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PRACTICE INSIGHTS

The forgotten forests: Incorporating temperate peat-forming wet woodlands as nature-based solutions into policy and practice

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Abstract

1. Peat-forming wet woodlands (forested wetlands) are naturally occurring carbon-dense ecosystems that have considerable potential to form an important part of net zero woodland establishment and peatland strategies, as well as provide crucial co-benefits to restore biodiversity and regulate hydrological systems. Despite their potential, temperate peat-forming wet woodlands have been widely lost, are critically understudied and are being overlooked in land-use strategies.
2. Unlike temperate 'dry' woodlands, some wet woodlands are peat forming and can store large amounts of carbon below-ground in peat in addition to the carbon in the tree biomass. The complex structure of these peat-forming wet woodlands creates high abiotic heterogeneity, resulting in a wide variety of microhabitats to support high levels of biodiversity, and this structural complexity can also increase water storage in the landscape and slow flood flows, providing natural flood protection.
3. Co-written by experts in academia and UK Government, we highlight critical knowledge gaps in our understanding of peat-forming wet woodlands that, once addressed, could form the basis for radical changes to their inclusion in net zero and land-use policies.
4. Policy and practice implications: The significant role that peatland restoration has to play in reaching net zero presents an immediate policy opportunity to consider the full range of ecosystems to achieve net zero targets, while protecting and enhancing socio-ecological sustainability. In co-writing this paper, our aim

is to stimulate discussion and sharing of knowledge between those involved in research, policy and practice in order to strengthen the evidence base for peat-forming wet woodland re-establishment and future management. We call on researchers, policymakers and land managers to take temperate wet woodlands from understudied and overlooked, to integrated ecosystems that hold great promise in the contributions they can make as nature-based solutions.

KEYWORDS
carbon-rich ecosystems, forested wetlands, land-use strategies, nature-based solutions, net zero, peatlands, UK policy, wet woodlands, wetlands

1 | INTRODUCING WET WOODLANDS

Wet woodlands—also known as forested wetlands (Box 1)—are heterogeneous ecosystems that can grow wherever wet conditions prevail in freshwater, tidal or saltwater environments, including coastlines, river valleys, lake edges, undrained floodplains, depressions and seepages (Barsoum et al., 2005, Figure 1). Wet woodlands can form complex mosaics of vegetation at different stages of development, varying in composition shaped by hydrogeomorphological conditions and microtopographical features such as levees and back swamps. There are multiple wet woodland types globally, which are typically classified by the environmental setting (e.g. riverine, coastal), hydrological regime (e.g. flooding frequency and duration), substrate properties (e.g. mineral, organic) and vegetation composition (e.g. coniferous, broadleaved or the dominant species). However, the common defining features of wet woodlands globally, is that they are wooded ecosystems with soils that are seasonally or permanently wet, the latter favouring rapid accumulation of organic matter and peat formation. Wet woodlands on organic substrates can accumulate and store large amounts of carbon in the form of peat, in addition to the carbon in the tree biomass (Davidson et al., 2022). They therefore have potential to form an important part of international net zero strategies, as well as provide crucial co-benefits as nature-based solutions (NbS), including the provision of rich habitat for animals, plants and fungal communities, the regulation and storage of flood waters, improvements in water quality and erosion control, and regulation of temperatures in wetlands and watercourses through shading (Gregg et al., 2021).

We are a group of researchers, experts and policymakers from academia and UK Government organisations responsible for

