

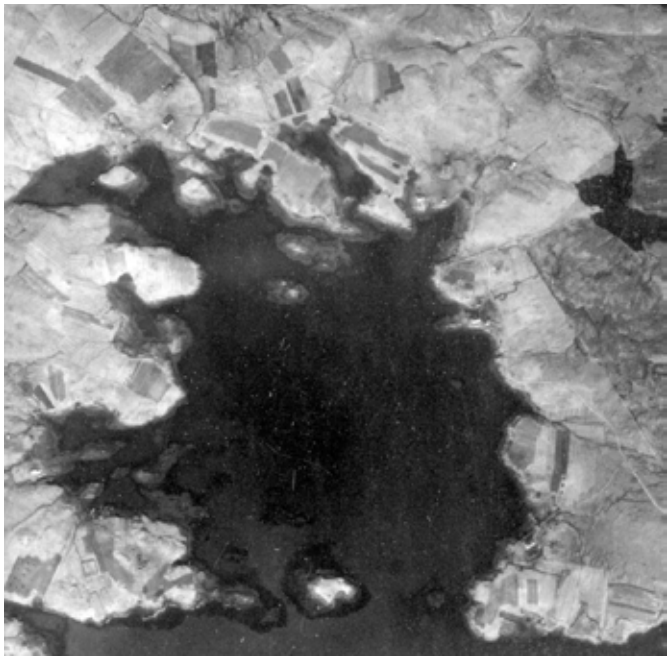
* Crofting is a form of small-scale mixed-use agriculture which arose in the Highland, island and Gaelic-speaking areas of the west of Scotland during the 18th century. Now governed by a special form of heritable tenancy, over 700,000 ha of hill, moor and cultivable land are held in crofts and common grazings.

# Five Levels of Analysis for evaluation of blackland soil systems

Level I: Context provides the broad societal background into which local developments occur, and includes climate/ disasters, historical events such as war, and technological changes ranging from the internal combustion engine to birth control.

Level III: Field is the local management level at which factors such as topography, drainage, vegetation, cropping preferences, and family structure/manpower affect land use within an agricultural unit.

The Blackland Centre has now completed its first five year plan (2011-15), including evaluation and initial field trials. Perhaps the most concrete outcome of this period has been the development of two fine-grained methods for assessing the potential of individual fields to return to agricultural use.



Level II: Landscape includes factors affecting regional land use such as population, traditional management and livestock techniques, law, and local economic conditions.


Level IV: Soil provides a general description as easily observable within 1m from the surface, such as structure, hydrology, horizons, with the spade or auger as a tool.

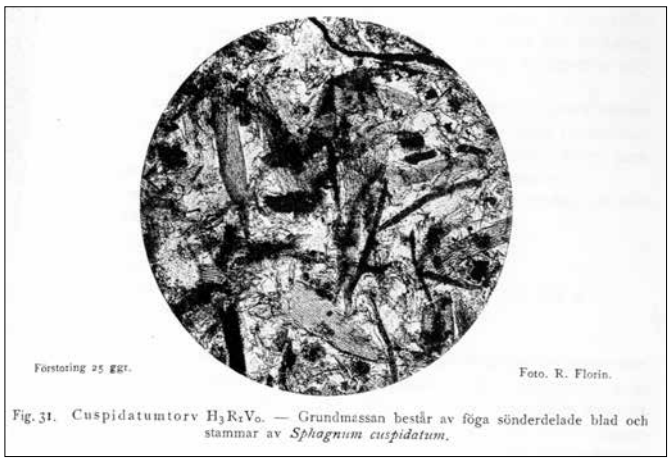



Fig. 31. Cuspidatumtorv $H_3R_1V_0$. — Grundmassan består av föga sönderdelade blad och stammar av *Sphagnum cuspidatum*.

Level V: Subsurface inspection requires laboratory techniques to determine genesis (including microscopic visual assessment e.g. pollen analysis), microbiology and molecular/chemical states.

The Blackland Index and the Blackland Vegetation Scoring (BVS) system can be used to create numerical scores for derelict fields whose past management is unknown. Both are simple field tests requiring no specialist equipment aside from one lab test of pH, and are designed to be used by land managers; the BVS system requires good botantical knowledge. They aid in understanding and comparing the potential of various fields within a limited geographic area, and are useful for mapping and for statistical treatment.

The results of the first 5 years of research were presented at a conference "Under-used Crofts: Realising the Potential" on 23 February, 2016 on Grimsay in the Outer Hebrides, Scotland. Jointly presented by the Blackland Centre and SRUC Research (Edinburgh), speakers discussed topics including causes and effects of under-use of agricultural blackland, soils and nutrient cycling in the west of Scotland, carbon balance in agriculture, and tools for visual evaluation of derelict fields.

The next research period (2016-21) will look more deeply into the soil processes - as yet poorly understood - that characterise blackland. Carbon cycling in soils of 50% - 70% OM may be different to that in mineral soils. Biogeochemical transformations may have taken place through the anthropic inputs of traditional rotations, causing soil aggregates to become more stable. This may bear on the distribution of useful grasses and forbs which appear to thrive well outside of their predicted pH and nutrient tolerances. Such factors make the blackland of the Outer Hebrides a challenging and valuable area for continuing research.

Today's concerns regarding food security, rural sustainability and adaptation to climate change have motivated action to return blackland to productivity, which in turn supports the diversity of traditional land use and the vitality of crofting communities. Generally intractable under high-input agriculture, blackland fields present a unique set of management questions, the answers to which have mostly been lost along with the generations that built them. Research on blackland - with tradition, ecology and agriculture as guides - may offer tantalising insights to agricultural resilience in the 21st century.

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# New IPS members

**Student members:**

Australia: Kariene Bain
Singapore: Lahiru Wijedasa

**Individual members**

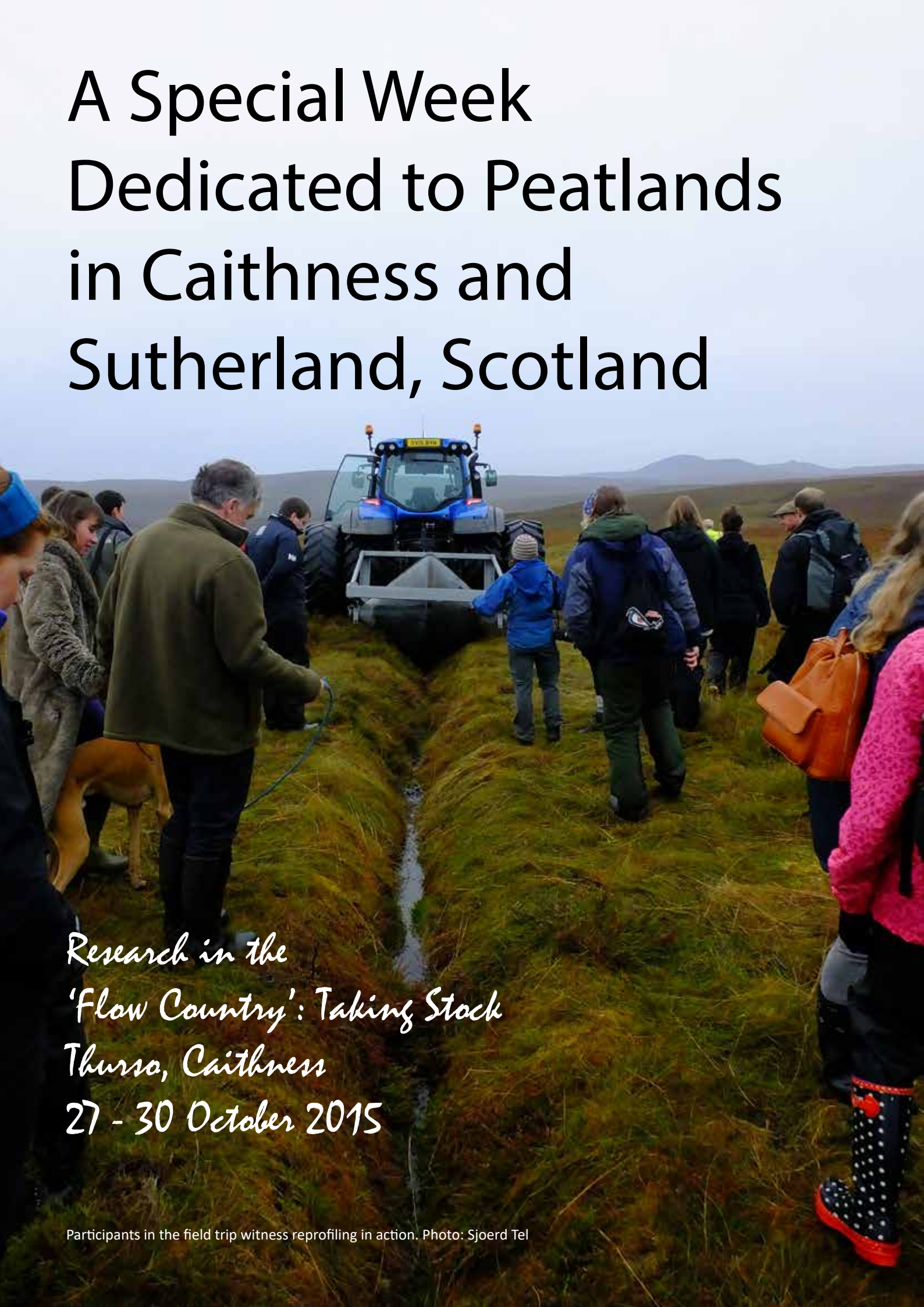
Canada (CSPMA/CSPP): Marie-Claire LeBlanc, Susanne Walford
China: Xian, Chang Chen, Peiling Chen, Dejian Gao, Shirong Guo, Qinghua Guo, Jeffy Hou, Ming Jiang, Zhiyang Jiang, Zong Li, Min Li, Changjun Ma, Litong Ma, Fuqiang Qi, Qingmao Shang, Yanfeng Shen, Xiangyang Sun, Jun Tan, Liping Wu, Haiyan Wu, Jiangping Xia, Dalin Yang, Zhiguo Yang, Zhong Yin, Rongsheng Zhao, Xiaping Zhou
Finland (Suoseura): Roy Ahlfors, Jani Antila, Nora Arnkil, Liisa Elo, Tuomas Haapalehto, Iikka Haikarainen, Tiina Heikkinen, Elina Häikiö, Henri Jokinen, Janne Kivilompolo, Aino Korrensalo, Merja-Teija Lehtonen, Niina Mattila, Ninni Mikkonen, Ville Mäkinen, Miia Parviainen, Timo Rannila, Heli Sadinsalo, Anna Salomaa, Aila Toivonen
Hungary: David Molnar, Katalin Nafradi, Balazs Pal Sumegi, Pal Sumegi, Tunde Sumegine Töröcsik
Ireland: Alex Copland, Patrick Crushell, Margaret O'Riordan
Malaysia: Noor Azura Ahmad, Felecia Collick, Joseph Jawa Kendawang, Siew Yan Lew, Frazer Midot, Priscilla Esther Mikin, Ken Guan Xhuan Wong
Singapore: Judah Jay
United Kingdom: Amy Gray

