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To whom it may concern,

Re. A Review of the Use of Peat In the Horticultural Industry: Consultation response.

Many thanks for opportunity to comment on this consultation paper. We would like to offer the following comments:

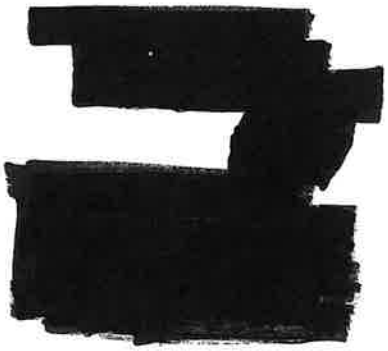
- Firstly, there appears to be some misunderstanding of the Ecosystem Services (ESS) Framework, especially with regards to section 10 (public consultation questions). Question H implies the categories (Carbon Storage, Economy, Nature Conservation and Social and Cultural Needs) can be regarded as separate entities to the provision of ESS. In fact the ESS Framework is intended to incorporate these 'values', this is the point of the ESS Framework. Indeed, it would be possible to attach monetary values to each of these 'values'. In addition, the significance of the ESS is that it represents a format for incorporating a diverse range of services including the historic environment (See Gearey *et al.* 2014, appended to this submission; this is also relevant to Appendix 1).
- We note there is only a single, slightly vague reference to what may be described as the 'cultural heritage' value of peatlands, which may be defined as the archaeological and palaeoecological records. Irish peatlands preserve an unprecedented record of the human past stretching back some 8000 years: a review commissioned by DAHG and published in 2013 highlights the presence of around 4000 archaeological sites within the industrially extracted bogs of Bord na Móna (Gearey *et al.* 2013; *Review of Archaeological Survey and Mitigation Policy Relating to Bord Na Móna Peatlands Since 2013*. Report to NMS/DAHG). At this point in time, many of these sties have been destroyed through peat extraction, with a minimum level of archaeological investigation. As of 2013, less than 10% of known archaeological sites had been subject to excavation.
- Leaving aside this scale of damage and destruction, it can be argued that the archaeological record of Irish peatlands has been significantly under exploited in terms of broader public appreciation, for example sense of place and local identity. In addition, given the importance of Irish heritage for tourism and as section 2 identifies, current and future economic issues facing regions such as the Irish Midlands, the heritage resource of peatlands have been significantly underexploited. This potential should be considered as part of any future programmes of peatland restoration and economic regeneration of these areas.
- There is no clear reference to the value of the palaeoecological record of peatlands (e.g. the information that proxies such as pollen provide of long-term patterns of environmental change) not only in terms of the preservation of these records from intact peat deposits, but also the value of these data in terms of informing restoration and conservation programmes.

[redacted]

- With reference to Appendix 3 (peatland research) it is encouraging that various peatland conservation projects are underway. However, none of these projects appear to take into consideration the peatland archaeological record, not least the fact that many of these locations still contain archaeological sites. Given that national archaeological policy holds that sites should be preserved *in-situ* or by record, it is essential that any such conservation or restoration projects consider the possible impact of future works. Whilst peatland restoration should be broadly beneficial to the archaeological resource, this cannot be assumed and consideration of this heritage management issue must be incorporated into restoration programmes moving forward.
- A possible way of dealing with some of our concerns may by through the working group proposed in section 10. However, it is essential that any such group includes individual/s with knowledge of the specific problems and issues as described above.

In conclusion in is encouraging that this consultation process is underway and peatland restoration is now firmly on the political agenda. We would urge that the historical environment and in particular the unique importance of the peatland archaeological record are not omitted from discussion and policy. The archaeological resource is finite, non-renewable and has already been significantly damaged through commercial peat extraction to date. It would be a further significant loss to the nation if peatland restoration programmes were to unwittingly compromise what of Irish heritage in these much-depleted landscapes.

Yours faithfully



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Managing, Valuing, and Protecting Heritage Resources in the Twenty-First Century: Peatland Archaeology, the Ecosystem Services Framework, and the Kyoto Protocol

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This paper argues that the development of the Ecosystem Services framework, which has recently emerged as an internationally recognized framework for valuing 'the 'natural capital' of ecosystems, presents a number of opportunities for heritage management and the archaeological record, arguing that the inclusion of archaeological and palaeoenvironmental 'value' within this framework presents an opportunity to incorporate heritage alongside a range of other critical 'services'. It presents a short case study focusing on the problems facing the preservation of peatland archaeological sites and deposits *in situ* alongside developments within peatland conservation and restoration initiatives partly driven by the ability of healthy, functioning peatlands to sequester carbon and hence mitigate climate change. It is argued that this drive towards peatland re-wetting may bring both positive benefits and opportunities for heritage management but also presents a number of practical issues, which now require active engagement from the archaeological community.

