

Paludiculture UK 2017: *Working with our wetlands*



Workshop Proceedings

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Kendal, Cumbria.

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Introduction

Peatlands cover over 10% of the UK, and represent a precious resource with multiple benefits; healthy peatlands store carbon, improve water quality and reduce flooding as well as providing a fantastic landscape for wildlife. Unfortunately, the vast majority of peatlands in the UK are in a poor condition because they've been drained of water to be used for conventional agriculture and forestry or damaged by peat extraction.

The damage caused can be irreversible, triggering soil degradation and greenhouse gas emissions as well as loss of other peatland benefits vital to our well-being. The damage can be greatly reduced though re-wetting; re-wetting however makes current, conventional land use unviable. What is the solution? Can there be a win-win for the peatland environments and those who use peatlands to earn a living?

Paludiculture, the productive use of wet and re-wetted peatlands potentially allows for long-lasting, sustainable cultivation of peatlands. Paludiculture (Latin 'palus' = swamp) uses biomass from wet and rewetted peatlands under conditions that maintain the peat body, minimises Green House Gas GHG emissions and may enhance additional peatland related ecosystem services and biodiversity.

In contrast to draining wetlands for arable / grazing land, or rewetting and abandonment, the land use concept of paludiculture offers new possibilities for landowners and land managers to continue using these sites under wet conditions.

Paludiculture is a relatively new concept in the UK, but projects in Germany, where the concept was born, show paludicultural systems may have the potential to provide sustainable, economically viable solutions for wetlands, and be beneficial for agriculture, conservation and ecosystem services in such habitats.

Paludiculture UK 2017 brought together stakeholders from farming, the peat industry, horticulture, government, academia, and environmental non-government organisations to stimulate conversation about paludiculture, the productive use of wet and re-wetted lowland peatlands in the UK.

Key questions were debated: what is paludiculture? Where and when could it be necessary in the UK? What are the challenges, incentives and opportunities? Who are the key partners? What is the market potential? Can it be a viable, sustainable alternative land use option to more traditional agriculture on wetlands?

Interactive exchange sessions were informed by a series of keynote speakers, including experts from Germany and other leaders in the field of paludiculture. The workshop concluded with a field trip to the Lyth valley on the edge of the Lake District National Park in Cumbria, England. The field trip consolidated the discussions had on the first day by visiting example sites, to look at the reality of managing wet habitats for agriculture, biodiversity and ecosystem services, and discuss paludiculture possibilities which may be suitable.

An important aim of Paludiculture UK was to offer networking opportunities. We hope the event inspired debate among participants and beyond on the potential of paludiculture in the UK. The workshop results will be taken forward to shape future paludiculture pilot projects in the UK and will hopefully inform future policy and debates. The time to act is now!

Presentation synopses

Opening speech

Emma Goodyer, Manager, IUCN UK Peatland Programme

Wetland systems, especially peatlands, provide multiple services and are of global importance. Unsustainable use of these systems places the habitats, and the services they provide at risk. Thanks to growing policy support, we are achieving more sustainable land management in some of our upland systems. However, changes in land management practices in many lowland settings are still a barrier. Being able to demonstrate that there can be some economic return in some peatlands will be key. However, wetland farming or paludiculture is not a panacea and will not be the answer in all cases.

The UK Peatland Strategy, published in January 2018, has the goal of 'adapting the management of drained peatlands under intensive productive use'. There are examples in the UK where individuals are ready to support change, for example, in the horticultural industry. We need to be able to deliver projects and large scale demonstration sites. There are challenges - funding being an obvious initial barrier – but also opportunities with a range of possible peatland products e.g. cranberries and Sphagnum.



Emma Goodyer is currently programme manager for the IUCN UK Peatland Programme. Emma has previously worked as a wetland ecologist, predominantly in Scotland. Prior to the IUCN UK PP Emma was employed by SEPA, Scotland's environmental regulator. During her time with SEPA, Emma advised on the environmental impacts of developments on wetlands, as well as drafting policy and guidance to support wetland protection. Before her time at SEPA, Emma studied for a PhD, during which she investigated the drivers of community structure of a group of green algae in intact and restored blanket bog habitats. Coming from this background in peatland ecology, Emma is pleased to be back in the field again, and is enjoying being part of the broad and applied nature of the work that the IUCN UK PP delivers.

The contribution of paludiculture to climate change mitigation and adaptation

Greta Gaudig, Director of Greifswald Mire Centrum, and Scientific assistant at the Institute of Botany and Landscape Ecology at the Ernst-Moritz-Arndt-University of Greifswald

Globally, drained peatlands are responsible for 5% of all anthropogenic greenhouse gas emissions. In 50 countries drained peatlands emit > 10 %, in 25 countries even > 50 % compared to national emissions from fossil fuels and cement. Therefore, peatlands must play a major role in reaching the targets of the Paris Agreement. The root cause of peatland emissions lies in agriculture, which had its cradle in steppes and semi-deserts and consequently transforms mires into dry landscapes. The results are everywhere the same: gigantic greenhouse gas emissions and other forms of severe environmental damage. Sustainable utilisation of peatlands appears only to be possible under wet conditions. Paludiculture aims at reducing drainage-induced emissions, preserving the peat body as a sustainable base of production, while generating marketable products.



