

Executive Summary

“A strategic assessment of the afforested peat resource in Wales, and the biodiversity, greenhouse gas flux and hydrological implications of various management approaches for targeting peatland restoration”

Rationale: peatland ecosystems and forestry in Wales

Peatland in pristine or good condition provides a range of critical ecosystem services, including biodiversity, carbon storage and sequestration, regulation of stream base flows, water runoff and downstream flood peaks and nutrient regulation and retention. Peatlands are also sinks and sources of several natural greenhouse gases, particularly carbon dioxide (CO₂) and methane (CH₄). More than 75% of deep peat soils in Wales are covered in semi-natural vegetation. Most of this is upland blanket bog, with significant amounts of fen and flush and, locally, lowland raised bog. These are all UK Biodiversity Action Plan priority habitats with UK and Welsh targets for habitat management and restoration. In this project it has been estimated that there are 18,092 ha of woodlands established on deep peats in Wales (soils in which the organic content of the surface horizon is > 80% and the peat depth is >40 cm¹). Of this area 11,232 ha remains under coniferous tree cover. The Welsh Government owns 11,038 ha of the afforested blanket bog and deep peat resource which are managed by Forestry Commission Wales (FCW). In order to deliver the habitat restoration objective set out in the Wales Environment Strategy, there is a need to progressively restore semi-natural habitat on these areas. Restoration measures should seek to better integrate the key objectives of nature conservation, soil carbon protection, carbon sequestration and water quality.

Report contents

This report provides a strategic assessment of the afforested peatland resource in Wales. The report:

- assesses the distribution of the Welsh peatlands, based on best available spatial information on the extent and location of peat soil and peatlands.
- delivers an improved distribution map of the upland blanket peat and deep peat soils resource at the highest resolution.
- includes an improved map of the distribution of afforested deep peats in Wales and ownership of forested land in Wales.
- provides an overview of the likely impacts of peat forming factors and afforested peatland restoration and management on the biodiversity, hydrology and greenhouse gas (GHG) benefits.
- develops *national* and *field based assessment schemes* based on rule based criteria, proxy factors and thresholds for the assessment of afforested peatland in Wales viable for restoration.
- carries out a national GIS assessment identifying potential restoration areas in Wales.
- tests the *field-based assessment* by ground truthing a number of sites in Wales.
- provides relative costs of afforested peat restoration

¹ Note the UKFS defines deep peat as >50cm depth. Use of 40cm depth is, therefore, precautionary.

Mapping peatlands in Wales

Reconciling the various descriptions and classifications within available spatial datasets to provide a unified picture of the deep peat distribution in Wales is a significant challenge. Spatial datasets of soils, geology and vegetation were assessed and combined to produce the definite improved map of peat resources in Wales. These include the National Soil Survey of England and Wales (NSRI survey), British Geological Survey dataset (BGS) and Habitat Phase 1 datasets for Wales. Based on these estimates peatlands cover 116,400 ha which is approximately 5.6% of Wales's total land area. The intact deep peat resource accounts for almost 3% of these UK peatland areas. The most extensive areas of peatland habitat are the upland blanket bogs (23,400 ha) mostly in North Wales and the substantial area of wet modified bog (22,600 ha) mostly in the uplands of central Wales.

The Forestry Commission Mapping and Geodata Unit (M&G) have recently digitised the soil mapping for Welsh forests from the original Forestry Commission soil survey records and these data were made available for this project. The new dataset is a significant improvement on the soil information that was previously stored in the FC sub-compartment database. The spatial dataset provides a more accurate and detailed record of the soils, at the time they were surveyed usually, prior to the original tree planting. The extent of available FC soil survey information across Wales is in total 74,985 ha that have been surveyed.

To assess the reliability of the Welsh Peatlands Map the peat classification of the national map was compared with a peat classification scheme based on the FC soil survey data in a case study in Gwydyr forest. The area of deep peat mapped in the Gwydyr forest by the FC soil surveyors (688.5 ha) is 12% smaller than that in the national map (784.6 ha). However, across Wales the area of deep peat soils identified by the FC soil surveyors is just 175 ha (1.6%) less, than the area of deep peat identified in the national map. As in the Gwydyr forest, the classification of mineral soils is more robust than the organic soils and the greatest shifts in the estimate of the peat resource arise due to the reclassification of the shallow peaty soil types. This illustrates the importance of accurate mapping, based on observation in the field, when trying to identify and assess the potential of afforested sites for restoration.