**Corporate/institute members**

Bosnia and Herzegovina: Marin Filipovic (Ekoterra)
Canada (CSPMA/CSPP): David Baldwin, Tom Gartner (Scotts Miracle-Gro Company, USA), Bowe McGinnis (Alaska Peat Inc.), Vicky Parenteau (Fafard et Frères), Justin Walsh (Juniper Organics)
Estonia: Mikk Sarv (AS Torf), Valeri Vesselov (AS Tootsi Turvas, Lavassaare Jaoskond)
Germany (DGMT): Roman Dittrich, Karin Kessler (Hydro-Consult), Geerd Smidt (Klasmann-Deilmann GmbH)
Ireland: Sharon Byrne, John Connolly (Coillte), Maurice Eakin (National Parks and Wildlife Service)
Latvia: Ingrida Krigere (Latvian Peat Association)
Lithuania: Irmantas Chrimlis (UAB Rekyva), Vaidas Intas (UAB Kamineros Kroviniu Terminalas), Ugne Radziunaite (IPS Lithuanian National Commitee)
Netherlands: J. Roosen (Cabot Norit Nederland)
Turkey: Ahmet Gulsun (GLS Grup Tarim A.S.)

www.peatlands.org/join-us

# A Special Week Dedicated to Peatlands in Caithness and Sutherland, Scotland



*Research in the 'Flow Country': Taking Stock*
*Thurso, Caithness*
*27 - 30 October 2015*

Participants in the field trip witness reprofiling in action. Photo: Sjoerd Tel

The peatlands of Caithness and Sutherland have been nationally showcased in a week long programme of events across the region, involving over one hundred scientists, policy makers, artists, land owners, and community representatives.

The week kicked off with a public 'Forum' at the Ferrycroft Centre in Lairg. The event, organised by the Peatlands Partnership and chaired by Professor Stuart Gibb of the UHI's Environmental Research Institute, opened with a talk via video by local MSP Rob Gibson. The Forum provided a platform for open discussion and debate on topics including the Scottish Government's Peatland Strategy and the Heritage Lottery funded 'Flows to the Future' project. Participants were also updated on efforts to secure UNESCO World Heritage Site status for the 'Flow Country' and a special workshop saw them attempt to draw its boundaries.

Next stop was Thurso, and the Third "Research in the Flow Country" conference. This brought researchers and students from all over the UK together with representatives from government and stakeholder agencies, as well as the renewable energy sector, to discuss the latest research findings. Included was a keynote presentation on the assessment of the global importance of the 'Flow Country' blanket bog, delivered by Professor Hans Joosten, Secretary-General for International Mire Conservation Group and based at the University of Greiswald, Germany.

Events continued with presentations on sustainable management of the Flow Country peatlands and the impacts on carbon emissions, biodiversity, water quality and climate regulation. However, delegates received the opportunity to sample more than simply science. Highlands and Islands Enterprise supported the promotion of some of the region's food and drink products. Meanwhile, hospitality students from the North Highland College treated them to a special dinner featuring the best available local produce. Local artists were also invited to contribute artwork inspired by the Flow Country landscapes to the poster session, which was also open to the public.

'Peatland week' was rounded off by a field trip to Welbeck Estate, led by the estate Factor Anson MacAuslan and 'Flows to the Future' Advisory Officer, Gearóid Murphy. Here, in the shadow of Scaraben, the group was able to observe blanket bog restoration in practice. Supported by the Scottish Natural Heritage's Peatland Action fund, the re-profiling of hill drains and their blocking with peat dams was shown to slow water flow from the bog and thus reduce erosion.

Anson then delivered an expected treat to visitors by showing them salmon spawning at a redd in the Langwell Water. He explained the ecology of these fish to a captivated audience, most of whom had never seen salmon up close. The field trip concluded with a visit to the Grey Cairns of Camster, allowing the group to observe an ancient cultural aspect of Caithness.

Dr Roxane Andersen from the Environmental Research Institute (part of the University of the Highlands and Islands), who led the organisation of the conference, stated: "We were delighted to bring together participants from all over the UK to discuss [the] latest research on these internationally important peatlands. We are already looking forward to welcoming

The poster session of the 3rd "Research in the Flow Country" conference included scientific poster, art work inspired by the landscape and was open to the public. Photo: Stuart Gibb

Participants in the Peatlands Forum attempt to draw boundaries for the Flow Country in a workshop. Photo: Stuart Gibb

delegates back to Caithness for the next Flow Country Conference in spring 2017. It is clear that we must work across disciplines and develop long-term monitoring programmes that evaluate how key peatland functions change with restoration practices and how they will respond to climate change".


Roxane Andersen

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with contributions from Gearóid Murphy (Flows to the Future), Stuart Gibb (ERI UHI), Caroline Eccles (Flows to the Future) and Ian Mitchell (Scottish Natural Heritage)


# Background Information

The **Peatlands Partnership** was formed at the end of 2006 following the completion of the EU Life Peatlands Project, with the aim of building on progress achieved by this project. The Partnership now provides a platform where all aspects of peatlands and peatland management can be openly discussed. Today, the Partnership comprises the following 'core' organisations: Scottish Natural Heritage, Forestry Commission (Scotland), Highland Council, RSPB Scotland, Plantlife International, The Flow Country Rivers Trust, Northern Deer Management Group, The Environmental Research Institute (of the UHI) and Voluntary Groups East Sutherland.

The **Environmental Research Institute** (ERI) in Thurso is part of the North Highland College, one of the academic partners and part of the University of the Highlands and Islands (UHI).