Greta Gaudig studied biology in Rostock and Greifswald (Germany) with majors in peatland and palaeo-ecology. Since 2004 she has been working as a scientific assistant at the Institute of Botany and Landscape Ecology of Greifswald University in different projects related to Sphagnum farming. She is the director of the Greifswald Mire Centrum, a centre that is itself at the science-policy-practice interface for all peatland related questions – locally and globally. The centre seeks science-based solutions for social challenges such as climate protection, biodiversity conservation and sustainable land use. Greta is also a member of the Scientific Advisory Committee and Author of

Paludiculture – German experiences with the productive use of wet peatlands

Sabine Wichmann, Research Associate at the Institute of Botany and Landscape Ecology, University of Greifswald

Conventional peatland agriculture and forestry is based on drainage which enhances peat oxidation, causes massive greenhouse gas emissions and eventually destroys the peatland subsistence base. In contrast, paludicultures (Latin 'palus' = swamp) use biomass from wet and re-wetted peatlands under conditions that maintain the peat body, minimises GHG emissions and may enhance additional peatland related ecosystem services and biodiversity.

In contrast to re-wetting and abandonment, the land use concept of paludiculture offers new possibilities for landowners and land managers to continue using these sites under wet conditions. Paludiculture ranges from harvesting spontaneous vegetation on natural sites to artificially established crops on re-wetted sites.

Successful examples from Germany on re-wetted fen sites include biomass harvest for direct combustion, low intensity grazing with Water Buffaloes, Common Reed as industrial raw material and Cattail as fodder for dairy cows or as insulation material.



Sabine Wichmann holds a Diploma degree in “Landscape ecology and nature conservation” from the University of Greifswald, Germany with focus on “Land use and landscape economics”. After her studies, she worked as a freelancer at the interface of land use and nature conservation focussing on a) payments for ecosystem services, agri-environmental schemes, auctions, and b) development prospects of rural, peripheral areas. Since 2008, Sabine has been a research associate at the institute DUENE e.V. and the University of Greifswald, working on paludicultures on both fen and bog sites for about 10 years. Her focus is on economic aspects, including cultivation procedures, suitable harvesting techniques, cost and revenues on farm-scale, valuation of ecosystem services, agricultural policy, agri-environmental schemes and other economic incentives.

Greifswald Mire Centre: www.greifswaldmoor.de

Paludiculture: www.paludiculture.com

Sphagnum farming as paludiculture on bogs for replacing peat in horticulture

Silke Kumar, Lead horticultural engineer, Torfwerk Moorkultur Ramsloh Werner Koch GmbH

For a long time in history, the bogs in Germany were considered waste lands. Considerable efforts were made by governments and landowners to change them into arable land. This always included drainage and either active removal of the peat layers or loss of peat because of oxidation and shrinkage. This practice causes subsistence, massive emissions of greenhouse gas and high costs for the maintenance of the drainage system. In 1981 the government of the Federal State of Lower Saxony introduced the first part of a bog protection program which essentially limited the amount of bog areas available for peat extraction and put the valuable bog remains in Lower Saxony under protection. Peat, especially the weakly decomposed peat which is the most important raw material for horticultural growing-media, was sourced more and more from the Baltic States as a result.

Sphagnum farming as paludiculture on bogs seems a solution to both problems: re-wetting the bogs drained for agriculture while still using them and producing locally a valuable raw material for the growing-media industry. Silke presented experiences from the first small plot of 1000 qm to up to 14 ha of establishing Sphagnum farming cultures and also on the horticultural trials with Sphagnum harvested from these plots. Aside from the ecosystem service benefits such as improved water quality, reduced GHG emissions and biodiversity conservation, the trial results show that sphagnum farming could provide potential regional economic benefits from farming such a renewable source: sphagnum lawn could be established within one and a half years, biomass productivity was ~8.7 t DM/ ha*yr. and harvest was possible after three years.



Silke Kumar has been helping to pioneer the use of sphagnum material in horticulture, and has been heavily involved in practical trials in the horticulture business and at research stations in North-West Germany. She has extensive practical experience of establishing Sphagnum-farming plots in North-West Germany; this experience ranges from site selection, site preparation, machinery, spreading of Sphagnum material and maintenance of Sphagnum fields to the final harvest.

Paludicultures, in Cumbria?

Jack Clough – Research Assistant and Paludiculture PhD student, Sustainability Research Institute (SRI), University of East London

A talk exploring the potential for paludicultures in Cumbria, presenting results from the development of a Cumbria-wide paludiculture potential map. Suggested case study areas were presented for a range of peatland types, with a focus on enhancing SSSI designated sites, as well as the method used for scoring and evaluating case study areas. The paludiculture crop plants that are available for temperate and boreal zones such as the UK were introduced, followed by a brief look at their market potential. Database of Potential Paludiculture Plants (DPPP) contains 473 entries: 62 trees, 73 shrubs, 235 herbs, 85 graminoids, 13 ferns and one moss genus. Around 80 of these species are promising for commercial paludiculture. They can be used in a variety of ways, including medicine, fuel, food and fodder. Clearly there are further considerations such as the technical challenges and the need for new markets and production lines. Next steps include further development of the UK DPPP, providing resources to farmers, and the investigation of 'carbon' farming credits.



Jack Clough first began his career in peatland research back in 2009 as a field assistant performing survey work for the monitoring of the Munsary Peatlands Reserve, Scotland with Richard Lindsay at the University of East London. Since completing his Undergraduate degree in 2012, Jack has worked as a Research Assistant for the Sustainability Research Institute (SRI) at the University of East London. Whilst at the SRI he has contributed to the research used to successfully purchase the Bolton Fell site thus removing it from peat extraction, and allowing restoration to begin. Jack has also contributed to the IUCN peatland briefing note series which are aimed at policy makers, practitioners and academics to help explain the ecological processes that

underpin peatland function. Jack is furthering his peatland expertise by conducting a part time PhD investigating the feasibility of paludicultures in the UK, with a focus on Sphagnum Farming.

Interreg GrasGoed – From wetland management of a Flemish peatland reserve to a circular economy? *Katrien Wijns – Project coordinator Interreg GrasGoed, Natuurpunt*

The Interreg project 'GrasGoed – Natuurlijk Groen als Grondstof' (GrassGood – Natural Green as Raw Material) allows nature managers, companies, and knowledge institutions in the border region between Flanders and the Netherlands to give a new life to the 'leftovers' of nature conservation.

