VALUING NATURE PROGRAMME

VNP10

# Natural capital trade-offs in afforested peatlands:

## Evidence synthesis and needs for the future of peatland forestry and forest-to-bog restoration.

**Valuing Nature | Natural Capital Synthesis Report**

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http://valuing-nature.net/ForestedPeatNC

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*Suggested citation:* Payne, R., Jessop, W. (2018) Natural capital trade-offs in afforested peatlands: Evidence synthesis and needs for the future of peatland forestry and forest-to-bog restoration. Valuing Nature Natural Capital Synthesis Report VNP10.



## Abstract:

UK peatlands are valued for the ecosystem services they provide: storing carbon to cool the climate, controlling water supply, hosting biodiversity, providing spaces for recreation and preserving a record of the past. In the twentieth century around 15% of UK peatlands were ploughed and planted with non-native conifer species, creating financial capital but imperilling some forms of natural capital. As many of these conifer plantations reach harvesting age critical questions concern what should be done next: should trees be re-planted or should peatlands be restored to open habitats? This report conducted a stakeholder consultation exercise to identify the key questions of concern to allow decisions to be made now and in the future. There was particularly strong backing for questions around the implications of afforestation and restoration for climate change. A review of the current evidence allows insight into probable mechanistic changes with afforestation and restoration but highlights absence of key data, in particular the lack of a robust greenhouse gas budget for any afforested UK peatland. Other important themes include biodiversity change, the limits to restoration, the financial value of peatland natural capital and flooding.

**Cover image:**

**Restored and natural peatland at Forsinard Flows.** © Richard Payne

# Peatlands and natural capital

Peatlands are some of our wildest and most natural habitats, valued for their beauty and intrinsic importance and also for their ecosystem services and stocks of natural capital.

**Regulating:**

- Cooling climate.
- Influencing water quality.
- Controlling water supply.

**Provisioning *(frequently destructive):***

- Food supply.
- Fuel supply.
- Timber supply.