**Flows to the Future** is an ambitious project that aims to restore areas of blanket bog damaged by forestry planting in the heart of the Flow Country. It will also promote and develop our knowledge about the role of peat and carbon storage, and involve and connect people everywhere with this precious habitat, delivering real economic benefits for one of the least densely populated areas in Scotland. The project is being delivered by the Peatlands Partnership with the lead partner being RSPB Scotland. The project is funded and supported by the Heritage Lottery Fund, RSPB, Scottish Natural Heritage, Forestry Commission Scotland, WREN, The Highland Council, Highlands and Islands Enterprise, the Environmental Research Institute, SNH Peatland Action, the European Regional Development Fund and SRDP.

For further information, contact:
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Gearoid Murphy, Advisory Officer, Flows to the Future: gearoid.murphy@rspb.org.uk

# Klasmann-Deilmann GmbH - An important player in the Emsland economic region

Olaf Lies, Lower Saxony's Minister for Economic Affairs, Employment and Transport, recently visited Klasmann-Deilmann in Geeste. "We are delighted to have the opportunity to present our company as representative of the Emsland economic region," said Moritz Böcking, Managing Director at Klasmann-Deilmann. Minister Lies was impressed by the firm's efforts to develop innovative raw materials and to use these as substitutes for peat. "Growing media are indispensable to modern horticulture," he affirmed. "They play a pivotal role in the value chain of the food industry. In seeking alternatives to peat and developing innovative raw materials, companies such as Klasmann-Deilmann are leading by example."

The discussions focused on cutting-edge issues that will be of key importance for the firm over the next 10 years. Summing up, Moritz Böcking said, "There is a considerable overlap between Lower Saxony's stand on major policy issues and

Assessing wood as a sustainable raw material for substrate and energy production (from left): Michael Perschl, Managing Director of production company Klasmann-Deilmann Produktionsgesellschaft Süd; Olaf Lies (SPD), Minister of Economic Affairs; Gerd Will (SPD), Member of the Lower Saxony State Parliament; Moritz Böcking, Managing Director of the Klasmann-Deilmann Group; and Andrea Kötter (SPD), Member of the District Council. Photo: KD

Klasmann-Deilmann's intentions. We both need to take advantage of this to our mutual benefit."

For example, Klasmann-Deilmann has, alongside peat, for many years been increasingly focusing on alternative constituents suitable for growing-media production. There is, however, competition for the necessary raw wood materials and residual green waste, which are being used more and more as an energy source.

"Where scarce resources are competed for, this is to the detriment of substrate producers and thus hinders the achievement of the federal state's policy, namely to accelerate the phasing out of peat extraction and to call for alternatives," Moritz Böcking commented. "In this respect, we need to see equal opportunities for both branches of industry in the future." Olaf Lies added that the firm could count on the state government's support.

# Funding for research projects to develop new raw materials

At the same time, Klasmann-Deilmann is also looking into new ingredients for substrate manufacture. As part of these activities, the company launched the world's largest Sphagnum-farming project, which is part-funded by the federal-state government, in the autumn of 2015.

"In the coming years, we will considerably expand our research and development work and explore completely new paths," explained Moritz Böcking. "Successes that we achieve in this context may prove crucial for commercial horticulture worldwide, underline the innovativeness of Lower Saxony's economy and, indirectly, help achieve Germany's environmental and climate protection objectives."

A support programme is desirable here that benefits the horticultural and substrate sector, in which companies are predominantly small and medium-sized and not able to fully fund extensive research projects. Minister Lies agreed to this idea in principle: "It's important that, where on the one hand we place limits on an industry in terms of raw-material extraction, we should on the other hand also make alternative options available."

Moritz Böcking added: "Within this context, and in line with Lower Saxony's climate and nature conservation goals, a debate should be launched to achieve greater flexibility in the after use of peat production sites." The commercial use of former extraction areas for paludiculture could prove path-breaking.

# Renewable resources dependent on land prices

Böcking also sees scope for political action with regard to the Klasmann-Deilmann Group's activities in the field of renewable energy and resources. "The wood fuels that we obtain from short rotation forestry plantations could make a significant contribution to the success of the energy transition." This is precluded by the excessive prices for agricultural land in Germany, which prevent this business segment expanding in

Klasmann-Deilmann is the leading player in the international substrate industry, with subsidiaries and trade partners in more than 70 countries.

Our substrates provide the basis for plant growth and for the success of horticultural companies. As an up-and-coming provider of renewable resources, we are also active in the renewable energy sector.

Our standards include RHP, ISO 9001, ISO 14001 and ISO 14064, and our benchmark is innovation and sustainability in all parts of the company.

In the 2015 financial year, we had a workforce of 950 and generated sales of about EUR 180 million.

The IPS Executive Board visiting Geeste, Klasmann-Deilmann and the Moormuseum in January 2015. Photo: Hannu Salo

an economically sound manner. In Böcking's view, one way forward is to promote more extensive uses of farmland – such as short rotation forestry – which would lead to a win-win situation in terms of the environment, agriculture and companies such as Klasmann-Deilmann.

Finally, Böcking thanked Minister Lies for showing interest in an industry that is not often the centre of public attention. Lies expressed his gratitude to Böcking for a stimulating inside look at a medium-sized family business with "a clear vision of the future", and is looking forward to "initiating smart projects in cooperation with the Ministry's Environment and Agriculture departments. Companies like Klasmann-Deilmann, who retain and create good and secure jobs, deserve support from the federal state."

For more information on Klasmann-Deilmann GmbH and their activities, you can visit the company's website at www.klasmann-deilmann.com or ask their press contact:

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# IPS Executive Board Elections 2016

The following persons are candidates for election to the Executive Board of the IPS at the Annual Assembly in Kuching, Malaysia on 19 August 2016. Six persons will be elected. Moritz Böcking, Erki Niitlaan and Claes Rülcker continue their work on the EB. All National Committees that have paid their membership fees 2015 can send one representative to the Annual Assembly. Each National Committee has one vote. More information can be obtained from the IPS Secretariat, ips@peatlands.org or from your National Committee.

### President
Gerald Schmilewski

### 1st Vice President
Björn Hånell, Samu Valpola, Guus van Berckel

### 2nd Vice President
Jack Rieley, Samu Valpola

### Ordinary Member
Donal Clarke, Lulie Melling, Jack Rieley, Paul Short, Samu Valpola, Guus van Berckel

### In addition, the Executive Board elected new Commission Chairs 2016 – 2018

| | |
|---|---|
| Environmental: | Bernd Hofer |
| Economic: | Guus van Berckel |
| Social: | Marie Kofod-Hansen |

# When it comes to growth, we focus on our responsibility

We don't ourselves set the standards we are measured by. Our benchmark is sustainability across all of the company's activities. At Klasmann-Deilmann, we integrate economy, ecology and social action into a holistic strategy.

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- ISO 14001
- ISO 14064
- R.H.P.
- PEFC
- Grünstempel®
- GRI-G4

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Professional training, organized in 2015 by Pôle-relais tourbières in Riou Pla fen, Ariège, Eastern Pyrenees. Photo: Francis Muller, FCEN/PRT

# Pôle-relais tourbières

## The French Mire Resource Centre

In 2001, during a first national action plan for wetlands, the French Ministry of Environment decided to create five resource centres devoted to the primary types of wetlands present in the country. Fédération des Conservatoires d'Espaces Naturels (FCEN), consisting of a network of conservancies working all over France, had just led a LIFE programme for the protection of mires and was given the task to implement Pôle-relais tourbières.

Thus, a source of information about these habitats was created that served as a support centre when implementing protection programmes. This centre also had to bring together all the national and regional actors concerned by these biotopes; though these actors may not have been the most widespread in the country (where it constitutes about 0.2% of the territory), they compensated for their relative smallness by the rarity and the originality of the species and habitats they presented.

The tools of Pôle-relais tourbières are simple: a team of four persons, supported by a scientific council and a network of 60 correspondents all over the country, as well as a vast physical and online library with 6235 technical, scientific, juridical and pedagogic references* about mires and peatlands in France and elsewhere in the world.

Pôle-relais tourbières works with four similar resource centres, each focusing on specific types of wetlands and coordinated by ONEMA (the National Board for Water and Aquatic Habitats): Mediterranean lagoons, marshes along the Atlantic coast, inland wetlands and ponds and mangroves and overseas wetlands. Together, they implement actions and redact documents, constituting support that is original in Europe and aimed at favouring the knowledge and protection of wetlands.

## Finding the best advice to give to site managers

Pôle-relais tourbières not only makes available literature created by different specialists, but also compiles best practices and edits guidebooks to be used by site managers. It compiled a book regarding the management of peatlands in French mountain areas (2010) and another about the best way to maintain fen orchids (*Liparis loeselii*) in its habitat (2014).