Clippings, a leftover from managing wet regions (such as reedland, wet heathland, peatland, etc.), are often left to waste. That is unfortunate, because thousands of tons of clippings are released every year. It is difficult to remove the clippings from the wet regions. Moreover, dumping them is very expensive. This project aims to create a circular economy by using clippings as raw material. Within the project, mowing machines, transportation and processing machines are improved. In addition, new products are developed and a market is created.



Katrien Wijns has been working for Natuurpunt for more than 7 years.

Natuurpunt is the largest independent nature conservation organisation in Flanders (BE). As part of the department nature conservation, she experiences the problems concerning the grassland management herself. She is involved in different projects about the valorisation of grass clippings. These go from small-scale composting to fermentation. In August 2016 she started coordinating the European project Interreg.

The Cumbria Paludiculture Pilot Project

Deborah Land - Lead Advisor, Border & Eden Team, Cumbria, Natural England

Over the past 100 years, bogs in the UK lowlands have been significantly diminished in extent and condition from 950 km² to just 60 km² today. Much of the remaining bogs are in poor condition owing to agricultural intensification, peat extraction and afforestation. Conventional use of peatlands has always been associated with drainage leading to many environmental problems, including greenhouse gas emissions. The UK is the 6th largest contributor to GHG from peatlands in Europe; much of those emissions come from peatland drainage for agriculture.

The UK has over 7 million ha peat and peaty soils, and over 42,800 ha peatland habitats; a considerable amount of which are found in Cumbria. Many of these are protected under legislation. However, owing to the legacy of how the boundaries of these sites were drawn up, the objectives of the protected sites are often in conflict with neighbouring land managers since many of the protected areas are surrounded by agricultural land with its associated drainage. Securing a more sustainable land use in these areas could remove this conflict. Such sustainable use will also safeguard the existing soils and the conservation of the carbon in the soils while also halting the continued loss and compaction of organic soils. We also live in rather uncertain times in the lead up to Brexit. Paludiculture practices could provide valuable diversification for land managers.

The first sphagnum growing trial in the UK is at Bolton Fell & Walton Mosses Site of Special Scientific Interest, north Cumbria. The trial comprises 6 beds measuring approximately 12m x 200m. These are inoculated with sphagnum using different methods and products so that a comparison can be made against the different techniques. The trial will consider the implications of water level management using drains, irrigation and a pump. The design of the trial also takes into account the practicalities of future harvesting and access. Working in collaboration with key partners, there will be ongoing monitoring of the site including GHG monitoring and peat accumulation. The trial will be completed in 2018.



Deborah Land has worked for Natural England and its predecessors for over 17 years and worked throughout the Northwest Region before settling in Cumbria. She currently has responsibility for the management and protection for a suite of SSSIs throughout the Eden Valley, where she has developed an expertise in peatland communities, heathlands and upland limestone grasslands. Through her work on peatlands, Deborah has developed extensive experience of peatland restoration and is currently working with an EU LIFE Project to develop innovative methodologies to restore a degraded peat bog. Deborah leads on peatlands in the Cumbria team and works closely with the Cumbria

Peatland Partnership as well as other key groups such as the Yorkshire Peat Partnership and Moors for the Future. She is also currently working to develop a Paludiculture project with key partners throughout the UK and EU. Deborah works closely with land managers providing advice through the application of agri-environment schemes and the provision of SSSI statutory advice.

The Great Fen – A lowland peatland restoration

Kate Carver, Great Fen Project Manager & Lorna Parker Great Fen Restoration Manager, The Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire

The Great Fen is working to create a new wetland landscape of 3,700 ha to surround and connect two National Nature Reserves, Woodwalton Fen and Holme Fen. The strategic vision for the Great Fen is expressed in a Masterplan which sets out environmental, social and economic aims. See www.greatfen.org.uk/great-fen-masterplan

The Great Fen was the first of the Wildlife Trust movements' Living Landscapes. Peats up to 4m deep are being removed from intensive agricultural production, sown with grass and where possible the ground water table raised. Land forming has taken place to create new pools and conditions for reedbed colonization. The Great Fen is seeking solutions to water quality issues, and also recognizes the need to continue farming on deep peats on which pump drainage is increasingly unsustainable. Working with the University of East London we are trialing paludiculture exploring crops (including *Glyceria fluitans*) and novel uses, to see whether it is possible to create a paludicultural system which is economically viable, offers ecosystem service benefits and can be applied across the region and on other wetland creation projects. www.greatfen.org.uk

Outputs of the interactive-exchange sessions



An important aim of Paludiculture UK 2017 was to offer networking opportunities and foster debate among participants from all over the UK. An Interactive exchange took place in working groups, covering:

- Opportunities and Challenges – Policy (Facilitator: Judith Stuart, Soils Policy Specialist, Policy lead on Peat, DEFRA)
- Opportunities and Challenges – Practical (Facilitator: Jane Barker, Environmental Scientist, co-founder of Dalefoot Composts & Deputy Chair LDNPA)
- Opportunities and Challenges - Ecosystem Services (Facilitator: Dan Hunt, Director of Bowfell Consulting, biodiversity and landscape expert)
- Opportunities and Challenges – Financial (Facilitator: John Farmer, Chair of the board of trustees, Cumbria Wildlife Trust)

Opportunities and Challenges – Policy

Key points: there is an urgent need for new policies and adaptation of existing policy at government level, to enable and promote paludicultures in the UK. The time to act is now.



