Running out of time? Peatland rehabilitation, archaeology and cultural ecosystem services

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SUMMARY

The United Nations Decade on Ecosystem Restoration places ecosystem rehabilitation at the forefront of global efforts to restore biodiversity and tackle climate change. From a cultural and historical perspective, peatland environments are essential for the preservation of important archaeological sites, artefacts and palaeoecological records that do not survive on drier landscapes. Peatland degradation and destruction has in the past resulted in the damage and loss of significant numbers of sites and those that remain are vulnerable to human activities and processes associated with climate change. Although peatland restoration offers significant positive benefits for the *in situ* preservation of surviving peatland archaeology, explicit consideration of the nature and vulnerability of the archaeological resource tends to be omitted from academic discussions and practical peatland restoration schemes. This short communication highlights the key issues associated with the maintenance and protection of the cultural heritage of peatlands and concludes that improved communication between heritage and peatland restoration programmes and agendas is now urgently needed to ensure the preservation *in situ* of archaeological sites and deposits.

KEY WORDS: climate change, heritage, historic environment, peat

INTRODUCTION

The announcement of the United Nations 'Decade on Ecosystem Restoration 2021–2030' (United Nations General Assembly 2019) demonstrates the global scale of commitment to the protection, preservation and restoration of global ecosystems. The United Nations Decade on Ecosystem Restoration places ecosystem rehabilitation at the forefront of efforts to restore biodiversity and tackle climate change. From a cultural and historical perspective, peatlands are essential for the preservation of important archaeological sites, artefacts and palaeoecological records that do not survive on dryland landscapes. The waterlogged, anoxic conditions of healthy peatlands can lead to the preservation of a diverse range of organic archaeological and palaeo-environmental remains (e.g. pollen and plant macrofossils), which may be referred to collectively as the 'archaeoenvironmental record'. This is included under Cultural Services, Physical/Intellectual Interactions, Scientific and Historical/Cultural Class of the Common International Classification of Ecosystem Services (see e.g. Gearey *et al*. 2014, Gearey & Fyfe 2016).

Peatland degradation and destruction have in the past resulted in the damage and loss of many archaeological sites, and those that survive today remain vulnerable to direct human activities and processes associated with global warming, such as the loss of key peat forming taxa (Mauquoy & Yeloff 2008). Peatland restoration (e.g. re-wetting through drain blocking) offers significant positive benefits for the *in situ* preservation of surviving peatland archaeology.

In this short communication we highlight pressing concerns associated with peatland rehabilitation and the protection of cultural heritage services. Given the speed and urgency of recent peatland restoration and rehabilitation programmes, it is essential that fragile and irreplaceable archaeological remains, surviving in areas scheduled for such work, are given optimal protection. We present the results of a preliminary analysis of the scientific literature, which indicates that the archaeological record is rarely considered in academic papers concerned with peatland restoration and rehabilitation. This has potential implications for the design and implementation of practical peatland restoration schemes.

THE STATE OF EUROPEAN PEATLAND ARCHAEOLOGICAL SITES

Significant numbers of archaeological sites and associated finds have been exposed over the last 30

years, especially in areas of Europe that have been subject to large scale drainage and peat cutting such as the Somerset Levels in southwest England (Coles & Coles 1986), the midlands of Ireland (e.g. Raftery 1990), Lower Saxony, Germany (e.g. Hayen 1987), and the Netherlands (e.g. Casparie 1987). Many sites have been destroyed through ongoing peat extraction and while some archaeological excavations have been carried out in these areas, comparatively little work has been done to assess the scale of loss on a trans-European scale (Chapman & Gearey 2013). The threats to peatland archaeological sites have been recognised since the 1990s, with the expression 'edge of extinction' used to describe the state of peatland archaeology, a situation attributed to: "...the present system of 'Nature' and 'Heritage' being regarded as separable..." (Buckland 1993, page 524). Despite some progress over the last 30 years, there is still room for improved dialogue between those who work in these two areas, nature and heritage.

Some national and regional estimates of the extent of the losses of peatland archaeological sites are available for Britain (Van de Noort *et al.* 2002): in the Somerset Levels, 62 out of 115 known sites have been destroyed by peat wastage and peat cutting over the last 150 years (Brunning 2002). In Ireland, around 4000 archaeological sites have been identified by archaeological surveys of the industrially extracted bogs of the midlands, and many of these have since been destroyed by continuing peat extraction; fewer than 10 % of these sites have been excavated and even fewer have been directly protected through their inclusion in areas of 'set aside' (areas of peatland that are excluded from further extraction; Gearey *et al.* 2013). Both archaeological and palaeoenvironmental potential of peatlands is referred to in Ireland's *National Peatlands Strategy* (Department of Arts, Heritage and the Gaeltacht 2015), and sites do survive in remnant Irish peatlands, some of which are currently undergoing, or are scheduled for, conservation and rehabilitation programmes. It is essential that such work takes account of the character and extent of these remains on a site-specific basis.