On its website, practical advice and lists are also offered; for example, where to find an exhibition about wetlands, a company specialized in field works on mires, and how to use drones to make a 3D-model of your mire. This website might currently look like an Ali Baba cave for everyone looking for information concerning mires. However, we hope to keep our cave less disordered than Ali Baba's! Our website is mainly available in French, as our centre is dedicated to helping national colleagues; as such, its English and German pages are not as up to date.

Advice for sites managers can reach them through the library and can also take the form of personal contacts in order to determine the proper management of peatlands, or when attempting to find solutions to difficult questions. In 2013, for example, having seen the interesting effects of Asian water buffaloes grazing in some types of peatlands in Central Europe, PRT proposed that such management, which had never been experimentally applied to French mires, could potentially be useful in some cases.

The managers of Marais de Sacy wanted to try this approach and now, a family of these animals peacefully lives in and satisfactorily assists in managing a part of this fen.

To improve the awareness and knowledge of all mire actors, PRT proposes training days or weeks for professional NGOs, foresters and others. The role of our five resource centres in public educational activities is also increasing.

## Implementing new regional protection projects

Pôle-relais tourbières helps regional organizations to mount and develop projects aimed at the preservation of mires and peatlands in several French regions. The purpose of doing so is to develop active programmes in all regions so that important mires are not forgotten in the long term.

For example, PRT took part in the preparation of the EU-funded LIFE+ programme, "Tourbières du Jura" www.life-tourbieres-jura.fr/accueil-eng.html, the most ambitious ever accepted in France.

It's now helping the Pays-de-la-Loire Region to create an action plan for the rehabilitation of its mires. This region has several large fens located around the Loire estuary (some of them having been damaged by farming activities, others by peat extraction) and a number of small, often neglected mires scattered across the region. In the mountain ranges in the heart of France, Central Massif is assuring coordination with several regional natural parks and conservancies to prepare a vast ERFD (European Regional Development Fund) funded project specific to the

View of the Pôle-relais tourbières library in Besançon, Franche-Comté. Photo: Francis Muller, FCEN/PRT

restoration of mires, and which should begin next year.

PRT also participates in national and international campaigns. The International Wetlands Day occurs annually on 2 February, on the birthday of the Ramsar Convention for Wetlands. A large number of events are organized all over the world to celebrate the date, to promote wetlands and to better highlight their amenities.

France is presently the country in the world where the largest number of wetland-related events is proposed to the public. In 2015, 551 events found place in one or another wetland; though mires were only involved in some of these, Pôle-relais tourbières relayed this event. It particularly promoted the day in Franche-Comté, the region in which it had been established. Though France had for a long time lacked an efficient network of Ramsar sites, the situation has been significantly improved, with several mire sites applying for candidateship: the Somme Valley, as well as the fens of Sacy in Picardy and Marais Vernier in Normandy being among them. Some applications may also soon occur in the Central Massif.

International actions only constitute a small part of Pôle-relais tourbières' actions. However, as mires are more widespread in Northern countries, it is important that the organization stay in touch with teams developing research and works in these countries. PRT also has regular exchanges with neighbouring countries, particularly Switzerland (common projects in the mires in the Jura Mountains, which constitutes the border between France and Switzerland) and Germany (we organized a common congress in 2008, and welcomed a group of German foresters in 2013 for professional training). It also participated in some activities of IMCG and the French National Committee of the IPS as long as it existed.

At a European level, with the Global Nature Network and its 'Living Lakes' programme, we invited 50 participants from 12 countries to a seminar in 2012 concerning "Current Issues of Biodiversity Protection and Participatory Development", where mires were a significant subject of discussion.

To summarize, though a national resource centre for mires first appeared as a tool among others for implementing a national action plan, it still exists 15 years later and fulfils its original function, i.e., being a link between all who, at a local, regional and national level, acknowledge mires as very special places, and do their best to protect and improve their quality.

*To make a request in our database, see http://pole-tourbieres.org:8080/dyn/portal/index.seam?page=search&fonds=2&req=11&menu= (menu in French only, as are 4579 of the references; 1242 are in English)

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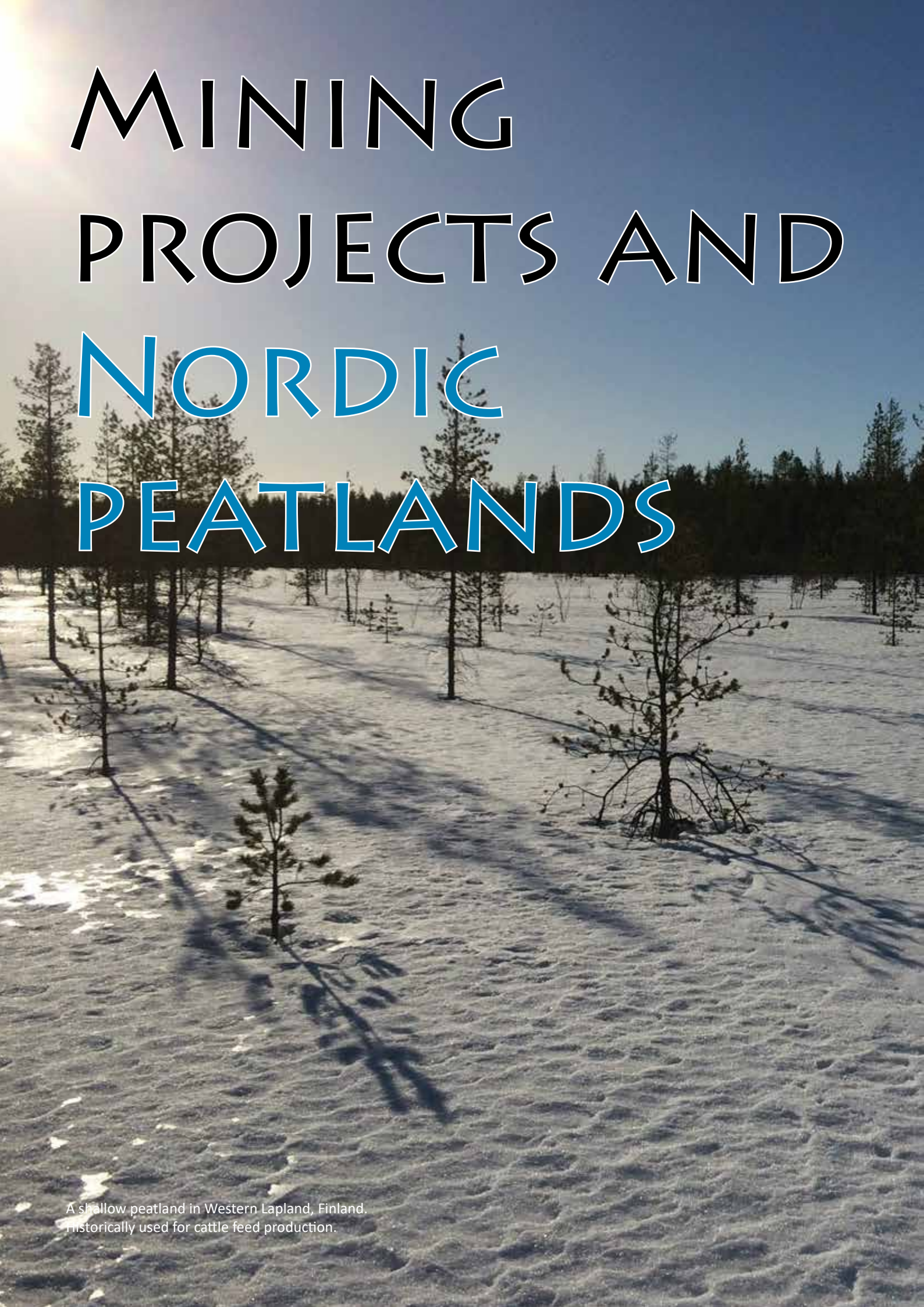
# Mining projects and Nordic peatlands



A shallow peatland in Western Lapland, Finland. Historically used for cattle feed production.

Recently, the relationship between peatlands and mining has increasingly gained public attention in Nordic regions. The permitting of exploration and mining projects that impact on wetland and peatland areas has been discussed from Gotland to Finnish Lapland. Nordic peatlands and mining projects have been closely connected since the Viking era. The nature of this relationship has changed over centuries and is once again developing in new directions.