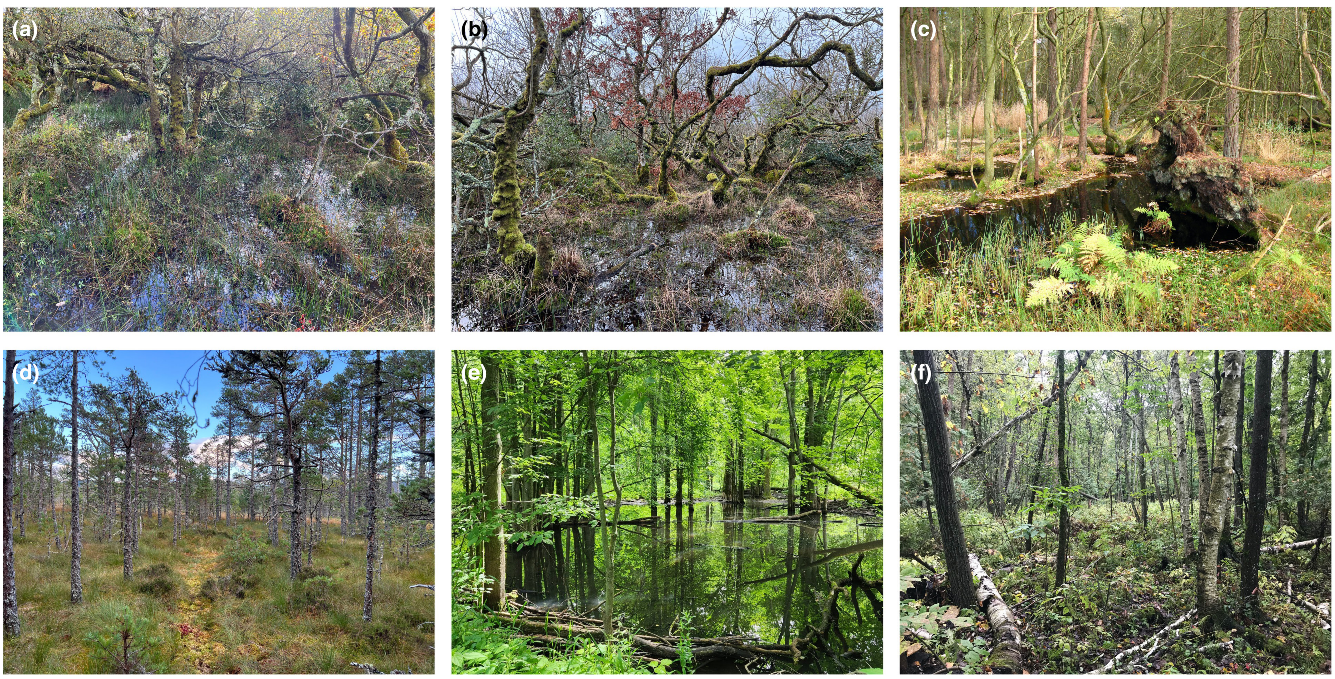

FIGURE 1 Examples of a range of different peat-forming temperate wet woodland environments, highlighting the range of understory hydrological conditions and vegetation communities in the UK (a–c) and examples of other temperate forested wetland types globally including bog woodland (d), broadleaved swamp (e) and mixed wood swamp (f). Photo credits: Scott J. Davidson (a, b, d, f), Iain Diack (c), Carlos Barreto (e).

BOX 1 Wet woodland terminology

The terms used to describe wet wooded ecosystems vary considerably globally, but typically a clear distinction can be made between wet woodlands that are:

1. subject to almost continuous waterlogged conditions and the resulting accumulation of organic matter (with commonly used terms including forested wetland, swamp, mire forest, bog forest, bog woodland, shrub or thicket swamp, carr, palustrine shrub wetland, and backwater sections of alluvial or floodplain forest), and;
2. wet woodlands that are subject to intermittent flood disturbances that result in the regular displacement of any accumulating organic material intermingled with raw alluvial sediment, typically adjacent to dynamic river channels (with commonly used terms including riparian, alluvial and floodplain forest).

The wide range of terms used globally reflects both the varied nature of the ecosystems and the classification schemes in use within different regions. Within the UK, the term *wet woodland* is used more widely amongst practitioners and policy officials to refer to any wooded ecosystem growing in wet conditions, and we adopt this all-encompassing term within this paper. We further qualify that we are primarily referring to *peat-forming* wet woodlands.

land-use strategies, and the conservation and management of the natural environment. In co-writing this paper, our aim is to promote discussion and shared knowledge between the research, policy and practice communities to strengthen the evidence base for temperate peat-forming wet woodlands and their inclusion in land-use policies. We first outline the characteristics of peat-forming wet woodlands and their potential role as NbS within climate and land-use strategies and then summarise the opportunities and challenges for our understanding of these wet woodlands, including identifying critical evidence gaps. Throughout the paper, we take a UK focus, which is where our expertise lies, but we draw on evidence from similar wet woodlands across the temperate regions. The opportunities and challenges we identify therefore have relevance beyond the UK. We put UK peat-forming wet woodlands into that wider context below.