Challenges	Solutions/Opportunities
Support for paludiculture activities not included in current policy	Clear policy signals from government; this should be included in policy statements, associated parliamentary bills and documents - such as the Government’s 25 Year Environment Plan, Agriculture Command Paper, SDGs, Planning Policy Frameworks etc.
Joined-up policy in support of paludicultures needed across government departments and sectors	<p>Paludiculture is not just about the environment. Include policy support of paludicultures in:</p> <ul style="list-style-type: none"> - Environment - Climate - Agriculture - Energy (e.g. biomass grown in the UK) - Business - Land use and planning
	<p>Government co-ordinated task force, made up of a wide range of stakeholders. Tasks to include:</p> <ul style="list-style-type: none"> - Inform scoping/pilot projects - Engage with current policy to determine what barriers exist to the trials. - Identify public champion(s) to support paludiculture campaigns - Encourage the supply chain to stimulate paludiculture-based business - Ensure full environmental lifecycles for paludiculture products - Assess how to shift activities on wetlands, particularly on marginal land, from subsidy-based to self-supporting activities - Develop strategic pilot projects for marginal agricultural land
Long term-support for paludiculture (or confidence that it will be)	Policy guarantees that re-wetting of land would be supported in the long term, e.g. longer

	than agri-environment schemes.
Current water management systems not favourable for paludiculture	Re-assessment of water management systems and policy across the country. Should private pumping be permitted? Or should pumps only be used during flood risk events and turned off at other times?
The UK needs new policies to cut greenhouse gas emissions	Re-assess UK carbon-related policy – such as peat emission inventories, carbon budgets, carbon tax/credit – and what opportunities they may provide for paludiculture. Revise peatland code to incorporate paludiculture
Funding and market development	Investment in Research and Development programmes, and support for long term pilot projects to assess the viability of potential paludiculture activities. These scoping exercises should be designed to test suitable crops, and the market opportunities.
Terminology – easily understandable?	Rebrand 'Paludiculture' as 'Wet Agriculture'

Opportunities and Challenges – Practical

Key points: There is a need for practical advice and support for farm and land owners to take them through a transition period from traditional land management (drainage) to paludiculture: facilitation funds, education and advice service, machinery rings and use of existing water management systems



	Challenges	Solutions/Opportunities
Funding	‘chicken and egg’ dilemma - funding is needed to establish paludiculture and markets for paludiculture products; but it will be hard to draw down funding/investment until paludiculture activities exist, which show that it is economically viable.	Provide funding opportunities and resources to local farmers & encourage ‘bigger players’ to invest
		Look for funding opportunities outside of normal (agricultural) funding streams – investigate the potential, for example, of social capital funding, eco-innovation grants, or ‘carbon’ farming credits to further increase profitability.
		The release from the CAP (post Brexit) may provide a great opportunity to influence policy and funding in favour of paludiculture.
Markets demand and products	Market demand needs to exist in order to draw down funding	Identify and develop potential markets: food (e.g. myrtle), fodder, medicines and supplements (<i>Drosera</i>), ornamental/raw materials (willow, reeds), biomass/energy, agriculture conditioners (<i>sphagnum</i>)
		Make evidence-based decisions on the best locations for paludiculture production in the UK. Develop a Scoring system for potential areas – for example, based on proximity to a designated site or flood risk zone, connectivity, existing marginal farmland that could be converted etc.
		Trial different systems for different crops and match market demand with local opportunities - what is sustainable and viable. It’s not a case of ‘one

		size fits all' - over 70 suitable species for UK paludiculture.
		Develop demonstration projects, to prove return on investment. The pilots should demonstrate the various scales – viable size, commercial area, investment, appropriate location/habitats, suitable crops that fit agriculture systems as well as added value, facilitation services available.
		Develop and build additional markets for example value-added, niche markets or eco-innovation paludiculture products, to help create new business opportunities, and jobs in paludiculture.
	Paludiculture markets could have a negative effect on natural habitats if not controlled. Crops with biggest profit margins are often monoculture mosaic; however research shows that monocultures can be bad for the environment and also production.	Develop a regulatory framework?
	Long term predictions of climate change may influence what paludiculture products are viable.	Trial different systems for different crops under different climate scenarios
Machinery/materials	Wet peatland sites offer particular challenges, especially in terms of accessibility for machinery – adapted/low pressure equipment is required	Develop and adapt existing farming equipment to cope with harvesting on wet soil.
		Establish a contractor's hub and machinery ring or co-operative to pool labour and machinery specialised for paludiculture activities to help farms with the transition.
		Establish what expertise or machinery already exists among contractors or in agriculture sector
		Establish the parameters needed for developing machinery specific to paludiculture activities.
		Establish sources of paludiculture materials –for example seed or vegetative.
Support for and take up among farmers and land owners	Farm and land owners may be reluctant to switch from existing, long-standing land management practises	Acknowledge that any transition to paludiculture from current land management activities will be a long term process and there may be cultural resistance, especially due to lags in return on investment and

		cash flow.
		Find Champions / to engage farm and land owners and representatives, to communicate the benefits of paludiculture – especially to the young farmers/next generation of farmers who may have to mitigate climate change impacts
		Education: Paludiculture can be about diversifying agriculture activities, rather than a complete change of land management – for example targeting paludiculture activities on marginal agricultural land.
		Develop support networks, to support and facilitate farm and land owners in the transition period – for example, is it possible within the current AES scheme? There are already some existing markets, for example willow/biomass production. Can these be a source of advice?
		Establish an advice service or paludiculture co-ordination hub?
Land and water management	Some water level management and drainage schemes will have been place for a long time. Bear in mind the cultural impacts of re-wetting versus drainage of land	Take into account how paludiculture will fit within or impact on current water level management schemes. Use existing systems and expertise to manage water levels? Liaise with regional drainage boards e.g. Cumbria
		Consider the impact paludiculture activities will have on surrounding land – for example, water levels, nutrient load, infrastructure and ground water
		Include water availability (irrigation) and storage capacity (dry periods) when designing water control