# The shared history of mining and peatlands

The shared history of mining and peatlands goes back to the Iron Age. In Nordic regions, the usual iron "mines" were actually peatlands. Bog iron provided materials for tools and weapons, making these peatlands one of the factors behind the power and success of Vikings.

"Bog iron mining" was often quite similar to the process we know as peat cutting. Iron ore nuggets were collected manually from peat blocks. Iron was processed in soil sumps using wood charcoal for creating a reduced atmosphere. The iron recovery rate may have been low, but little by little, processing facilities developed into the first versions of blast furnaces. Iron production from bog and lake iron held its position for a long time. During the 19th century, bog iron production gradually deceased. It had lost the competition against iron extraction from hard rock deposits. Explosives enabled these new developments and economics favoured mining methods that are similar to modern techniques.

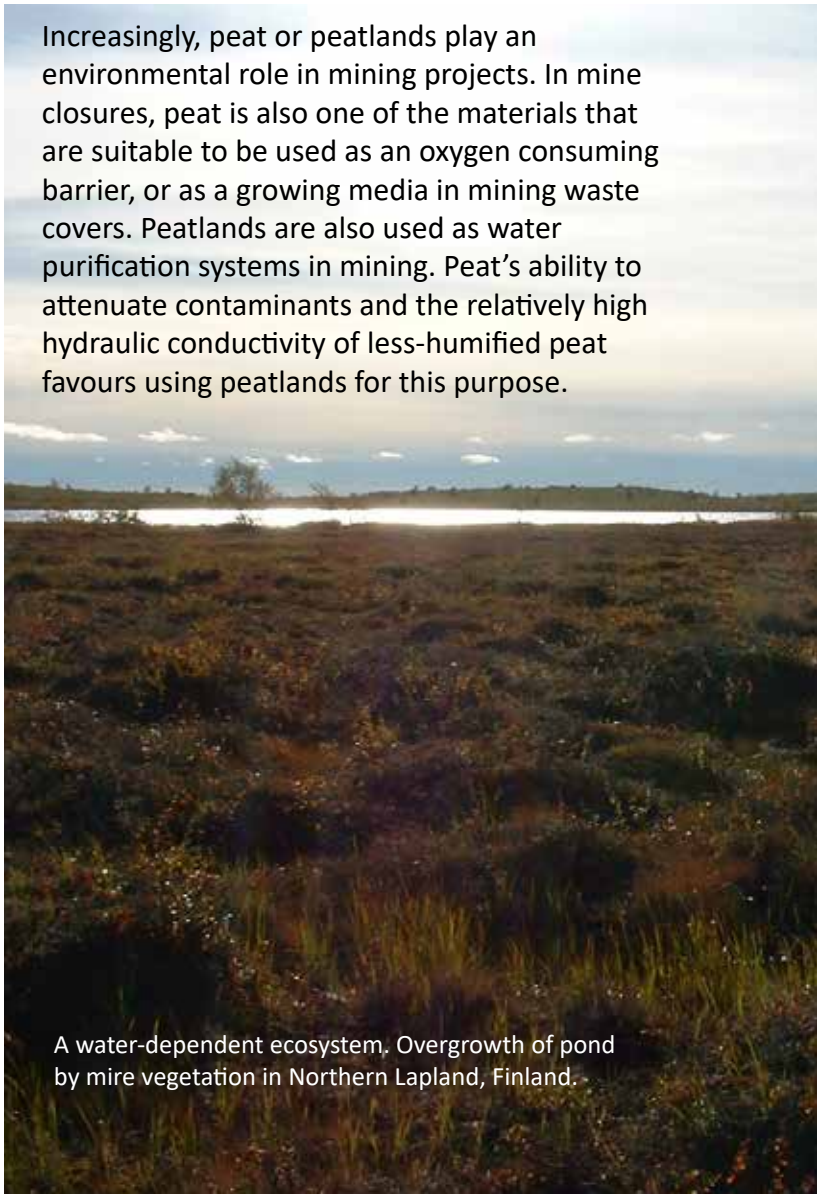
Nordic bog iron is post-glacial, as are peatlands and in suitable environments, it is continuously building up. Nordic bog iron is formed as a result of the oxidation of iron transported by groundwater. Iron oxyhydroxides form minerals like goethite by a process of crystallization. In this way, both iron and peat continue to accumulate over time to form these "bog iron mines", something we modern people can only dream about: a rechargeable metal resource. During the Iron Age, new generations returned to use their ancestors' mining sites.

In the modern world, there are more people with higher demands, consuming far more metals and minerals than before. Modern mining changes peatland environments more dramatically and at a completely different scale. But can we predict the true impacts of our mining activities? Does mining risk wiping out mire landscapes for good?

# Mining today in peatland environments

In the Nordic regions, there are many peatlands and several mining projects are likely to take place in peatland environments. In some cases, the ore is simply located below a peatland. Peatlands also often serve as tailings impoundment facilities as landforms favour damming peatlands for this purpose. The peat layer may also form a part of the barrier between tailings and the groundwater regime. Well-humified peat and especially compacted peat have relatively low hydraulic conductivities.

Increasingly, peat or peatlands play an environmental role in mining projects. In mine closures, peat is also one of the materials that are suitable to be used as an oxygen consuming barrier, or as a growing media in mining waste covers. Peatlands are also used as water purification systems in mining. Peat's ability to attenuate contaminants and the relatively high hydraulic conductivity of less-humified peat favours using peatlands for this purpose.



A water-dependent ecosystem. Overgrowth of pond by mire vegetation in Northern Lapland, Finland.

Mining waste with acid rock drainage and metal leaching potential.

Peatlands are ever more becoming an environmental concern in the area of mining. Besides changes effected through actual land-use, the potential impacts of mining include, for example, water quantity and quality changes, dust, noise and vibrations. These physical and chemical changes in the surrounding environment are also to some extent likely to be reflected in the area's biodiversity.

One of the key impacts of mining is lowering the water table. Mire ecosystems are dependent on certain water tables and mine drainage always alters the groundwater table to some degree. The hydrological footprint size of mines varies according to many different factors, for example, mine type and mine size, as well as the hydraulic conductivity of both overburden and bedrock, as well as the fracturing of bedrock. Understanding hydrogeology is becoming one of the most critical factors for assessing the environmental impacts of mining on peatlands and mire ecosystems.

# Can we predict the mining impacts on peatlands in a reliable manner?

A commonly asked question is if a peatland will be able to maintain its water table near a deep mine. There is obvious risk of misinterpretation if assessments are carried out by looking at surface catchment areas only. A fractured zone in the bedrock can drain water to a mine from several catchment areas that may appear, on the surface, to have no obvious connection to the mine site.

The first step to evaluate this situation is the conceptual hydrological and hydrogeological characterization of the site.

This is carried out in order to gain a better understanding of the surface and groundwater interactions and the regional flow regimes. The first step enables planning the second step, i.e., hydrogeological testing. The third step is predictive modelling, which enables (among other things) defining the hydrological footprint of the mine.

Representative hydrogeological testing of the bedrock may appear almost impossible to achieve. However, this is not the case. In a well-managed mining project, hydrogeological test-work can be well-targeted. Exploration drilling and geological assessments can produce plenty of useful data. A three-dimensional geological model, complemented by data from geotechnical core logging can provide a reasonable basis for planning different tests.

In a peatland environment, there are often complex features present in the surface hydrology that cannot be overlooked. The correct data collection approach and the correct detail level play key roles and should also be derived from the conceptual site characterization.

Measurement techniques, assessment methods and modelling packages for geochemistry, noise, vibration and air quality are well developed and

Mining waste.

commonly used today. The toolkit for ecological studies is also more encompassing than before.

Are assessments and predictive models trustworthy? Good modelling work includes calibration and validation. Both models and "traditional calculations" should be tested by sensitivity analysis. Sensitivity analysis aims for an understanding of the uncertainties and recognizing the critical inputs.

Water treatment on a peatland. Overland flow field is a suitable solution for many purposes: it attenuates solids, metals, metalloids and nutrients.

A critical input can be defined as a parameter that significantly changes the output, even if the parameter itself is changed only marginally. The quality of the critical inputs have to be as good as possible. The confidence level varies from one assessment to another, and the confidence level can be stated.