Wet woodlands in the UK are found on floodplains, fens and bogs, and along river channels, streams, seepages and springs (Figure 1). Many UK wet woodlands have an uneven-age structure and composition shaped by hydrogeomorphological conditions, and can occur in a mosaic of other woodland and open habitat types (e.g. upland oak woods, open fens). Most peat-forming wet woodlands in the UK occur as sparse open stands of *Pinus sylvestris* on ombrotrophic peatlands, or as closed-canopy low-stature stands of *Alnus*, *Betula* and *Salix* on minerotrophic peatlands (carr). These peat-forming wet woodlands are comparable to the mire and swamp forests (European Forest Type 11, Barbati et al., 2014) and bog woodland (91D0 of the EU Habitats Directive) across Europe, and the coniferous swamps on both ombrotrophic and minerotrophic peatlands in North America (although tree density varies widely according to hydrological conditions). The shrub or thicket swamps of North America are most similar to the broadleaved wet woodland found on minerotrophic peatlands in the UK. Wet woodlands on mineral or organic-rich substrates along river valleys and floodplains in the UK are commonly dominated by species of *Alnus*, *Betula*, *Populus* and *Salix* and are comparable with the alluvial forests (91E0 of the EU Habitats Directive) and floodplain forests (European Forest Type 12) found across continental Europe. Plantations are extensive on drained peatlands and other wetlands in the UK, but we do not consider them in this paper (apart from their potential to be restored to functioning peatlands encompassing mosaics of open wetland and wet woodland) and instead we focus on natural peat-forming wet woodlands that support native species. Similarly, temperate rainforest in the UK is sometimes referred to as wet woodland; however, we are focused solely on wet woodlands in the context of forested wetlands.

2 | WET WOODLANDS AS NATURE-BASED SOLUTIONS

Wet woodlands were formerly widespread in the UK, dominating many floodplains and wetlands but are now rare. The most recent estimate of total wet woodland extent in Great Britain is ~170,000 ha, covering <1% of the land area and representing only 6% of all woodland. It is highly fragmented with almost 28% in patches <5 ha in extent (Forest Research, 2020) but with notable concentrations in Scotland, East Anglia, Shropshire and Cheshire. Their rarity is the result of long-term drainage and subsequent land conversion rather than a lack of suitable natural habitat. Palaeoecological evidence shows widespread wet woodland colonisation of floodplains after the last ice age (~10,000 years ago; Peterken & Hughes, 1995). Deforestation of floodplains began in the Neolithic and wet woodlands were almost completely deforested by the Iron Age (Brown, 2002). A similar pattern of historic wetland deforestation is recorded in continental Europe and North America (Byun et al., 2018; Kolka et al., 2018; Peterken & Hughes, 1995) and in Europe, mire and swamp forest and floodplain forest now cover just 6.6% and 1% of the total forest area respectively (Barbati et al., 2014).

Perhaps owing to their widespread loss, temperate wet woodlands, particularly in the UK and parts of continental Europe, have been neglected by the scientific and conservation communities and there is limited information on their carbon cycling processes, the biodiversity value of different wet woodland types, and their resilience to climate and land-use change (Section 2.1–2.3). Because of this, wet woodlands in these regions are at risk of being overlooked in both tree-establishment and peatland strategies. For example, in the UK, they are not typically included in forestry guidelines because their wet growing conditions are not suitable for timber harvesting, nor are they considered in peatland guidelines (Section 3). The current management guidelines for wet woodlands in the UK are nearly 30 years old (Forestry Commission, 2003; published in 1994, reprinted 2003), written before the focus on carbon-rich landscapes for net zero targets, and therefore not fully reflective of current policy challenges. With the increasing urgency of climate change mitigation and adaptation using NbS, there is a window of opportunity to assess how we can best use the full range of natural ecosystems to achieve net zero targets, whilst protecting and enhancing socio-ecological sustainability.