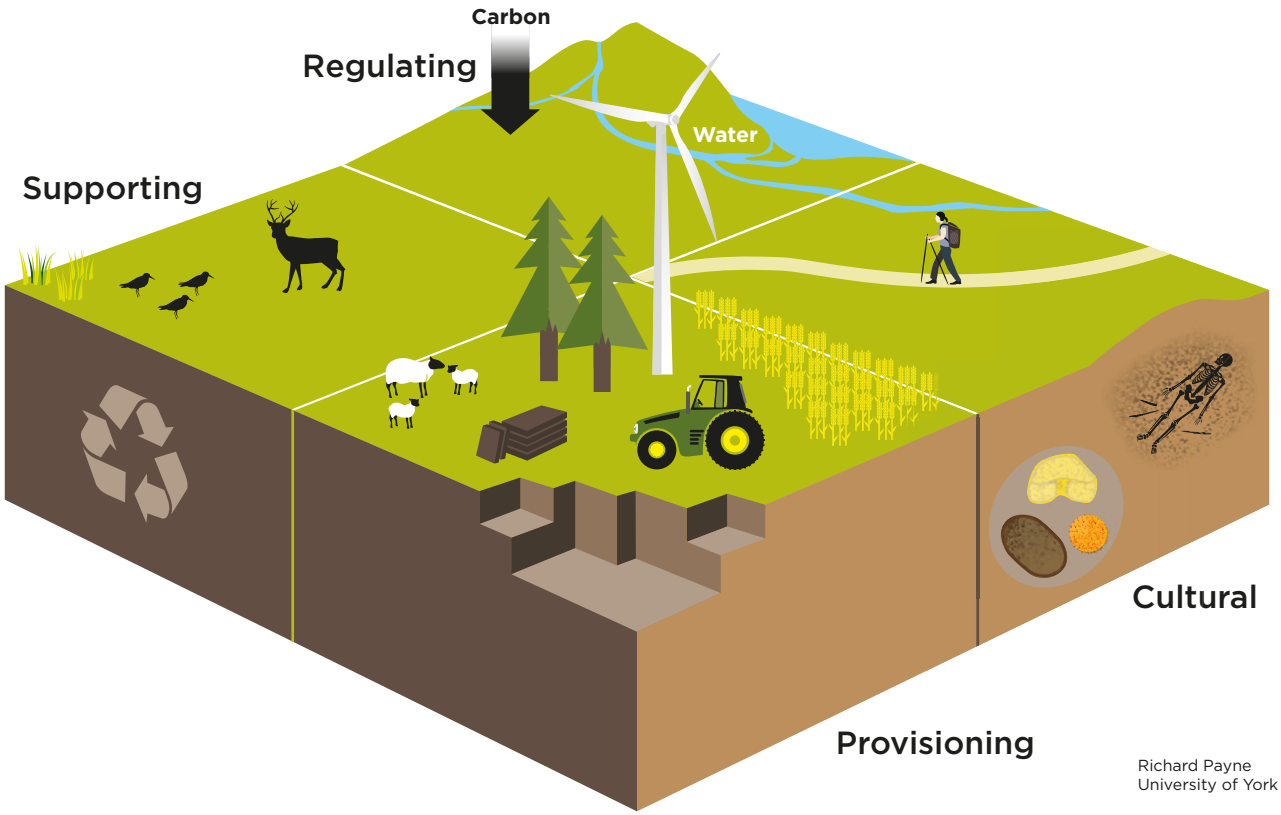
**Cultural:**

- Spaces for recreation.
- Records of the past.
- A sense of place.

**Supporting:**

- Hosting species.
- Accumulating peat.

## Peatland natural capital




Richard Payne
University of York

# Peatland and Forestry

## The past:
## **Planting on peat**

Between the 1940s and 1980s around 15% of UK peatland was ploughed and planted with trees, mainly non-native conifers, motivated by a desire to increase domestic timber supply, create employment and make use of land viewed as having no other economic use. This planting has created a timber-production industry on peatlands but at the expense of some forms of natural capital, particularly biodiversity. By the 1990s new tree-planting on deep peat had been halted by regulatory and tax changes; questions now concern what should be done with the plantations we already have. There are two principle options: restoration or continued forestry.

**Peatland ploughing for forestry, Caithness, 1979.**


Photograph by George Day, presented by permission from the University of Aberdeen and courtesy of Norman Davidson and http://www.forestry-memories.org.uk

## Restoration

The first option is that peatlands planted with non-native conifers be restored back to open bogs. There is a widespread belief that afforestation of peatlands was an error which should be reversed. Extensive progress has been made in developing methods for the restoration of afforested peatlands, involving tree-removal and re-wetting. Forest-to-bog restoration is underway at sites across Britain and available data show a gradual recovery in many key functions.

**Forest-to-bog peatland restoration at Forsinard Flows, Caithness.** The foreground area has had trees removed and furrows blocked.


## Continued forestry

The second option is that, at least some, afforested peatlands should continue to be used for forestry. Doing so would acknowledge that peatland forestry has positives in terms of economic output and employment and mitigates need for timber imports and replacements.

**Peatland forestry at Corsua Flow, Dumfries and Galloway.** © Richard Payne

## Peatland Edge Woodland

A proposed but disputed third alternative is that there may be a 'middle way' which allows low-density woodlands on peat. In Scotland there is a policy for the creation of so-called *Peatland Edge Woodland*. The theory is that this might deliver some benefits of both peatland and woodland but the concept is controversial.

**Low density tree-cover at Maud Moss, a potential analogue for the Scottish policy of 'Peatland Edge Woodland'.** © William Jessop

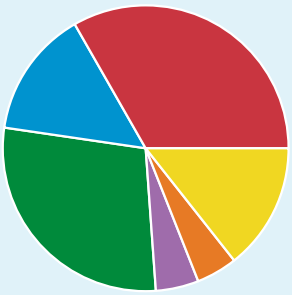
# This project

In this report we undertook a consultation exercise to identify the key questions of concern to stakeholders. We address these questions by highlighting the current state of evidence and future needs. We focus on the five most voted questions and briefly consider three others which also attracted support. For more detailed discussion and the full list of submitted and nominated questions, the reader is referred to the extended version of this report.