KEYWORDS heritage, ecosystem services, peatland archaeology, Kyoto Protocol, climate change

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Introduction

The value of the archaeological record has often been determined by criteria derived from largely within the archaeological community itself, generally in relation to legislative frameworks and in England, through the principles of 'designation' (e.g. Darvill, et al., 1987), whilst 'value' is in turn promoted through academic research frameworks and agendas (e.g. Glazebrook, 1997). These are critical mechanisms but they are used primarily by archaeological practitioners and hence can be regarded as largely internalized value systems, which are arguably poorly understood outside the profession (e.g. Olivier, 2013; 1996). Whilst legal protection and academic frameworks are clearly essential tools for managing the archaeological resource on regional and national levels, the archaeological community has in the past perhaps been slow to recognize the importance of wider, transferable mechanisms that ascribe cultural value within a broader context of social, aesthetic, or evidential qualities (e.g. Drury & McPherson, 2008).

Ecosystem services and archaeology

Olivier (2013: 693) has recently stated that: '[…] we should re-think our primary approach to cultural heritage in wetlands, and move from existing orthodoxies of protection and preservation to a flexible approach in tune with prevailing attitudes to sustainability and environmental change'. In this paper we will propose that emerging international agendas may offer just such an approach for the future management, protection, and resourcing of archaeology. We will outline some of the implications for archaeology and heritage of the Ecosystem Goods and Services framework (ES) as formulated by the Millennium Ecosystem Assessment (WHO, 2005) and which may be defined as: '[…] the contributions that ecosystems make to human well-being, and arise from the interaction of biotic and abiotic processes' (Haines-Young & Potschin, 2010). The ES framework is a formal recognition of the fact that ecosystems provide benefits that wider society does not directly pay for or value, yet could not easily survive without or afford to replace, such as flood mitigation or carbon storage (Reed, et al., 2010). In recent years, ES have emerged as a formal approach to describe the relationship between ecosystems and society and are widely accepted within the international science and policy community (e.g. Daily, et al., 2009). It is highly likely that the ES framework will not only guide future environmental policies and management but will influence international policy and 'economic actors' (Kok, et al., 2010).

The significance for archaeology is centred on the fact that heritage values and cultural identity are recognized within the ES framework (Table 1). The archaeological and palaeoenvironmental records (archaeo-environmental record) can be assigned to the 'Cultural Services' Section, 'Physical and Intellectual Interaction' Division, 'Intellectual and representative interactions' Group (see Table 1; Gearey & Fyfe, in press). However, the importance of cultural services and value are not to date well recognized within various management and planning agendas which: '[…] could benefit from a better understanding of the way in which societies manipulate ecosystems and then relate that to cultural, spiritual and religious belief systems' (Tengberg, et al., 2012: 14).

TABLE 1

EXTRACT FROM PROPOSED STRUCTURE FOR COMMON INTERNATIONAL STANDARD FOR ECOSYSTEM GOODS AND SERVICES (CICES; EUROPEAN COMMISSION, 2014), WITH RELEVANCE TO ARCHAEOLOGICAL AND PALAEOENVIRONMENTAL 'SERVICES'

Note that this classification is relevant to all ecosystems (not just peatlands) and the Cultural Services Section is one of three sections (the other two are: Provisioning, Regulation and Maintenance).

Section	Division	Group	Class/Examples
Cultural Services	Physical and Intellectual Interaction with biota, ecosystems and landscapes	Physical and experiential interactions; recreation and community activities	Physical use – Outdoor recreation
			Experiential use – e.g. Conservation activities
		Intellectual and representative interactions	**Heritage/Cultural Archaeo-environmental Record**

The potential role that archaeology and related disciplines such as palaeoenvironmental study can play in this context should be self-evident, but there has to date been little concerted discussion or debate regarding this. This paper will present a case study concerning peatland conservation and ecosystem services that is intended to demonstrate the importance of active archaeological engagement with these rapidly developing agendas. In particular, we will discuss the potential harmonies as well as conflicts with archaeology that may arise from the international drive towards the restoration of peatland environments, related in part to the Kyoto Protocol (the international agreement linked to the United Nations Framework Convention on Climate Change: UNFCCC), which committed signatory countries to internationally binding green house gas emission reduction targets. We will suggest that the ES framework provides an opportunity to ensure that heritage is best protected, valued, and resourced in the future in the manner proposed recently by Olivier (2013).