Given their former extent in regions that have seen large-scale land conversion, there is substantial potential to re-establish some of the lost temperate wet woodlands (e.g. on drained low-grade agricultural land) and we suggest that their management and re-establishment could play an important role as NbS for mitigating climate change (Figure 2). We outline below the ways that wet woodlands—particularly those on organic-rich substrates—could contribute as NbS and highlight key knowledge gaps in the evidence base for including wet woodlands into government policies.

2.1 | Wet woodlands as carbon stores

One of the main ways that wet woodlands could contribute as NbS is through harnessing the carbon sequestration potential of wet woodlands that accumulate organic material as peat. Compared with temperate 'dry' woodlands (i.e. temperate woodlands with soils that are not seasonally or permanently wet) and non-treed peatlands, these wet woodlands may therefore—under the right conditions—provide a win-win when considering management for carbon sequestration. While the above-ground carbon in living biomass, litter and deadwood is quantified for UK dry forests (estimated at 674, 190, and 149 Mt CO_2e respectively, Forest Research, 2021) there are no equivalent estimates for wet woodlands. Forest carbon stores, for all forest types, are strongly species- and site-dependent and tree productivity is generally lower in waterlogged soils, especially if the tree species are not adapted to waterlogging. However, dominant wet woodland trees have specific traits to improve tolerance to waterlogging, allowing them to retain levels of productivity. For example, fast growth rates allow seedlings to develop rapidly beyond the vulnerable recruitment stages in areas of repeat flooding, adventitious roots and hypertrophied lenticles at the base of shoots help rapidly replace flood-damaged roots and absorb oxygen, and pressurised gas transport maintains oxygen supply to roots (McVean, 1956). Despite lower productivity than dry woodlands, compared with non-treed wetlands dominated by *Sphagnum* spp. or herbaceous vegetation, the high tree cover in wet woodlands means that net primary productivity (NPP) can be higher (Davidson et al., 2022). Roots can constitute up to 60% of NPP in forest ecosystems (Jackson et al., 1997), and, in peatlands, fine root production is particularly important for NPP, nutrient and carbon cycling (e.g. Iversen et al., 2018). However, root data are sparse. For example, in a review of North American swamp carbon fluxes, only three studies—all from needle-leaved swamps—presented below-ground NPP measurements (Davidson et al., 2022).

Although roots are likely important for below-ground carbon, the most significant below-ground carbon store is peat (Beaulne et al., 2021). Globally, peatlands contain ~600GtC on <3% of the land surface; which is a quarter of the world's soil carbon stock, and is twice that stored in the world's forests (Loisel et al., 2021). Peat forms by waterlogged conditions slowing the decomposition of deadwood, roots and other plant litter and net peat accumulation is determined by the balance between productivity (litter