**http://valuing-nature.net/sites/default/files/documents/Synthesis_reports/ForestedPeatNCFullReport.pdf**

- Governmental/ Statutory body
- Research organisation
- Forestry
- Other private sector
- Third sector
- Land owners/ managers
- Other/ prefer not to say

Pie chart size is proportional to the number of votes received.



## How does the greenhouse gas balance of peatland forestry differ between deep and shallow peat and compare to forestry on mineral soils?

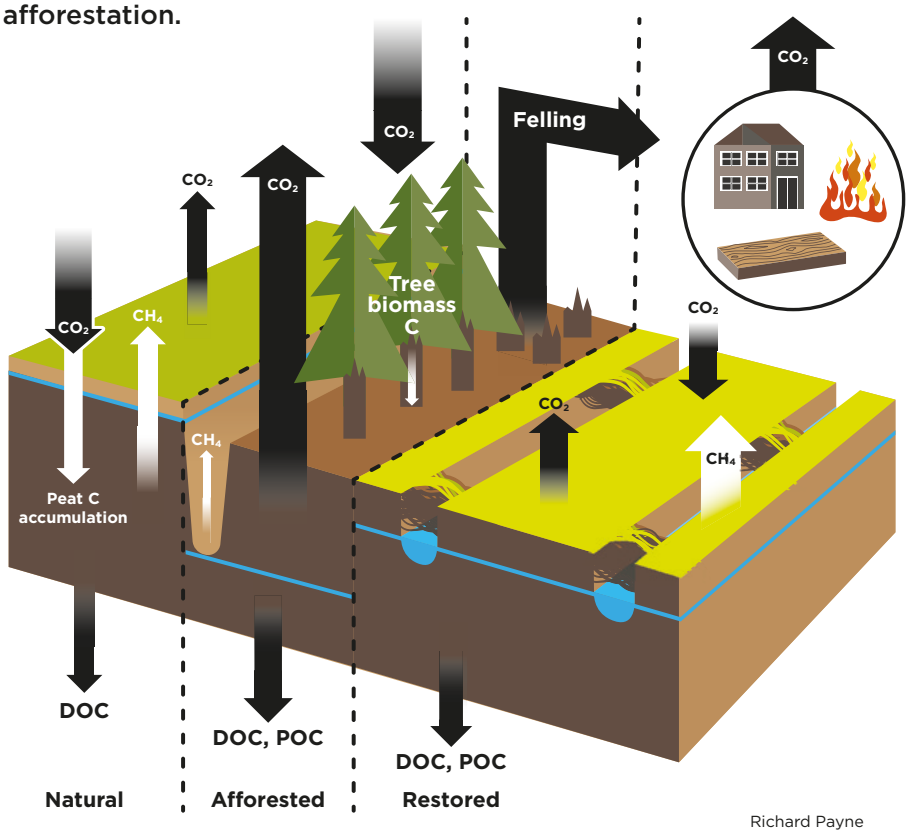
## How does the greenhouse gas budget of a peatland change with initial afforestation, restocking or restoration?

## Current evidence:

- Substantial loss of peat carbon is likely to have occurred during the process of afforestation.
- Afforested peatlands are likely to lose carbon from peat and fail to accumulate new peat.
- Afforested peatlands are likely to have higher rates of carbon fixation. How this compares to peat carbon loss is unknown.
- The full climatic consequences of peatland forestry ultimately depend upon long-term timber usage, supply chains and alternatives.
- Restoring peatlands is likely to substantially reduce oxidative carbon loss but is likely to increase methane loss, at least in the short-term.
- In the long-term, intact peatland is a more secure carbon store than timber.
- Forestry on mineral soils will provide more effective climate-change mitigation than forestry on peat.
- Differences in greenhouse gas budgets between deep and shallow peat are unknown.

## Evidence needs:

- Long-term whole-system greenhouse gas budgets for afforested peatlands, including restocked sites.
- Quantification of carbon-stock changes with afforestation.
- Greenhouse gas budgets for sites at a variety of stages of restoration.
- Modelling of future changes.