The Welsh Peatland Map was also compared with peat depth probe readings from a number of projects (e.g. ECOSSE Plynlimon survey, Welsh wind farm projects). In general the peat probe survey data and the areas mapped as deep peat show reasonably good agreement. However, several surveys appear to have concentrated on the margins of the area mapped as deep peat and in these surveys the number of discrepancies is greater.

The total afforested deep peat area in Wales is estimated as 18,092 ha. Using available data sources (e.g. FC legal boundary, FC woodland grant schemes), it was possible to identify the owners of over 85% of the afforested peat. The greater portion of the land is in public ownership, the extent and distribution of the Welsh Government Woodland Estate afforested deep peat is 11,038 ha, of which 6,592 ha are under coniferous forests in addition to 1,687 ha of young stands and 2,018 felled. Other public authorities are

responsible for 16.6 ha. There are 4,845 ha owned by private individuals and businesses, and 59 ha owned by voluntary organisations.

Benefits from afforested peatland restoration: appraisal of the literature

A comprehensive review was carried out of the available literature and lessons learnt from existing afforested peatland restoration projects, examining the factors affecting peat formation and the impacts of restoration and management on the biodiversity, hydrology and greenhouse gas (GHG) benefits. It was not always possible to use reported evidence from open peatland restoration projects to predict the likely outcomes of afforested bog restoration. Neither was it always possible to apply reported outcomes from other countries to Welsh sites.

In addition, an appraisal of the scientific literature and reviews available on different management approaches to improving the condition of afforested blanket peat and deep peat soils was included. The likely outcomes of a range of management practices are provided but it is very important to include monitoring and reporting of the outcome of such efforts on the medium and long term success of any restoration project to provide evidence to inform future decisions.

The speed of delivery of benefits was also considered and the likely short and long term impacts of afforested peatland restoration on the provision of the main ecosystem services is summarised. There is a paucity of evidence from medium to long term afforested peatland restoration projects. For example, the lack of research and monitoring of non-C GHG emissions from previously-afforested peatland areas needs to be addressed before conclusions can be made on the likely GHG implications of restoration.

National and field based assessments of restoration potential in Wales

Based on the appraisal of the available literature and the research team's expert judgement; *national and field based schemes* for the assessment of the potential for restoration of an afforested peat site have been developed using rule-based criteria, factors and thresholds.

The *national assessment scheme* applies GIS and spatial datasets to assess five *issues*: a) current status of the peat; b) hydrological integrity of the site; c) consequence of restoration in terms of greenhouse gas emissions; d) ecological integrity of the site and e) climatic integrity of the site. The rule-based criteria score a site's potential for restoration so that the sites with good potential to become peat forming habitats have higher scores than those which will merely retain the existing peat. Each criteria is classed into three categories in which the lowest score (**no score**) ≡ has the least advantageous, neutral or potentially detrimental consequences of restoration; a medium score (**value of 1**) ≡ advantageous consequences of restoration and the highest score (**value of 2**) ≡ most beneficial consequences of restoration.

At national level, each issue has been assessed and mapped separately (peat condition, hydrology, GHG balance, biodiversity, and climate integrity). The five issues are then

combined using the weighting factors to determine the final score for each site and produce the national map.

The results of the *national assessment* reveal that the best opportunities for restoration on the WGWE (excluding consideration of other factors beyond the scope of this study) are in the Snowdonia National Park, Tywi forest and Coed y Mynydd regions.

Once a site has been identified as potentially restorable by the *national assessment scheme*, a follow up *field assessment* will be required to validate the desk-based national assessment. A *field-based assessment* was developed based on field observations. The *field-based assessment* proved to be very reliable when tested by ground truthing a number of afforested peat sites in Wales.

A *Field Assessment Tool* has been developed and is intended to be used by FC Wales staff (e.g. forest planners or conservation managers) responsible for the strategic planning of an afforested peat site e.g. during the revision of the Forest Design plan or identification of sites for compensatory restoration action within the WGWE Wind Energy Programme.

Overall, this project is a significant step in collating spatial data, evaluating available knowledge and developing and testing *national* and *field* based assessments in order to improve information on the distribution of Welsh peatlands and strategically assess the restoration potential of afforested peat in Wales. Moreover, it also demonstrates an approach to integrating consideration of biodiversity, climate change and water policy.

Cost of afforested peat restoration

The report includes an initial exploration of the likely costs of restoration of afforested peatlands, based on previous work, and the relative costs of different management options assessed.