While such programmes should be beneficial to the long-term preservation *in situ* of fragile archaeological sites and deposits, benefits cannot be assumed without knowledge of (1) the nature and extent of the remains and (2) the precise nature of the rehabilitation measures employed (Rotherham 2020). At present, there is no published 'best practice' describing restoration and conservation methods for the protection of archaeological sites and deposits. A stakeholder review (Gearey *et al.* 2010) identified two relevant knowledge gaps: firstly, limited understanding of the factors controlling the preservation of archaeological remains within peat, particularly in relation to hydrogeological processes; and, secondly, a lack of understanding of the impact of different management practices on archaeological and palaeoenvironmental records. In order to best manage the surviving archaeological resource, there is a need to collect more data on the condition of archaeological sites and to assess the implications of water quality, water table stability and associated processes of re-vegetation for the long term *in situ* preservation of archaeological and palaeoecological material. However, such work can only be done in advance of restoration and conservation projects, and hence planning for this needs to be carried out before any works commence.

THE EFFECT OF CLIMATE CHANGE AND PEATLAND REHABILITATION

The effects of climate change on peatlands further threaten the survival of organic archaeological and palaeoecological deposits across Europe (e.g. Davies *et al*. 2015, Boethius *et al.* 2020). Programmes of peatland restoration and rehabilitation therefore represent the last chance for the preservation of this irreplaceable source of information about past cultures and environments. A key difference is that while restoration of certain peatland ecosystem services, such as carbon sequestration, might be re-established in time through re-wetting, damaged or degraded archaeological structures cannot be restored by the same process (Gearey 2016). Desiccated archaeological wood, for example, cannot be re-saturated and lost information (e.g. tool marks) cannot be restored. The best that can be hoped for is to halt further inadvertent damage and ensure programmes of rehabilitation create conditions that are optimal for the future survival *in situ* of archaeological remains (Gearey & Chapman 2006).

Peatland restoration and rehabilitation programmes have gathered pace across Europe (e.g. Glenk & Martin-Ortega 2018), with government heritage agencies such as Historic England producing landmark guidance outlining 'best practice' approaches for protecting archaeological remains during programmes of peatland restoration (Historic England 2021). This is an important development, but there is still an urgent need for improved dialogue between these initiatives and the heritage community to ensure account is taken of the rarity, vulnerability and fragility of the surviving record, and that restoration measures do not inadvertently compromise the future *in situ* preservation of those archaeological

sites and deposits that survived previous peat cutting and drainage (e.g. Bain *et al*. 2011).

We carried out a search of academic publications (2010–2020) to assess references to archaeology in the most recent literature focused on peatland rehabilitation. This was conducted using Google Scholar with a keyword search for the terms 'peatland rehabilitation', 'peatland rehabilitation +archaeology', 'peatland rehabilitation+palaeo-ecology', within a search range of the period from 2010 to 2020 inclusive. The spelling of 'archaeology' was searched to cover the international use of the term (as opposed to 'archeology'; *cf.* Deetz 1989, Little 2006), with 'palaeoecology' included to cover the palaeoenvironmental records preserved in peatlands. The results of the search are shown in Figure 1. Of 4425 papers identified through this search, only 60 (1.35 %) included the terms 'peatland rehabilitation+archaeology' and 'peatland rehabilitation+palaeoecology'. The results of this preliminary search, while far from exhaustive or in-depth, indicate that 'archaeology' and 'palaeo-ecology' have rarely formed part of academic research into peatland rehabilitation and ecosystem services.

The search also revealed significant variation in the depth of discussion of archaeology. For example, in one paper from 2010 on peatland restoration (Kimmel & Mander 2010), the term 'archaeology' appears only once in the appendices as a tabulated key term for reference only. In contrast, more recent work has attempted to incorporate valuation of the archaeological record into cultural ecosystem services assessments (Gearey *et al.* 2014, Van Hardeveld *et al*. 2018). Furthermore, Greiser & Joosten (2018) considered the importance of the peatland 'archive' in terms of the provision of the palaeoecological record as a cultural ecosystem service. Their research developed a methodology for assessing the value of the palaeoenvironmental record in 49 peatlands from northeast Germany, with the aim of assessing how this might be applied in the