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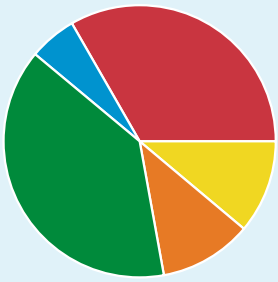
**Conceptual diagram of key carbon cycle pathways and changes with peatland afforestation and restoration.**



## Is it possible to have trees on peat without loss of biodiversity and carbon storage?

**Current evidence:**

- Naturally forested peatlands demonstrate that forested peatlands can accumulate carbon and host high conservation-value biodiversity.
- Naturally forested peatlands are very rare in current UK conditions and it is not clear if they can be created.
- Retention of carbon storage and biodiversity are some motivations for the recent Forestry Commission Scotland policy on 'peatland edge woodland' but the achievability of this policy is disputed.

**Evidence needs:**

- Better understanding of naturally forested peatlands in the UK, including their carbon balance, ecology and long-term development.
- Close monitoring of Peatland Edge Woodland pilot sites, including carbon fluxes and biodiversity.

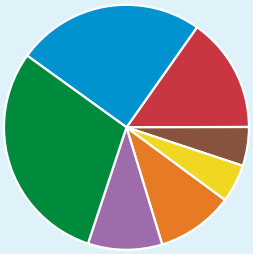
## What are the limits to the achievability of forest-to-bog restoration in terms of factors such as peat condition, depth and site extent?

**Current evidence:**

- Considerable progress has been made in developing effective methods of peatland restoration.
- Optimum methods have consolidated and ambition has increased.
- Some factors still pose considerable challenges including extensively cracked peat, very dry sites and climatically-stressed sites.

**Evidence needs:**

- Further development of best practice methods.
- New and strengthened pathways for communication of outcomes.
- Longer-term monitoring of restoration success in terms of a wider range of indicators.



# What is the financial value of natural capital in natural and afforested peatlands and how does this change with restoration?

**Current evidence:**

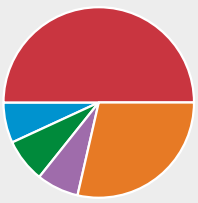
- Peatland natural capital is considerable but difficult to quantify.
- Applying the carbon price recognised by the UK government to the estimated carbon stock of UK peatlands yields an estimated valuation of at least £46 bn.
- Forestry on peatland is likely to have a significant impact on natural capital stocks and ecosystem service delivery.
- Peatland forestry is a substantial industry which creates domestic timber supply and employment.
- Peatland forestry is less economically productive than forestry on mineral soils.
- Peatland restoration generates economic activity and employment but this is largely funded by public and charitable investment.

**Evidence needs:**

- A comprehensive economic valuation of peatland natural capital and change with afforestation and restoration.