	service not a risk
It is not currently possible to quantify ESS baselines, trends.	Need to demonstrate the ESS benefits on farm and wider landscape scale, and that paludiculture is economically manageable and viable – to farmers, policymakers and funders
	Monitor paludiculture projects in tandem with implementation.
Lag – slow change in the wetland system is an issue. What could be paid for over a 5-10 year agri-environment style agreement?	Trial of “payment by results” for paludiculture? Develop proxy outcomes e.g. water level over time, from shift to paludiculture system?
Current land management by livestock farmers is well-established over a long time. Need to consider the cultural values – at local level and wider public; this could dictate the pace of change. What would a change to paludiculture look like? Will it be seen as positive or negative?	Policy needs to support land management focussed on ESS benefits of wet peatlands and not support purely livestock farming.
	Show that it’s possible to make money from providing ESS benefits through paludiculture activities. Farmers will deliver policy change (outcome) if it’s viable
	Demonstration of ESS benefits could help to garner public support. Focus on a mixture of ESSs (not just carbon).
	Support of cultural services supported by re-wetting peatlands: Biodiversity conservation: provide habitats for rare and unique plant and animal species (cultural ESS) and increase the supporting and regulating services biodiversity can provide within the peatlands and wider landscape (e.g. pollination and peat control). Preservation of Paleo and historic archives in peat masses, as well as the aesthetic value of re-wetted peatlands, which could also bring tourism opportunities

Conclusions & Next Steps

The workshops demonstrated that there are many potential benefits and opportunities of paludiculture for UK peatlands – for the climate, the economy, the environment and people. Case studies from outside the UK demonstrate the feasibility of paludiculture on bogs and fens, and that paludiculture potentially offers the opportunity to combine utilisation and conservation of peatlands. However paludiculture is a relative unknown in the UK, and it will be a challenge to draw on support from land/farm owners, funders, politicians, the business sector or the wider public until it is shown to be economically viable. What are the next steps towards successfully combining economic sustainability and the environmental protection of our peatlands? The talks, discussion and debate of Paludiculture UK delegates can be distilled to six practical ideas to follow:

Paludiculture task force

Set up government-led, multi-stakeholder ‘paludiculture task force’ to define plans and strategies for the successful implementation and monitoring of the Paludiculture agenda at the national to local levels.

Pilot projects & feasibility studies

Develop pilot projects in the UK to demonstrate the sustainability, feasibility and opportunities of Paludiculture or ‘wet agriculture.’ It’s clear that there will be no ‘one size fits all’ solution, and that the pilot projects need to be locally relevant, and demonstrate a mixture of paludiculture models, crops, markets, machinery and sources of funding. The pilot study should demonstrate the practical aspects of paludiculture but also include a feasibility study to investigate the potential for paludiculture markets, funding streams and likely take up of wet agriculture by farmers/landowners.

Identify appropriate funding: link paludiculture with existing policy targets.

The great ambition of the Paludiculture UK workshop will only become a reality if appropriate resources are found for the implementation of paludiculture. Brexit could provide funding opportunities (release of money from CAP and from EU agriculture policy), but also funding challenges – there could be little enthusiasm to release funds for novel, ‘risky’ ventures. Therefore linking paludiculture with existing policy targets – e.g. flood management, CO² emissions etc. – is seen as the best way forward to secure funding.

Paludiculture should be self-supporting, but there will be a time lag before there is a return on any investment. The establishment of a facilitation fund and/or financial support from government will be key, to help in the transition period between initial investment and return. Look for alternative (commercial?), novel funding streams and ‘added-value’ products.

Communicate the paludiculture agenda

Create opportunities for dialogue on the implementation of paludiculture among different sectors, to discuss opportunities, challenges, how they will participate in it and share best practices. Recognise that Paludiculture will involve a sea change from traditional land management (drainage) to working wet farmland for fibre, not food. Winning ‘hearts and mind’ is crucial to the success of any transition to paludiculture; target dissemination workshops, demonstration days, practical training sessions at land owners and farmers - ‘the paludiculture-ers’ of the future. Find public figures to champion the paludiculture cause. Farmers and land owners will deliver change if it’s seen to be viable.

Machinery and expertise hub

Working with ‘wet agriculture’ will require specialist machinery and skills. Establish a contractor’s hub and machinery ring to pool labour, expertise and specialised machinery; this will be of particular help as farm/land owner transition to working with ‘wet agriculture.’

Push for paludiculture policy

Lobby policymakers across all relevant sectors from agriculture to business; shout out about the paludiculture possibilities. There is a need for new policies and adaptation of existing policy at government level, to promote, fund and enable paludicultures, and long-term re-wetting of land, in the UK.

Seize the opportunity created by Brexit and the break from EU policies to introduce clear plans and timelines for the participatory implementation of a paludiculture agenda at national and regional levels.

These are just some initial steps put forward during the two-day Pal UK workshop. The challenges associated with the implementation of the paludiculture agenda are numerous but the potential for transformation is enormous and our joint efforts can make these changes happen.

Recognize the urgency of the peatland agenda and seize the momentum. Time to act is now!