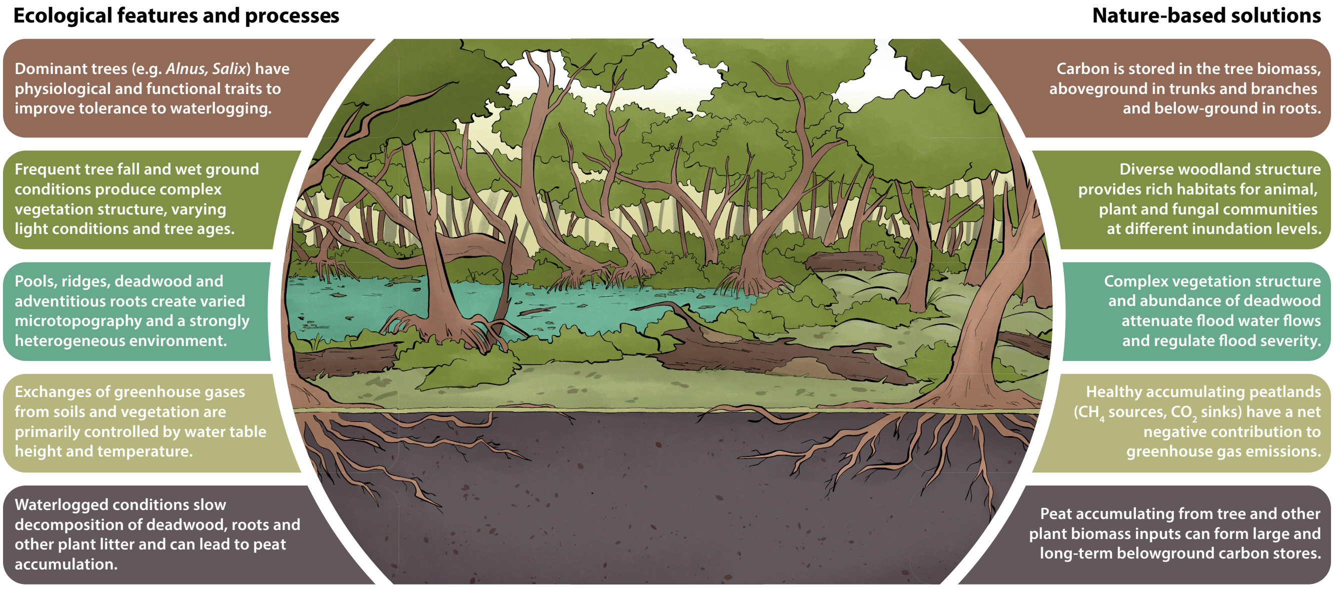

FIGURE 2 Representation of the key ecological features and processes of temperate, peat-forming wet woodlands and the nature-based solutions they have the potential to provide.

inputs) and decomposition. Given suitable site conditions (i.e. low decay rates from waterlogging), peat in temperate wet woodlands can reach depths >3 m, representing large carbon stores (Davidson et al., 2022; Ott & Chimner, 2016). However, while there are estimates for non-treed peatlands, we know of no estimate of the carbon stock in UK wet woodland peat or soils. Some peat carbon stock estimates may include wet woodland samples (e.g. categorising 'fen, marsh and swamp' together) but these values do not give a clear indication of the wet woodland component (Gregg et al., 2021).

When assessing the carbon balance of wet woodlands, carbon fluxes also need to be considered. Healthy (i.e. wet) peatlands are natural sources of CH_4 and sinks of CO_2 with a combined net negative contribution to radiative forcing, and evidence suggests restoring peatlands leads to net carbon gain even accounting for natural CH_4 emissions (Ziegler et al., 2022). There are no greenhouse gas (GHG) flux datasets for peat-forming wet woodlands in the UK and flux data for temperate wet woodlands globally is variable (Davidson et al., 2022), but it is likely that wet woodland types in organic-rich, frequently waterlogged contexts function in a similar way to other non-treed peatlands with (1) temperature and water-table depth being the main controls on the carbon balance, (2) GHGs being released from the peat mass as well as the stems of vegetation; and (3) a high spatial and temporal variability in GHG fluxes (Barba et al., 2019; Evans et al., 2021).

As outlined above, many temperate wet woodlands have been heavily influenced by clearance and drainage, and these activities, alongside climate change, are likely to determine whether wet woodlands act as a carbon sink or source in the future. A key knowledge gap therefore is the potential for wet woodland carbon sequestration under different climate and land-use scenarios.

2.2 | Wet woodlands as biodiverse ecosystems

In addition to having the potential to be large carbon stores, wet woodlands can be very biodiverse and bioproductive compared to temperate dry woodlands. Their high biodiversity and bioproductivity are likely a result of the typically complex structure and composition of wet woodland vegetation, the specific traits of component species (e.g. nitrogen-fixing capacity of *Alnus*, nutrient-rich litter), and the availability of diverse microhabitats that form as patterns of sedimentation and drainage vary. Wet woodland flora are generally more diverse than other woodland types and the species richness of many woodland landscapes can largely depend on whether and how much wet woodland is present (Forestry Commission, 2003). The high structural complexity and frequent tree-throw in wet woodlands creates variable light conditions and tree age structure (Pielech & Malicki, 2018). *Salix* and *Populus* spp. provide rich habitat and resources for arthropods, with exceptionally high numbers of associated species (Kennedy et al., 1984). In the historical and relict examples of intact wet woodland, channel movement, tree-throw and herbivores created opportunities for repeated initiation of succession and episodic regeneration (Peterken & Hughes, 1995) in what is described by Brown (2002) as a mosaic of disturbance regimes.