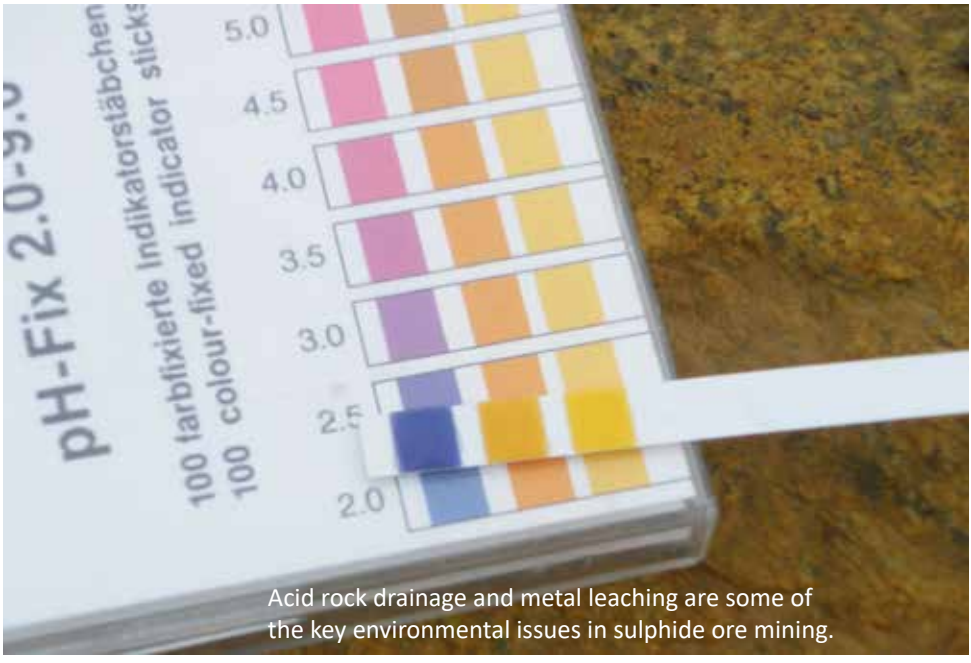
# Exploration in Natura 2000 peatlands – limitations within reason

A significant quantity of Nordic peatlands have protection status, or Natura 2000 status. One of the most discussed mining subjects has been exploration drilling in Natura 2000 areas. In this context, it can be highlighted that Natura 2000 status does not mean protection in the traditional sense of site protection. Within Natura 2000 areas, the survival of certain species or nature types, defined on a case-by-case basis, has to be secured.

Many human activities take place within Natura 2000 areas (consider, for example, the Tornio River catchment area as a Natura 2000 area). Exploration work should not be entirely prohibited within Natura 2000 areas. From a purely legal perspective, before exploration can be permitted, impacts have to be assessed from the perspective of the species or nature types that form the basis for the Natura 2000 status of the site in question.

All the necessary precautions should be taken to secure the initial purpose of Natura 2000 sites, but minimizing other nature impacts is also part of good practice. On the other hand, unnecessary exploration limitations can also backfire from an environmental protection perspective. In a well-managed mining project, exploration provides data for environmental purposes.

For example, assessment of the hydrological footprint of potential future mines will benefit from exploration stage drilling data (as explained above). Very few exploration projects develop




Acid rock drainage and metal leaching are some of the key environmental issues in sulphide ore mining.

Mire vegetation reappears on industrially used land.

into mines; some nonetheless do and incomplete data sets may result in incomplete environmental impact assessments.

## Mine closures – possibility for mire establishment?

Mire establishment is an interesting potential complementary mine closure method, especially in the case of sulphide ore mining environments. Sulphides are generally relatively stable, as long as they remain under waterlogged conditions or if oxygen availability is limited in some other way.

When exposed to air, iron sulphides react with oxygen and generate a variety of iron compounds and sulphuric acid. If the system's neutralizing capacity is small, pH falls and the mobility of metals increase. This phenomenon is known as acid rock drainage and metal leaching (ARDML).

Topography can often be an obvious limitation to mire establishment. For example, waste rock dumps are generally elevated compared to their environment. Clearing ponds related to tailings storage facilities, on the other hand, present a potential site for post-closure mire establishment. Sometimes, contaminated soil materials are removed and relocated, causing pool-shaped landforms that are also suitable for mire establishment.

In some cases, mine closure measures include backfilling of an open pit with waste rock. If the waste rock has been characterized as an ARDML-risk, mire establishment on the top of the backfill may be very beneficial, as it limits oxygen availability and prevents ARML in several ways. Accumulation of organic mass brings oxygen consuming decaying material to the system. Conditions are water-logged. The inflow of more oxygen rich water flow is especially slow in water-saturated peat compared to free surface water. Peat also provides a medium for the attenuation of metals and metalloids, should ARDML occur. Phytoremediation can also potentially play a role.

Wetland development experiments have already taken place at a small scale at mine closure sites. In the future, experts in peat extraction area after-use and experts in mine closure should increase their information exchange. In the field of peat extraction area after-use, mire regeneration techniques have been developed for quite some time. Mine closure specialists have tool kits even for peat extraction sites with sulphide soil issues. After all, the same basic science supports all the applications and with careful planning, we can learn to utilize peatlands almost as resourcefully as our Iron Age ancestors.



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# Outflow of suspended solids from cutover peatlands in Sweden

## Lack of reasonable legal limits for suspended solids

In Sweden, permissions related to the Environmental Act regulate the allowable emissions of different elements and substances to surface waters from industry, municipal sewage treatment plants, etc. Permissions related to cutover peatlands generally include concentrations and amounts of a number of elements that should not be exceeded (guidance or limit values) in the outlet from the extraction sites. The aim is to reduce negative impacts on organisms, e.g., fish in downstream recipients. Elements of great concern are hydrogen (acidity, pH), nitrogen and phosphorus, as well as hazardous metals, e.g., mercury (Hg).

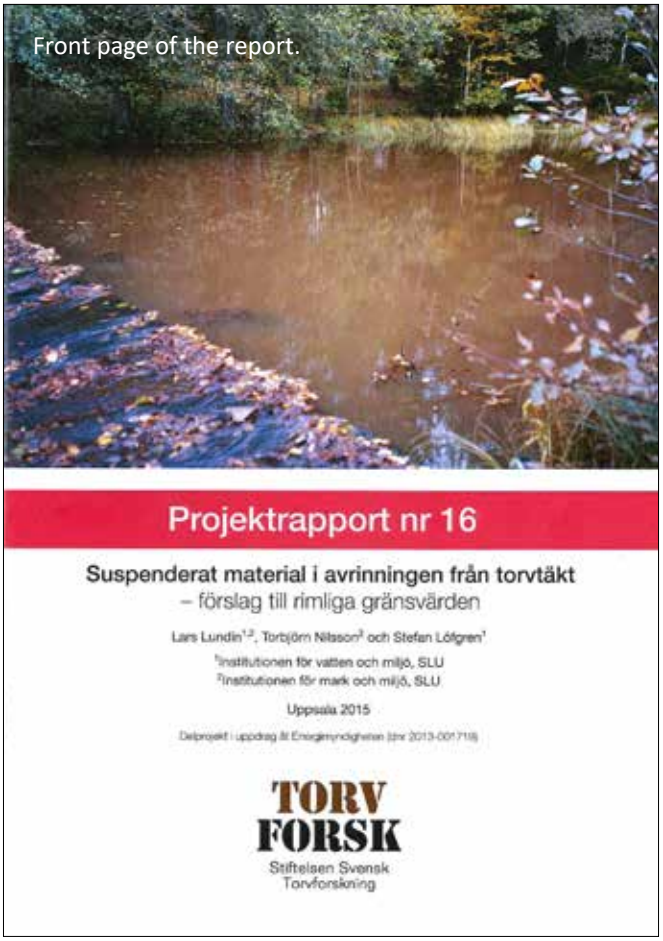
Suspended solids (SS) are also in focus and other elements which could be bound to SS. Legal limit values, set by the environmental authorities, are often considered low and difficult to achieve by the peat industry. Currently, SS is not included in the Swedish environmental quality classification system for surface waters. The limit values for SS are therefore to a great extent subjectively chosen and set in the permissions.

In order to obtain a commonly accepted and more objective classification system for suspended solids, the Swedish Energy Agency and the Swedish

Stefan Löfgren. Photo: Therese Zetterberg

Lars Lundin. Photo: Christian Demandt

Torbjörn Nilsson. Photo: Cajsa Lithell



Front page of the report.

Peat Research Foundation (TorvForsk) initiated an evaluation of existing SS data in inlets and outlets of cutover peatlands and streams draining catchments with different land cover and land use. The aim was to present reasonable limit values for SS in the outlets from cutover peatlands, based on effluent treatment efficiency at the extraction sites and SS concentrations generally found in Swedish streams. The Swedish University of Agricultural Sciences (SLU, Uppsala) carried out the assessment on suspended solids in Swedish surface waters and the results are summarized in this article (Lundin et al., 2015).