Case study — Peatland restoration, archaeology, and Ecosystem Services

It has long been known that peatlands and wetland environments can preserve fragile and unique records of the past, but this has not always been entirely recognized or incorporated into related conservation agendas that should in theory align closely with archaeological imperatives (e. g. Coles, 1995). The waterlogged anoxic conditions of peatlands can result in the preservation of a diverse range of archaeological and palaeoenvironmental remains (collectively the archaeo-environmental record) which are rarely found on dryland sites. Sites and finds from these environments include the extensive complexes of prehistoric sites in the Somerset Levels of southwest England (Coles & Coles, 1986), the midlands of Ireland (e.g. Raftery, 1990), Germany (e.g. Hayen, 1987), and the Netherlands (e.g. Casparie, 1987). Other notable finds include the numerous 'bog-bodies' found in peatlands across Europe (e.g. Sanders, 2009). The palaeoenvironmental potential of peatlands is also well established with analyses of sediment sequences from such contexts providing critical information regarding vegetation change, human impact on the environment, and Holocene climatic fluctuations (e.g. Chambers, et al., 2011).

However, areas of established archaeological potential also tend to be those that have been most heavily disturbed by drainage, desiccation, and peat cutting and hence remain problematic in terms of preserving sites and deposits of archaeological value *in situ*. The fate of sites and records is closely tied to the fate of peatlands themselves (Van de Noort, et al., 2001), which face a range of serious threats the world over in the twenty-first century, including drainage, agricultural improvement, peat cutting, afforestation, burning, and increased atmospheric nutrient deposition (e.g. Lindsay, 2010). Preservation *in situ* has long been the preferred management option for archaeological sites across Europe (cf. Wainwright, 1989) and is recognized as a principle tenet of the European Charter for the Protection and Management of Archaeological Heritage (1992), commonly known as the 'Valletta Convention'. Whilst destruction of peat through agriculture or peat cutting clearly destroys any archaeological value, indirect impacts can have an equally deleterious effect. Preservation of archaeological sites *in situ* in peatlands is becoming increasingly problematic.

For example, study of the burial environment of the internationally important Mesolithic site of Star Carr in the Vale of Pickering, Yorkshire, has shown that the peat containing the archaeo-environmental deposits has become highly acidic following isolation from the influence of circum-neutral groundwater (Milner, et al., 2011). Although Scheduling under UK law recognizes the importance and cultural value of such sites, this cannot always of itself 'protect' the archaeology (Emerick, 2012). The deteriorating burial environment at Star Carr means that the only recourse may be preservation by record (Vorenhout, 2012). For the wider archaeological resource in peatlands the story appears bleak; in England it has been calculated that: '[…] 50% of the original extent of lowland peatland has been lost in 50 years […]' and that an estimated '[…] 10,450 wetland monuments have been destroyed or damaged during the same period' (Van de Noort, et al., 2001). A similar situation has also been identified in other European peatlands (e.g. the Netherlands [Van Heeringen & Theunissen, 2007]). Nearly 4000 archaeological sites have been identified in the industrially cut lowland peatlands of Ireland since 1990, and, whilst there is a programme of archaeological mitigation associated with peat extraction, only a very small percentage of these sites have been excavated (Gearey, et al., 2012). Brunning (2007: 46) has stated that, despite the supposed legal protection of many wetland sites: 'The well proven, extensive and rapid destruction of waterlogged archaeological deposits in European peatlands should be regarded as a significant crisis'. This situation arguably cannot be tackled without recognition of current and future threats within the context of broader management agendas (Olivier, 2013). In the context of peatlands in particular, the ecosystem services provided by healthy peatlands in mitigating climate change and the associated recent drive towards the restoration of damaged and degraded systems bring both challenges but significant potential opportunities for archaeology.

Peatland restoration and climate change: potential implications for the preservation and management of the archaeological record

Peatlands cover only 3% of the world's land area but are the largest long-term carbon (C) store in the terrestrial biosphere and (next to oceanic deposits) the Earth's second most important store (Joosten & Couwenberg, 2008). However, C cycling

within disturbed peatlands can be disrupted such that these ecosystems may instead become significant sources of C to the atmosphere (as CO_2, e.g. Waddington, et al., 2002). Although the precise processes are highly complex, research suggests that restoration of degraded peatlands can reduce C losses to the atmosphere (e.g. Tuittila, et al., 1999).

The Kyoto Protocol accepted terrestrial carbon sinks for GHGs as offsets for fossil fuel emissions, but peatlands were not explicitly included. However, following UNFCCC's COP-15 meeting it was agreed in principle that 'wetland re-wetting' could be included in any post-2012 protocol and looks likely to feature more prominently in the Kyoto Protocol and any successor for the second commitment phase (the Doha amendment) which is due to run from 2013 to 2020 (Dunn & Freeman, 2011).