Well-developed ground microtopography in wet woodlands with adventitious roots, pools and ridges, provides a strongly heterogeneous environment at different inundation levels (McVean, 1956) that has the potential to harbour high and unique biodiversity (BRIG, 2011). For example, one of the few invertebrate studies from peat-forming wet woodlands found >1500 species across different components of the woodland (Jackson et al., 2000). The large quantities of dead and decaying wood provide niches for high fungal and saproxylic invertebrate diversity (Ellis & Ellis, 1997), and UK wet woodlands have been noted as crucial refugia for numerous priority or uncommon species including birds (e.g. *Poecile montanus*, *Poecile palustris*, *Acanthis* spp.), mammals (e.g. *Arvicola amphibius*, *Lutra lutra*), herptiles (e.g. *Natrix helvetica*, *Triturus cristatus*, *Rana temporaria*, *Bufo bufo*), invertebrates (e.g. *Melanapion minimum*, *Rhynchaenus testaceus*) and plants (e.g. *Thelypteris palustris*).

Wet woodland structural complexity is likely not only important for supporting high overall biodiversity, but also providing micro-scale refugia under climate change by buffering against extreme and long-term average change. Despite these promising indications, there have been no rigorous wet woodland biodiversity studies across the range of taxonomic groups and wet woodland types in the UK. Thus, there are key knowledge gaps on the unique assemblages of wet woodlands, the environmental tolerances of wet woodland species, the role of microhabitats and microclimate on biodiversity now and under climate change, the importance of connectivity, and how the (eco)hydrological conditions at macro- and micro-scale influence biodiversity, above-ground productivity and carbon sequestration.

2.3 | Wet woodlands as natural flood protectors

Historical records and intact wet woodlands provide insight into their role as natural flood protection and water storage solutions. The abundance of deadwood forms dams, causes water to back up into pools and creates multiple channels (Peterken & Hughes, 1995). These channels and pools increase the water storage capacity of wet woodlands and can slow floodwaters (Cooper et al., 2021). The structural complexity of the trees, undergrowth and deadwood additionally slow flood flows by increasing hydraulic roughness and creating obstructions, attenuating the downstream flood wave (Thomas & Nisbet, 2006). Wet woodland, particularly on floodplains, therefore represents a very valuable, but essentially lost ecosystem in the UK; and its historic removal may have contributed to increases in flooding severity (Thomas & Nisbet, 2006). Today, approximately 70% of the 1.6 million ha of floodplains in England and Wales are under agricultural use, and only 11% support semi-natural ecosystems (Lawson et al., 2018). Within that 11%, alluvial forest and bog woodland covers just 8750 ha (Lawson et al., 2018), <1% of floodplains. In addition, 42% of English and Welsh floodplains are currently disconnected from their rivers by infrastructure such as embankments (Cooper et al., 2021; Lawson et al., 2018), and many upstream woodlands that may have provided natural flood management via coarse woody dams have also historically been drained for management reasons.

Reconnecting rivers to floodplains as an approach to flood control has been discussed for decades and the research, practicalities and policy around natural flood management have been discussed extensively elsewhere (see Cooper et al., 2021 for a review). It is unlikely that re-establishing wet woodlands would be able to provide complete protection for downstream urban areas, but they could make a valuable contribution alongside existing flood defences to tackle increased risk of flooding associated with climate change (e.g. intense localised rainfall events), as well as providing a range of other related ecosystem services such as improvements in water quality, habitat for fisheries, carbon stores and biodiversity provision. Understanding how these components interact and the conditions under which wet woodlands can provide maximum benefits is a key evidence gap for policy development and implementation.