# Huge amounts of data from inlets, outlets and streams were evaluated

Concentrations of SS in inlets, outlets and recipients of cutover peatlands were provided primarily by the Swedish peat company Neova AB and the county administration board of Västra Götaland. In total, this database included approximately 7 000 observations from 76 peatlands. The Department of Aquatic Sciences and Assessment (SLU) is responsible for the national monitoring of streams, rivers and lakes, and holds a huge water chemistry database including data on SS. Data from this database, as well as the results from a few research projects, were included in the assessment. In total, the SLU database included approximately 30 000 observations.

# Suspended solids in streams draining mires, forests and arable land

Data from the cutover peatlands showed that the SS concentrations in the inflow from upstream natural mires (control location) had a mean value of 9.5 mg SS $L^{-1}$. This value was only slightly higher (10.5 mg SS $L^{-1}$) in the outlet from the extraction areas, though statistically significantly higher than in the inlet. Median values were 4.5 mg SS $L^{-1}$ and 5.6 mg SS $L^{-1}$, respectively, while the 90% percentile values were 17 mg SS $L^{-1}$ and 21 mg SS $L^{-1}$, respectively. The Swedish forest streams had a mean value on 7.0 mg SS $L^{-1}$ and a median value of 3.8 mg SS $L^{-1}$, indicating no significant differences between the two types of land cover and land use.

Streams draining agricultural areas on the contrary exhibited higher SS concentrations with a mean value of 14.9 mg SS $L^{-1}$ and a median value of 8.7 mg SS $L^{-1}$. From these comparisons we conclude that the SS concentrations in drainage water from peat extraction sites do not tangibly deviate from those found in streams draining non-exploited mires or forested areas. However, streams draining agriculture-dominated catchments had higher SS concentrations.

# Spatial and temporal variation should be considered

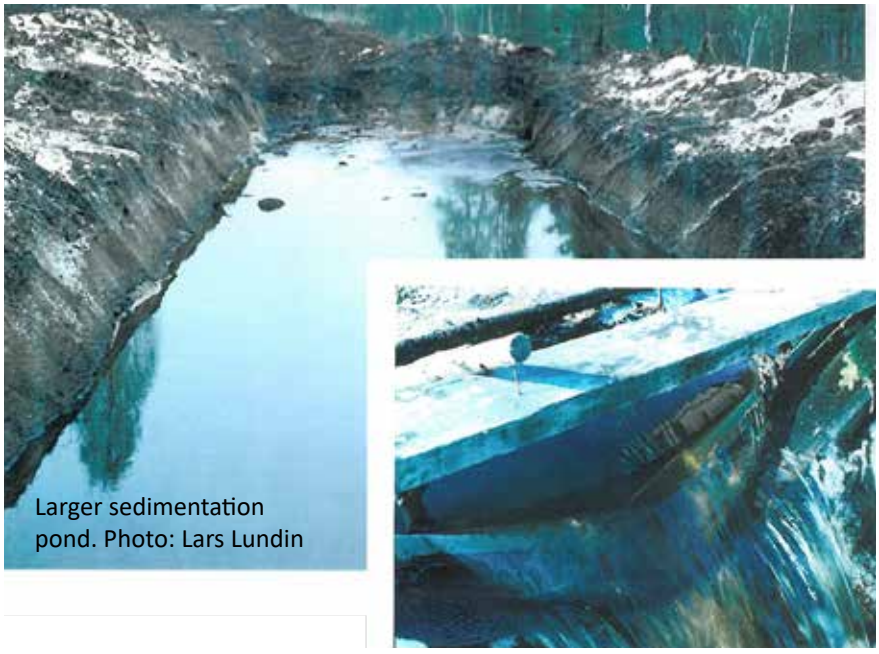
Following on from above, there is however considerable variation in the SS concentrations between different cutover areas and recipients. Furthermore, there is a large variation in time. The


Small pond for mitigating susp. outflow which is too small. Photo: Lars Lundin

implication of this is that the spatial and temporal variations should be considered before permission of peat extraction is given and legal limit values are set. In a parallel project at SLU, the monitoring design related to the control of emissions and downstream effects of cutover peatlands was assessed. In order to take into account the local prerequisites at each extraction site, it was stressed that there is a need for a working and well-designed monitoring system before the start of extraction.

# Reasonable and legal limit values demand improved monitoring

Our results showed that 10% of the observations from extraction site outlets had SS concentrations exceeding 21 mg SS $L^{-1}$. These high values need consideration, since it is most probably these that cause negative biological effects downstream. Therefore, we suggest an improved design and location of sampling sites, and a higher sampling intensity compared with today and/or the use of monitoring equipment allowing for continuous measurements of turbidity. Such data could provide valuable information for setting reasonable and locally adjusted legal limit values on SS, as well as guide the industry on how to optimize the treatment of peat extraction effluents, limiting negative downstream effects.


Larger sedimentation pond. Photo: Lars Lundin

# Source

Lundin, L., Nilsson, T. and Löfgren, S. 2015. Suspenderat material I avrinningen från torvtäkt – förslag till rimliga gränsvärden (Suspended solids in runoff from peat extraction areas - suggestion for reasonable limit values). Projektrapport 16. Swedish Peat Research Foundation (TorvForsk). Stockholm. 32 pp. (In Swedish)

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Allan Robertson Grants 2/5 2015

# Measuring Carbon Flows and Biomass in Forestry-Drained and Pristine Peatlands in Southern Finland

It is well known fact that peatland ecosystems are important sinks of carbon. Carbon accumulates through gross primary production and peat formation. Carbon dioxide is released from peatlands through mineralization and plant respiration. These processes are closely connected with vegetation, water level and other environmental factors and site characteristics.

This all changes if peatlands have been drained. The growth of shrubs and trees increases and mosses decline. This also decreases the carbon sink function of the peatland and may turn it to the carbon source. If the drained peatland is restored and the water table is raised, trees and shrubs should recede and mosses (especially Sphagnum) could take over again. This could return these areas to carbon sinks. Still, the spatial variances in vegetation can influence the spatial distribution of carbon flows.

The main aim of the study is to analyse $CO_2$ fluxes and the plant biomass of restored (previously forestry-drained) and pristine peatlands, and find connections between the amount of plant biomass, its structure (plant functional types), photosynthesis, respiration, and the overall net ecosystem exchange.

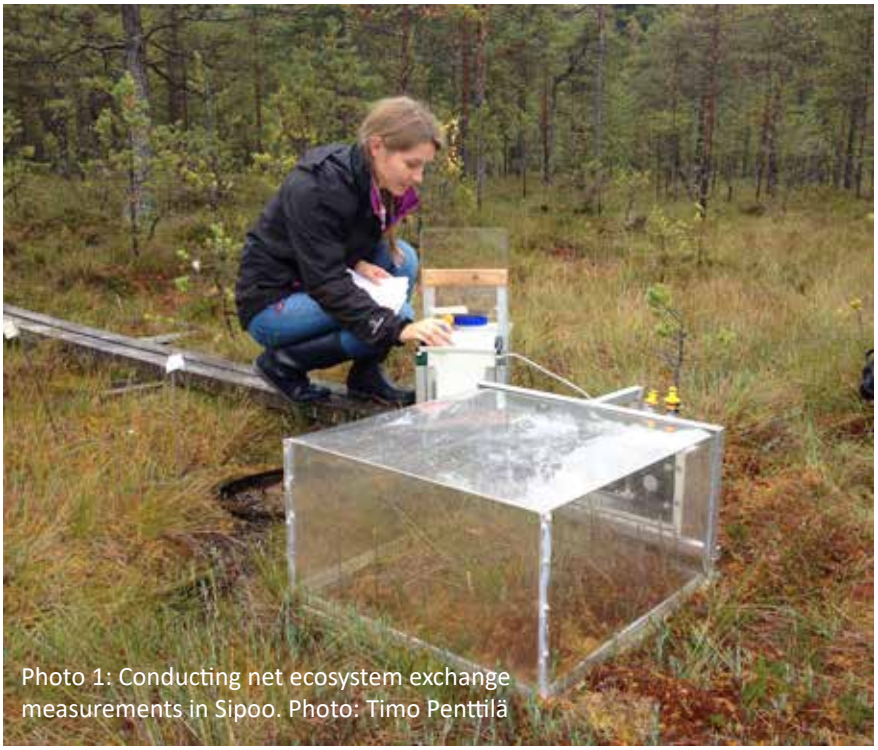

Photo 1: Conducting net ecosystem exchange measurements in Sipoo. Photo: Timo Penttilä

## Methods

The study sites, Tervalamminsuo (Tammela) and Stormossen (Sipoo), are located in southern Finland. Both these peatlands have previously drained and then restored parts, as well as sections of peatland that have been left in their natural states. In these peatlands I conducted carbon flow measurements and vegetation analysis (plant cover and biomass). For carbon flux measurements, I used a transparent chamber (60*60*30 cm), an infrared gas analyser (EGM-4), shades, opaque cover and a cooling system (Photo 1). The measurements were

conducted in 2015 at least once a month (twice in July) during the vegetation season from May until November. The measurements were conducted over a two- to three-minute period. The carbon content in the chamber was recorded in every 15 seconds. In this paper, I analyse only the net ecosystem exchange (NEE) measurements based on raw full-light NEE measurement data.