Sustainable Clean *Sphagnum* Inoculum since 2005 for *Sphagnum* Farming & Restoration



Neal Wright, Simon Caporn (Manchester Metropolitan University MMU), Anna Keightley (MMU)

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1. Clean:

- No foreign biota
- No Weeds
- No spread of Pathogens



2. Very small amount of Source

- A few Stands = unlimited production



3. Pure Species

- Single (any) Species
- Mixed to order



4. Juvenile

Many growing points ~ 100,000/litre

Translocated material

1. Dirty

- Weeds
- Pathogens etc



2. Large areas of *Sphagnum* bog destroyed



"Pure" *Sphagnum* species:

With thanks to all who have allowed us to collect small handful from your sites

- | | | |
|-------------------------|------------------------------|----------------------|
| <i>S. angustifolium</i> | <i>S. fuscum</i> | <i>S. pulchrum</i> |
| <i>S. capillifolium</i> | <i>S. imbricatum</i> (varia) | <i>S. rubellum</i> |
| <i>S. cuspidatum</i> | <i>S. inundatum</i> | <i>S. rusowii</i> |
| <i>S. denticulatum</i> | <i>S. magellanicum</i> | <i>S. squarrosum</i> |
| <i>S. fallax</i> | <i>S. polustre</i> | <i>S. subnitens</i> |
| <i>S. fimbriatum</i> | <i>S. papillosum</i> | <i>S. tenellum</i> |



Pure Species or Blend
of range of species
Known Local Origins
UK & Europe

New BeadaMoss® Production Facilities



In full production 2018/19

Production Capacity of new facilities:

Over 250,000 litres

Enough to plant 50Ha of *Sphagnum* Farm beds per year



Over 350,000 supplied winter/spring 2017
Planting ~300Ha.

Costs *Sphagnum* Farming:

Cost per Ha to apply BeadaGel™ that has been specifically modified for *Sphagnum* Farming:

Current cost €20,000/Ha

Volume production with 2 years:

Reducing to €6,000/Ha

Beadamoss



Beadagel



Beadahumok



Costs Restoration:

Hand application allows targeted application
@ 35(min)lit/Ha = £350/Ha

Backpack or machine application
@ 35-140 lit/Ha from £350/Ha

Handplanting required
@ 1250-10,000/Ha from £585/Ha

Net including application costs and quantity dependent

Restoration:

Beadahumok™

Grow well in all situations:

- Wet
- Dry (ish)
- Waterlogged
- Competitive
- Open



Supplied on a roll



One year's growth



Natural Resource Wetland



English Broad Girdle



Dry conditions



Very Wet conditions





'Softrak' 120 / 75

Again, following demand from Nature Conservation Bodies for machines to use on their nature reserves and benefiting from the experience gained with the Wetland Harvesters, the 'Softrak' was developed. This allowed Nature reserve managers to work on areas previously deemed inaccessible to vehicles. Initially used just for moving men and equipment the 'Softrak' soon developed into a multipurpose tool carrier, with front and rear linkages and PTOs and a huge range of attachments, including: 'Cut and Collect' systems, mowers, mulchers, chippers, stump grinders, cranes, winches and specialist bodies. Over a 100 'Softraks' are now in use throughout the world in all sectors where access is difficult or impossible with conventional equipment.

Softrak 120

Following the success of the Softrak 65, with over a 100 machines out in the field, and with demand for a larger and more powerful variant, the Softrak 120 was developed. This features the same ultra-low ground pressure as the standard Softrak but with a larger carrying capacity. Fitted with a Tier 4, 120hp Deutz engine the Softrak 120 is aimed at the conservation contractor or organization looking to manage larger areas of wetland. To date, machines have been delivered to Belgium and the UK with orders for machines for Russia and Europe with enquiries from throughout the world.



Reed Harvesting and Baling systems.

One of the many specialist attachments for the Softrak range of vehicles is a harvesting and baling system for the cutting, binding and baling of reed for use in thatching. Once cut and bundled the baler produces a bale with approximately 80-100 bundles of reed that can then be easily mechanically handled. Reed harvesting systems are now in use in Russia and throughout the UK.

Tracked Trailer

With ability to harvest areas previously though inaccessible it soon became apparent that a means of transporting larger quantities of material was required. The powered tracked trailer can carry up to 2,000 kg at ground pressures similar to the Softrak Hydraulically powered with a load sensing drawbar the trailer will automatically match it's speed to that of the Softrak. The trailer can be used to transport baled material or, with a suitable body, can carry low density chopped or chipped bulk materials off site.



TODAY AND THE FUTURE

Having established pre-eminence in many of its sectors, Loglogic continues to grow rapidly, both domestically and abroad. Loglogic are committed to ensuring continued support for its ever expanding customer base and is aiming to become a world leader in their sectors. Loglogic is also exploring other avenues for its unique design and engineering skills including renewable energy systems.

As part of the DECC Wetland Biomass to Energy incentive scheme, Loglogic are providing harvesting systems to AB Systems and Anaerobic digester systems AMW IBERS

THE USAGE OF GRASS AS RAW MATERIAL

Within nature conservation, grasslands are often mowed annually in order to preserve their typical species. But the tons of clippings are usually left to waste. Until now. The EFRO funded project 'GrasGoed' wants to develop biobased products that contain the clippings of natural grasslands.



Managing nature reserves often exists of mowing the grasslands yearly. It protects the typical habitats.



The grass is mowed with specially designed mowing machines, in order to preserve the soil and vegetation of the often wet areas.



Transport is expensive. Therefore, the clippings are being compressed. That way, less air and more grass is being transported.



After being cleaned and cut into small pieces, the grass is ready to be processed.



Through a biological process, the clippings are divided into fibres, proteins, and cell fluids. Using the fibres, proteins, and cell fluids as raw materials, we develop new products.



Examples are paper and cardboard, insulation, or peatless potting soil from grass fibres. The protein concentrate and the nutrient rich fluid are converted into livestock feed or soil enhancers.

PACKAGES, POTTING SOIL, FODDER... THE POSSIBLE PRODUCTS WITH GRASS AS RAW MATERIAL ARE ENDLESS.



"Dealing with nature grass is a good balance between biodiversity, sustainable feed and materials, innovation, local economy and fun."

Leon Jaore M.Sc.
Chairman Natural Fiber
Application Center



"If clippings can become a raw material for industry, we can bring the cost-benefit balance of nature management more into balance. That means more resources to invest in nature and in nature experience."