3 | OPPORTUNITIES FOR WET WOODLANDS IN POLICY AND PRACTICE

Globally, one of the main NbS mechanisms to reach net zero targets is tree establishment: the European Green Deal commits to planting 3 billion additional trees in the EU by 2030; international governments and NGOs have committed to the One Trillion Tree initiative, and the UK government has committed to increasing tree planting rates across the UK to 30,000 ha per year (HM Government, 2021). Achieving the ambitious UK target of increasing the currently low (13%) woodland cover and small woodland carbon sink (4.6% of total emissions, Committee on Climate Change, 2019) will require restoring a broad range of native wooded ecosystems to ensure the 'right tree in the right place' (Stafford et al., 2021). A holistic approach ensures that afforestation is undertaken sensitively to derive a full range of NbS for every woodland that is restored, taking account of the need to protect, restore and connect a wide array of different ecosystem types across the landscape for maximum natural capital gains (Seddon et al., 2020).

Despite the potential of wet woodlands as NbS, they are not typically included in UK forestry guidelines, and the Woodland Carbon Code—a private investment scheme backed by the UK Government—excludes woodland establishment on peat >50 cm deep. This requirement rightly prevents afforestation of naturally tree-less peatlands but does not consider peatlands that once hosted native wet woodlands comprising wetland-adapted tree species that require no drainage, or the fringes to the peatlands. Wet woodlands are similarly overlooked in UK peatland strategies. Peatlands are now internationally recognised as important NbS (Strack et al., 2022) and the UK's Office for National Statistics classify them as providing 'very high' value for money: restoring all UK peatlands to near natural conditions would cost an estimated £8.4–21.3 billion, but would deliver £109 billion in carbon benefits alone, outweighing costs 5–10 times. UK policy focus has been on upland peatland protection and restoration, set out in the 25 Year Environment Plan, the UK Net Zero Strategy and the England Peat Action Plan. Only 20% of the UK's ~3 m hectares (~12% of UK land area) of peatlands are in a near natural state (UK Government, 2021) and approximately 280,000 ha of peatland has been targeted for restoration by 2050, including within a >£750 m *Nature for Climate Fund* to be spent by 2025. Lowland agricultural peats—where wet woodlands would have dominated at various times before land clearance—are now gaining attention (e.g. the recent UK Government Lowland Agricultural Peat Task Force) because they are responsible for 3% of England's overall GHG emissions (UK Government, 2023). The absence of peat-forming wet woodlands in the UK's national GHG inventory, the Peatland Code (the UK carbon market scheme for peatland restoration projects) and the England Peat Action Plan indicates a lack of understanding of the extent to which this peatland type could help deliver net zero targets. For example, the Peatland Code focusses on upland peatlands and has recently been updated to include fens, but other peatland types, including peat-forming wet woodlands, cannot yet be included because of a lack of underlying data on emissions factors. For the same reason, this peatland type cannot be included in the national GHG inventory. Wet woodlands are therefore at risk of remaining a forgotten ecosystem in the NbS policies being formulated and implemented in the UK. These omissions and the opportunities we outline below have wider relevance beyond the UK to other temperate regions with similar peat-forming wet woodland ecosystems that have been significantly affected by land conversion.

The current focus on achieving net zero by 2050 presents a window of opportunity to consider the full range of native ecosystems that can contribute towards climate change mitigation alongside maximising benefits for the environment and society. As shown in Section 2, we suggest that wet woodlands have the potential to contribute significant benefits to land management; to restoration targets over the coming decade and beyond through their carbon storage capacity; and the provision of wildlife-rich ecosystems and other co-benefits including flood protection. Despite their current rarity in areas that have seen large-scale land conversion, evidence suggests that when drainage and clearance activities cease, wet woodlands can rapidly re-establish through natural regeneration (where browsing is controlled, within a 10–50 year period, Broads Authority, 2023), making them a low-intervention, low-disturbance and low-cost NbS. Marginal land such as grazing marshes and low-grade agricultural land that requires drainage could be suitable locations in order to minimise displacement of agricultural production. Re-establishing wet woodlands in suitable locations could contribute to a variety of ambitious targets enshrined in the UK Environment Act 2021 and set out in the Environmental Improvement Plan including: (1) increase tree and woodland cover to 16.5% of total land area in England by 2050; (2) halt the decline in species populations by 2030 and reverse declines by 2042 to reduce risk of extinction; (3) restore or create >500,000 ha of wildlife-rich habitat by 2030 including the contribution from peat restoration and biodiverse woodland creation. Similar re-establishment of wet woodlands throughout continental Europe in suitable locations could contribute to the commitment of EU Member States to restore at least 30% of habitats from poor to good condition by 2030 (and 90% by 2050) via the Nature Restoration Law. Restoration of peat-forming wet woodlands in particular could contribute to both peatland restoration targets (restoring at least 30% of drained peatlands by 2030 and 50% by 2050) and forest ecosystem targets (establishing an additional three billion trees by 2030) set out within this law.