Biomass samples were collected at the end of July, 2015. From the Stormossen site, I collected 24 bryophyte and eight vascular plant samples, and from the Tervalamminsuo site I collected 36 bryophyte and 12 vascular plant samples. The vascular plant samples were collected from a round plot with diameter 15 cm, and the bryophytes samples were collected using a PVC cylinder with diameter 5 cm. Sampling points were chosen from near the $CO_2$ flux measurement collars with a vegetation similar to those in the collars. The plants were cleaned and dried for 48 hours at 65°C. After drying, the plants were weighed on a species level.

# Outcome

In both study sites the restored parts are less effective carbon sinks than the unrestored sites (Sipoo) or they are larger carbon emitters (Tervalamminsuo) compared to the part of the same peatland in the pristine state (Fig. 1). Tervalamminsuo was a carbon sink, but the Sipoo site was a carbon emitter, from that viewpoint, both parts (restored/pristine) were similar in one peatland.

There were differences also in the amount of aboveground plant biomass and its distribution between bryophytes and vascular plants (Fig. 2). In both sites, the restored parts had lower bryophyte biomasses compared to the pristine parts of the peatland. In addition, the Sipoo site had a lower bryophyte biomass than in the Tervalamminsuo site. There were almost no differences in vascular plant biomasses between the sites, only the restored sites had an iota (0.3 g $dm^{-2}$) smaller vascular plant biomass when compared to the pristine sites.

I thank the International Peatland Society for financing my fieldwork with the Allan Robertson Grant. I also thank Timo Penttilä for his immense help in planning and conducting the study and Kristel Karu for the biomass measurements.

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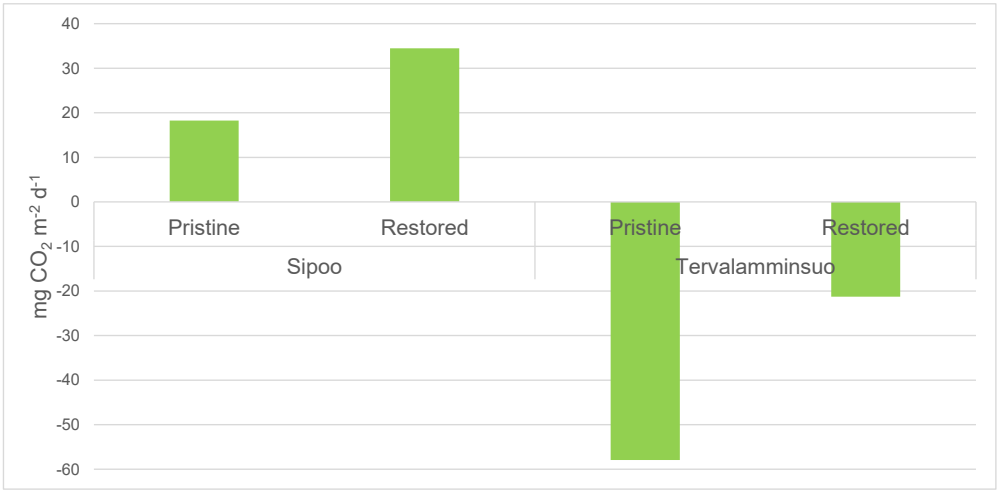


Figure 1. Net ecosystem exchange in restored and pristine parts of the Sipoo and Tervalamminsuo sites.

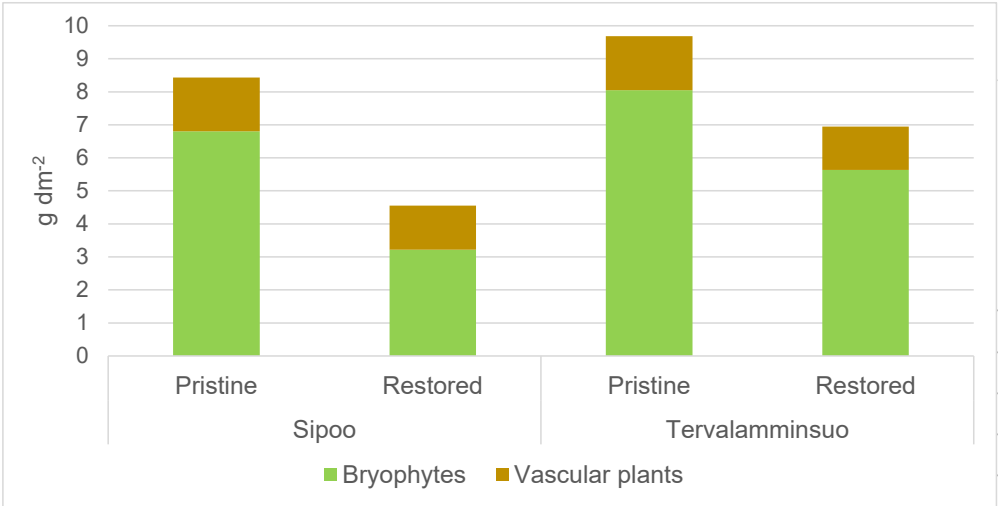


Figure 2. Aboveground biomass in restored and pristine parts of the Sipoo and Tervalamminsuo sites.

# Peat and peatland events

IPS Executive Board Meeting
Scientific Advisory Board Meeting
National Committee Round Table
Kuching, Malaysia, 14 August 2016

**15th International Peat Congress**
**"Peatland in Harmony - Agriculture, Industry, Nature"**
**Kuching, Malaysia, 15 - 19 August 2016**
**www.ipc2016.com**

IPS Annual Assembly and General Assembly
IPS Executive Board Meeting
Kuching, Malaysia, 19 August 2016

6th International Meeting on the
Biology of Sphagnum
Khanty-Mansiysk, Russia, 15 - 24 August 2016
http://mukhrinostation.com

IMCG Field Symposium and Congress
Peninsular Malaysia and Borneo
Malaysia and Brunei, 19 - 28 August 2016
www.imcg.net

10th SER European Conference on
Ecological Restoration
'Best Practices in Ecological Restoration'
Freising, Germany, 21 - 27 August 2016
www.ser.org

CAFEi2016
3rd International Conference on Agricultural and Food Engineering
Universiti Putra Malaysia
Kuala Lumpur, Malaysia, 23 - 25 August 2016
www.cafei.upm.edu.my

16th Baltic Peat Producers Forum
Kaunas, Lithuania
14 - 16 September 2016
www.asocdurpes.lt/en

10th INTECOL International Wetlands Conference
`Hotspots of Biodiversity and Ecosystem Services under Global Changes`
Changshu, China, 19 - 24 September 2016
http://intecol-10iwc.com/EN/Index.aspx

German Peat and Humus Day
Bad Zwischenahn, Germany
29 September 2016
www.ivg.org

EUROPARCS Conference 2016: Seminar about peatland restoration, paludiculture and climate change
Jura Vaudois Regional Park, Switzerland
19 - 23 October 2016
www.europarc.org

IPS Executive Board Meeting
Amsterdam, Netherlands
17 - 18 November 2016

Convention on Biological Diversity
13th Meeting of the Conference of the Parties
Cancun, Mexico
4 - 17 December 2016
www.cbd.int/cop

IPS Annual Convention 2017
Late May, Northern Scotland

IPS - ISHS Joint Symposium
Portland, Oregon, USA
20 - 25 August 2017
www.ishs.org

Carbon Cycling in Boreal Peatlands and Climate Change II – Hyytiälä revisited
Hyytiälä, Finland
25 - 29 September 2017
aino.korrensalo@uef.fi
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