Tom Embo, General Director of
NatuurInvest



"Grasgoed is a perfect project to combine applied research and the education of biobased minded students."

Jappe de Best
Project manager and lecturer of
CoE / Avans University of applied
science



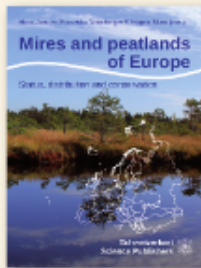
"It would be fantastic if the member magazine of Natuurpunt is based on clippings of their own nature reserves."

Katrien Wijns
Project coordinator of GrasGoed



"We try to create a local cycle: with clippings from a certain nature reserve, we make product for the local sales market."

Martijn Wagener
CEO of Grassal



Hans Joosten, Franziska Tanneberger & Asbjørn Moen (eds.)

Mires and peatlands of Europe

Status, distribution and conservation with contributions of 134 authors

2017. X, 780 pp., 129 figures, 161 tables, 112 coloured photos, ribbon, 28 x 21 cm

ISBN 978-3-510-65383-6 **hardcover 94.00 €**

www.schweizerbart.com/9783510653836



The authors provide the first comprehensive and up-to-date overview of mires and peatlands in biogeographic Europe. Written by 134 authors, the book describes mire and peatland types, terms, extent, distribution, use, conservation, and restoration individually for each country and integrated for the entire continent. Complemented by a multitude of maps and photographs, the book offers an impressive

and colourful journey, appreciating the core principles and unifying concepts of mire science.

The European continent features an impressive variety of mires and peatlands representing unique ecosystem biodiversity and harbouring a large treasure of flora and fauna.

Europe is also the continent with the longest history, the highest intensity, and the largest variety of peatland use, and as a consequence it has the highest proportion of degraded peatlands worldwide.

Their massive degradation also kindled the desire to protect these beautiful landscapes, full of peculiar wildlife. In recent decades attention has widened to include additional vital ecosystem services that natural and restored peatlands provide. Yet, only now there is a rising awareness of the necessity to conserve and restore mires and peatlands in order to avoid adverse environmental and economic effects.

The book provides extensive information for scientists, practitioners, peatland enthusiasts, decision-makers, and anyone interested in vegetation, landscapes and history of the European continent. The book will serve as a baseline for peatland science and conservation in Europe for current and future generations.



Paludiculture – productive use of wet peatlands

Climate protection – biodiversity – regional economic benefits

Eds.: Wendelin Wichtmann, Christian Schröder, Hans Joosten with contributions by 73 authors

2016. VIII, 272 pp., 153 mostly coloured figs, 109 tables, 49 info boxes, 28 x 21 cm

ISBN 978-3-510-65283-9 **hardcover 79.90 €**

www.schweizerbart.com/9783510652839



Peatlands cover some 4 million km² worldwide. Approximately 15% of this area – particularly in the temperate zone and the (sub)tropics – is drained, largely to be used for conventional agriculture and forestry. Drainage leads to irreparable damage to peatlands. Subsidence and soil degradation frustrate long-term peatland utilisation and are responsible for almost 5% of the total global anthropogenic greenhouse gas emissions.

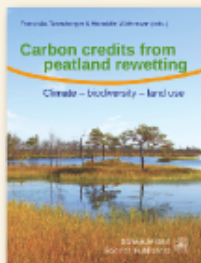
Soil degradation and greenhouse gas emissions can strongly be reduced by rewetting. Rewetting, however, makes conventional land use impossible. In contrast, paludiculture on wet and rewetted peatlands allows for permanent, sustainable cultivation of peatlands.

This volume introduces paludiculture as a new land use practice to produce biomass and simultaneously to reactivate or sustain a wide variety of ecosystem services impaired by peatland drainage. Biomass from wet peatlands is useful for various applications: as fuel and raw material, food, fodder and medicine.

The book discusses and evaluates the ecosystem services and economic feasibility of various land use options. It describes the historical development of peatland utilisation, its increasing intensification and resulting soil degradation, and the recent development of paludiculture as an alternative, balanced land use option. Practical recommendations, legal aspects as well as international experiences with paludiculture are presented.

This title is also available in German language:

www.schweizerbart.com/9783510652822



Carbon credits from peatland rewetting

Climate – biodiversity – land use

Science, policy, implementation and recommendations of a pilot project in Belarus

Eds.: Franziska Tanneberger, Wendelin Wichtmann

2011. XII, 223 pp., 100 mostly coloured figs, 41 tables, 30 info boxes, 28 x 21 cm

ISBN 978-3-510-65271-6 **hardcover 39.80 €**

www.schweizerbart.com/9783510652716

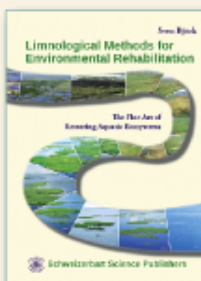


Belarus ranks 8th among the world's countries in terms of peatland CO₂ emissions and occupies 3rd place in emissions per unit land area. In recent years, tens of thousands of hectares of drained peatlands in Belarus have been rewetted.

This volume provides a synthesis of the challenges encountered and solutions adopted in a pilot project conducted in Belarus between 2008 and 2011. It presents data and conclusions from the project and relates basic principles to advanced applications, integrating science and politics, ecology and economy. The experiences and recommendations set forth in this volume will inspire practitioners, scientists and politicians alike.