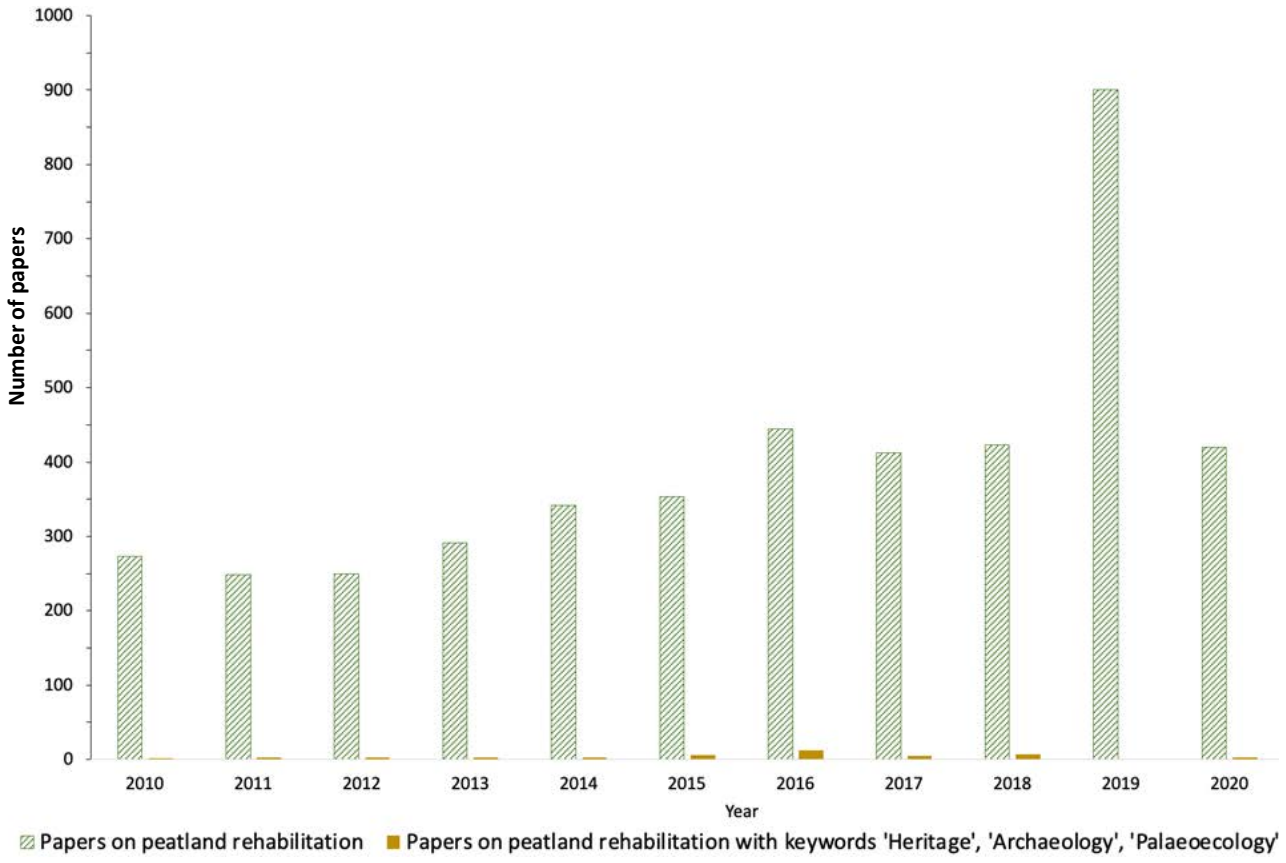

Figure 1. Results of Google Scholar online literature search using the following terms: 'peatland rehabilitation', 'peatland rehabilitation+archaeology', 'peatland rehabilitation+palaeoecology'. Numbers of papers published in each year between 2010 and 2020 on peatland rehabilitation are shown in green and those on peatland rehabilitation which also include heritage, archaeology and/or palaeoecology are shown in brown.

compensation for loss of archives occurring as a result of peatland degradation and destruction (Gresier & Joosten 2018).

PEATLANDS AS CULTURAL LANDSCAPES

In a recent assessment by the United Nations Human Rights Commission of the relationship between environmental challenges in the face of climate change (Bennoune 2020), the impact of peatland restoration on 'cultural rights' has been recognised as a concern (Gearey & Everett 2020). The value of peatlands extends beyond ecological functions and cannot be captured solely by scientific metrics; there are always human aspects, such as personal attachments and memories associated with peatlands (Flood *et al.* 2021). These intangible elements must remain a key consideration of peatland rehabilitation since archaeology is an undervalued and often unrecognised component of 'restoring' human relationships to these landscapes (Gearey & Everett 2020).

CONCLUSIONS

Peatlands have long been threatened by a perfect storm: large scale destruction through past and continuing anthropogenic processes and the impact of climate change on what survives. Restoration programmes offer significant positive benefits for a range of ecosystem services including the protection of the archaeological record. Gearey *et al.* (2014, page 241) suggested that: "...the inclusion of cultural value [in the ecosystem services framework] allows the promotion of the archaeological resource alongside other competing and arguably 'higher priority' conservation agendas". However, the academic and heritage curatorial community has on the whole been slow to recognise and react to the ecosystem services framework and further dialogue is required (Hølleland *et al.* 2017). Brunning (2007, page 46) stated that: "The well proven, extensive and rapid destruction of waterlogged archaeological deposits in European peatlands should be regarded as a significant crisis"; the opportunity to address this crisis is therefore, long overdue. It is essential that the state and extent of the surviving peatland archaeo-environmental record is fully identified and assessed in all relevant locations, and that methods for assessing its value are developed in alignment with the ecosystem services framework, since this forms the basis of most peatland rehabilitation and restoration activities. Closer collaboration between academic, curatorial, conservation and restoration communities is also vital to ensure the protection and survival of the archaeological and palaeo-environmental archive into the future.

AUTHOR CONTRIBUTIONS

BRG wrote the first draft of the manuscript and conducted the study together with RE. The Figure was prepared by RE. BRG and RE revised the final version of the manuscript.

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