Wet woodland re-expansion would contribute to shifting their current conservation status from unfavourable to favourable (Natural England, 2023). Surviving wet woodlands in the UK and across parts of continental Europe are poorly protected and face multiple pressures that lead to a deterioration in habitat quality and resilience—most notably drainage (both within the woods and in the surrounding landscape, and in some regions they are de-watered by abstraction of water for public water supply and agriculture), eutrophication from enriched surface and/or groundwater, and invasive non-native species. Adding complexity to the situation, some wet woodlands today have developed as a result of recent colonisation of previously more open wetland, a process generally accelerated by drainage and nutrient-enrichment. These 'open' wetlands were often the only remaining sites in many parts of the country, so conservation efforts have generally involved clearance of woody plants to retain the species of fens and bogs. Availability of sufficient land with appropriate hydrological conditions (including good water quality) to re-establish open and wooded wetlands at large scale would move us beyond this perceived conflict between open and wooded wetlands. For example, in England, shifting to a favourable conservation status requires an expansion in wet woodland area of at least 53,000 ha to increase patch size and link isolated patches, restoring natural hydrological function, water chemistry and nutrient status, encouraging diverse woodland structure, native species, the presence of standing and fallen deadwood and leaf litter, and shifting species towards 'Least Concern' (Natural England, 2023). With wet woodlands rapidly naturally regenerating, some of these features would appear with minimal intervention, others will require ambitious landscape-scale planning and catchment-restoration programmes that incorporate targets for woodlands, wet woodlands, rivers, floodplains and open wetlands within the context of the wider ecosystem rather than in isolated components of the landscape.

We have outlined above some key areas that need further research to provide the evidence base for understanding the role of wet woodlands as NbS. With the current pressure on achieving net zero commitments (underpinned by national GHG inventories and carbon accounting), it is the carbon budget value of wet woodlands that will likely determine policy interest in these ecosystems both within the UK and internationally. In net zero accounting terms, wet woodlands are essentially an unknown quantity and cannot yet be included in GHG inventories due to a lack of data. Generating data on their potential carbon gains as restoration occurs, developing accurate assessments of their emissions abatement potential, and emissions factors are therefore high priority knowledge gaps. In addition to these, more information on the effectiveness of wet woodlands as NbS in a variety of land-use settings, including their cost-effectiveness compared to alternatives, will help incorporate wet woodlands into land-use planning (and crucially for the UK, into Local Nature Recovery Strategies), and maximise the co-benefits. The recently established Wet Woodland Research Network aims to facilitate cooperation between researchers, policy, and practice organisations to improve understanding of wet woodlands, and incorporate this understanding into land management practices, policies and incentives. We invite you to join us.

AUTHOR CONTRIBUTIONS

Alice M. Milner and Andy J. Baird conceived the idea for the paper. Alice M. Milner led the paper's production. Alice M. Milner, Dan Abrahams, Andy J. Baird, Nadia Barsoum, Marion Bryant, Scott J. Davidson, Emma Dear, Iain Diack, Emily R. Lines and David Smedley co-wrote the manuscript, including contributing critically to the ideas presented in the paper and providing input as academic, policy and practice experts. Adam Noach provided analysis on wet woodland extent. All authors contributed to writing and gave final approval for publication.

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CONFLICT OF INTEREST STATEMENT

We declare we have no conflict of interest.

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