This title is also available in Russian language:

www.schweizerbart.de/9783510652723



Sven Björk

Limnological Methods for Environmental Rehabilitation

The Fine Art of Restoring Aquatic Ecosystems

2014. 381 pages, 489 figures, 17 tables, 28 x 21 cm

ISBN 978-3-510-65292-1, **bound, 79.80 €**

www.schweizerbart.de/9783510652921



Lakes and wetlands, ecologically impaired to various degrees by pollution and exploitation are a sad reality not

only in Europe, but around the globe. But wait: Ecological restoration of these ecosystems is possible! Sven Björk, the pioneer and long-time practitioner of ecological lake restoration describes well-illustrated, practical examples (before and after) of the restoration of different types of damaged aquatic ecosystems and discusses tailor-made approaches to rehabilitate their individual ecological structure and functions. The crucial importance of the relationship between catchment area and the associated lake/wetland in selecting the "right" approach and thus successful restoration is pointed out and discussed.

Björk's instructive book is aimed both at administrators seeking approaches and help to fix ailing aquatic systems and also at aquatic ecologists interested in designing tailor-made methods for restoring, monitoring and documenting the results of eco-medical operations on lakes and wetlands.

**Schweizerbart Science Publishers
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order@schweizerbart.de www.schweizerbart.com



Cumbria BogLIFE Project

Introduction

The Cumbria BogLIFE Project is a £5.5M, 5 year project, 50% funded by B/LIFE+ to restore three severely degraded lowland raised bogs in Cumbria, UK.

The sites, comprising 2,807ha of the Natura 2000 network, are:

- Bolton Fell Moss Site of Community Importance (SCI) - severely degraded, recently commercially milled site, of which 60% is bare peat.
- Roudsea Woods and Mosses Special Area of Conservation (SAC) - former domestic peat cuttings, with 20% tree and dense rhododendron cover.
- South Solway Mosses SAC - includes former domestic peat cuttings and commercially milled areas, with scrub and significant areas of bare peat.

Key Objectives

1. To start the process of restoration on 715 ha of 'degraded raised bog capable of natural regeneration' (Annex I habitat 7120).
2. To use the sites to illustrate a range of restoration techniques to managers of similar habitats and to wider audiences.
3. To monitor the recovery process and disseminate best practice guidance associated with the restoration techniques.
4. To raise public and professional awareness about the importance and value of the sites and lowland raised bog habitats.

Monitoring

- To review the efficacy of previous restoration works and to apply new and innovative techniques of restoration.
- Monitor the response of the vegetation, hydrology, and carbon fluxes, through in-house research and collaboration with academic institutions.
- Contribution to Ecosystem Services (modelling long-term change in terrestrial carbon storage) and Socio-economic evaluation.



Tree and rhododendron removal

Removal of 120 ha trees and 83 ha of dense Rhododendron and long term control with herbicide



Roudsea Wood and Mosses rhododendron felling work.

Ground works to restore water levels

The problem:

- 314 ha degraded, milled peatland surface
- 192 ha degraded, vegetated peatland surface

Once a peat surface has been damaged, the water table is lowered. The surface layer dries out turning from a low conductivity peat to a relatively 'free-draining' high conductivity peat. Drainage is further increased by tree roots and cracking.

Our solution:

- Block the entire sub-surface flow path through the damaged peat by building 'bunds' of raw, un-dried peat - forming an almost impermeable barrier.
- Join bunds together to create 'cells' that hold water at or near ground level.
- Cover with turf, which protects them from drying out and eroding.
- Where there is a shortage of raw, un-dried peat use of underlying clay can be a good substitute for the bund core.
- Block and back-fill drains and ditches
- Re-profile and reduce the angle of cut peat faces

Re-vegetation of bare peat surfaces

Using new and innovative techniques on 314 ha, including:

- Ground surface preparation
- Introduction of a nurse crop, to create a suitable growing environment for Sphagnum.
- Introduction of viable Sphagnum propagules from suitable donor site or nursery-grown
- Mulching for protection using straw, heather or other organic material.

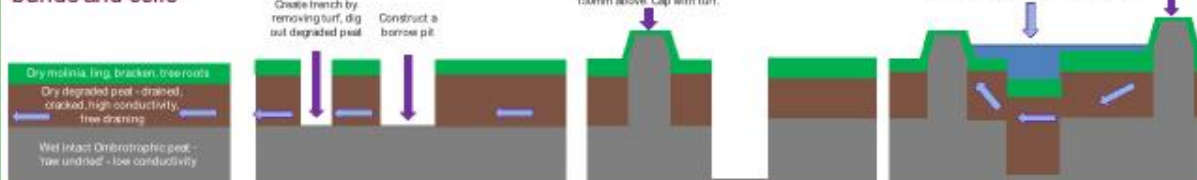
Bolton Fell Moss re-vegetation work



Roudsea Wood and Mosses SAC Bund and cell construction on degraded lowland raised bog



Construction of bunds and cells



For more information contact:

cumbriaboglife@naturalengland.org.uk

0300 060 1022

www.facebook.com/cumbrianmrs

Restoration of degraded lowland raised bogs on three Cumbrian SBSSs/SACs (LIFE B/NAT/UK/000443)

Delegate list

PALUDICULTURE UK 2017 - DELEGATE LIST				
First Name	Surname	Job Title	Company	Email
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Mark	Hamill	Head of Technical For growing media	Westland Horticulture	
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David	Harpley	Conservation Manager	Cumbria Wildlife Trust	
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Phil	Westwood	Operations Manager	The Scotts Company (UK) Ltd	
Judith	Stuart	Peat and Soils Policy Advisor	Defra	
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Clifton	Bain	Director	IUCN UK Peatland Programme	
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Ann	Mc Cann	Technical Advisor	Bulrush Horticulture Ltd	
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Andrew	Cole	Monitoring Officer	Natural England	
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Andrew	Walter	Eastern Reserves Officer	Cumbria Wildlife Trust	
Susie	Lane	Peatland Restoration Officer	Cumbria Wildlife Trust	

Many thanks to all those who attended, and engaged in the debate about Paludiculture in the UK!