## Three other questions with support:

**How will biodiversity recover with forest-to-bog restoration in the long-term?**

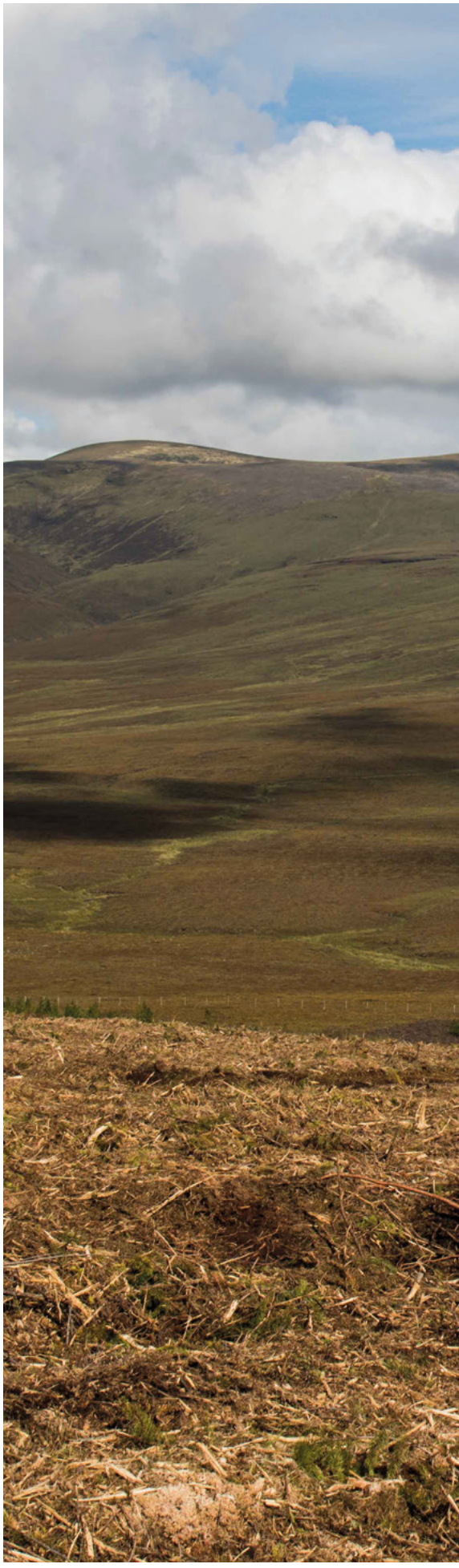


**How do afforested peatlands and peatland restoration affect downstream flood risk?**

**Should peatland plantations removed be compensated by additional forestry on mineral soils, where should these plantations be located and what are the opportunities and costs of doing this?**

# Summary

Deciding the future of UK afforested peatlands will require trade-offs to be made between alternative forms of natural and financial capital. Decisions ultimately reflect value-judgements which transcend evidence alone. This project demonstrates that amongst the stakeholders who participated in this project there is very strong support for the pre-eminence of questions around greenhouse gas budget as a key evidence need. Current evidence does not even allow a conclusive answer to the question of whether planting trees on peat has ameliorated or exacerbated climate change. Addressing this question requires new, primary, scientific data collection but also assessment of the role of peatland wood-products in the supply chain and the consequences of their withdrawal. On a sufficiently long time-scale it is probable that peatland restoration is better for climate than continued forestry but the scale of the difference is unclear. In other aspects the evidence is more clear-cut. In terms of biodiversity it is clear that afforestation leads to losses of high conservation-value peatland species, continued forestry will change that situation little and restoration leads to short-term gains, with the probability of further gains in the long-term. If biodiversity is the goal, restoration is likely to be the better course. To enable multiple forms of natural capital to be balanced against each other and against financial capital, the stakeholders involved in this project showed support for economic valuation of natural capital change under alternative scenarios. It is unlikely that the future will see a single UK-wide change in land-use. It is probable that some plantations will be re-stocked, others restored while Peatland Edge Woodland may be trialled in others, despite the lack of evidence that this concept is achievable. Decisions will need to be made around the criteria for which of these options is most appropriate in any individual site.



**Peat dam construction at Dalchork forest, August 2017.** © Ian McKee


JCB

# With thanks

Richard Payne acknowledges support from the Leverhulme Trust (project RPG-2015-162) which established his group's research in this subject area and supported much of the background literature review and network-building on which this project is based.

# Further reading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- Lindsay R (2010) Peatbogs and carbon: a critical synthesis to inform policy development in oceanic peat bog conservation and restoration in the context of climate change. *RSPB Scotland.*
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**Acknowledgement**

This Natural Capital Synthesis Report was funded by a NERC Policy and Practice Impact Award as part of the Valuing Nature Programme.

The Valuing Nature Programme is a 5 year £7M research programme which aims to improve understanding of the value of nature both in economic and non-economic terms, and improve the use of these valuations in decision making. It funds interdisciplinary research and builds links between researchers and people who make decisions that affect nature in business, policy-making and in practice. See **www.valuing-nature.net**

The Valuing Nature Programme is funded by the Natural Environment Research Council, the Economic and Social Research Council, the Biotechnology and Biological Sciences Research Council, the Arts and Humanities Research Council, and the Department for Environment, Food and Rural Affairs.

**Further information visit: valuing-nature.net/ ForestedPeatNC**

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