Therefore, protection and restoration of degraded peatlands looks set to become a priority for various national and regional agencies for biodiversity, water, and climate change objectives. Such schemes have already begun in various countries; for example, the International Union for the Conservation of Nature Peatlands Programme in the UK (Bain, et al., 2011) has identified a goal of bringing one million hectares of peatlands into good condition or 'restorative management' by 2020. Restoration usually involves techniques to stabilize eroding surfaces, re-establish peatland vegetation cover, and raise the water table, and hence encourage waterlogged conditions that will enable peat to grow again (Worrall, et al., 2010). This is of benefit to the archaeo-environmental record as water-table instability can be highly damaging to organic remains and deposits (see Chapman & Cheetham, 2002). This is demonstrated by the fact that the only archaeological site in the Somerset Levels that appears secure from the threat of desiccation is the section of the Neolithic Sweet Track that benefits from a pumping system, which keeps water levels high in the Shapwick Heath National Nature Reserve (Brunning, et al., 2000; see also Brunning, 2013). Similar efforts to stabilize the burial environment are underway on Bourtanger Moors, north-east Netherlands, where the surviving section of the Nieuw Dordrecht Neolithic timber trackway is threatened by desiccation (Theunissen, et al., 2006).

However, conflicts may arise when conservation measures are carried out without input and possibly lead to the discovery of and/or unintentional damage to the resource (e.g. Gill-Robinson, 2008). Measures which lead to the re-establishment of plants such as *Phragmites* (reeds), for example, may lead to damage of fragile organic archaeological remains via root and rhizome penetration (Coles, 1995). Successful restoration can also make it difficult to identify or assess the presence of archaeological remains, especially within intact wetlands (Coles, 1995). Whilst peatland restoration programmes may therefore broadly align with heritage management imperatives, archaeological involvement within current and future conservation and restoration programmes are clearly essential to ensure that priorities and policies do not clash (see also Emerick, 2012). The raised water tables which are a key feature of many peatland restoration programmes (e.g. Cris, et al., 2011) should thus bring significant positive benefits but in practice restoration measures and programmes represent a range of possible opportunities as well as threats for the future protection and management of the archaeo-environmental resource (Bain, et al., 2011).

Conclusions: Ecosystem Services and archaeology

This paper has presented a short case study arguing that peatland restoration initiatives within the ES framework could be critical for the future heritage management of peatlands as it provides a formal mechanism for integrating the transferable nature of the 'evidential value' (see Drury & McPherson, 2008: 28) of these ecosystems within a framework that places cultural heritage alongside, for example, biodiversity, water regulation, and climate regulation services. In particular, the inclusion of cultural value allows the promotion of the archaeological resource alongside other potentially competing and arguably 'higher priority' conservation agendas.

A number of specific and general implications arising from the developments discussed above may be identified. Firstly, the drive towards peatland restoration should provide significant positive benefits for the future protection of the archaeo-environmental resource. However, it is essential that schemes include informed input from archaeologists to ensure account is taken of the character of different landscapes, the vulnerability of the record and any appropriate guidance in terms of specific mitigation. Given that ES looks likely to move from being a largely heuristic device to a tool which may shape national and international policy (see e.g. Reed, et al., 2010), broader archaeological engagement with the ES framework, at levels of policy and practice, is now critical for the future management and protection of the resource.

Recent study suggests that the cost of peatland restoration may be offset by the value of C storage provided by healthy peatlands (e.g. Worrall, et al., 2009). In this context, the representation of heritage within the ES framework takes on added significance given the fact that Payments for Ecosystem Services (PES) schemes are beginning to proliferate internationally (Braat & de Groot, 2008). In the future, peatlands may feature within schemes to draw carbon funds through voluntary 'carbon markets' to fund restoration projects (e.g. Joosten, et al., 2012). Trading in carbon credits is likely to become increasingly important in the near future: 'Carbon will be the world's biggest commodity market, and it could become the world's biggest market overall' (*New York Times*, 2007). Importantly, archaeological and palaeoenvironmental research can contribute directly towards understanding of certain of these issues (e.g. Dearing, et al., 2012). Durham, et al. (2012) for example, have observed that the degradation of organic archaeological remains produces Green House Gases that contribute to global warming. The inclusion of heritage within the framework of ES may therefore provide a means and mechanism for resources to fund the archaeological component of future peatland restoration work.

Whilst this paper has focused on the specific area of peatland archaeology and ES, the emergence of this framework represents a potentially important opportunity for heritage more broadly. We suggest that the archaeological community needs to be aware of, and must engage with this process as soon as possible, as it very much represents an opportunity to begin to develop the '[…] flexible approach in tune with prevailing attitudes to sustainability and environmental change' called for by Olivier (2013: 693). Otherwise archaeology and heritage may find itself without a place at the table in future discussions and responses to the environmental pressures that will affect global ecosystems in the twenty-first century.

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