IUCN National Committee United Kingdom

Peatland Programme

POSITION STATEMENT: Burning and Peatlands

The IUCN UK Peatland Programme (IUCN UK PP) is a partnership of environmental NGOs, statutory agencies, land managing bodies and scientists collectively working for the conservation and restoration of peatlands.

Our work brings together strong science, sound policy and effective practice by creating a platform for information exchange and providing briefings.

The topic of burning was a key consideration in the IUCN UK PP Commission of Inquiry on Peatlands (Bain *et al*., 2011) and led to a summary briefing on Burning on Peatbogs (IUCN UK PP, 2011). A more recent IUCN UK PP publication, Briefing Note No. 8: Burning (Lindsay *et al*., 2014), summarised the scientific evidence from an ecological perspective, following Natural England's Review of Upland Evidence NEER004 (2013) on managed burning and Peatbogs and Carbon (Lindsay, 2010). This updated Position Statement (version 4) takes account of the Natural England Evidence Review NEER014 (Glaves *et al*., 2020).

This Position Statement should be read alongside a summary of key papers available on the IUCN UK PP website.

Key Points

1. The overwhelming scientific evidence base points to burning on peatlands causing damage to key peatland species, peatland ecosystem health, and the sustainability of peatland soils.

2. Burning vegetation on peatland brings no benefits to peatland health or sustainability.

3. Evidence points to peatland restoration management not requiring burning; burning is harmful to the prospects of peatland restoration.

4. Misleading interpretations of some scientific work point to methodological inconsistencies in defining peatlands and assessing impacts of burning management; there is no evidence that peatland ecosystem health in the UK benefits from burning.

5. The most effective long-term sustainable solution for addressing wildfire risk on peatlands is to return the sites to fully functioning bog habitat by removing those factors that can cause degradation, such as drainage, unsustainable livestock management and burning regimes. Rewetting and restoring will naturally remove the higher fuel load from degraded peatland vegetation.

6. Further research and good practice guidance is required for managing wildfire risk on peatlands.

Impact of burning on peatland habitat and function

1. There is consensus amongst peatland scientists and policy makers that burning is, or has the potential to be, damaging to peatlands. The UK Government's recent publication of the England Peat Action Plan (Defra, 2021) states:

   > *"While there continues to be scientific debate over aspects of the environmental impact of managed burning, there is a large and increasing body of literature that provides evidence that overall managed burning is damaging to peatland"*.

   It is well established that burning can degrade bog habitats, leading to reductions or loss of key bog species (plants and animals); development of micro-erosion networks; increased tussock formation and increased dominance of non-peat-forming vegetation such as heathland species (e.g., common heather, *Calluna vulgaris*, and the moss *Hypnum jutlandicum*).

2. The impacts of fire on bog habitat, and particularly the main peat-forming *Sphagnum* species' ability to recover, depends on the frequency and intensity of the burn, along with other factors such as prevailing soil water levels, intensity of livestock trampling, climate, altitude, and the starting condition of the peatland.

3. Rotational burning on peatlands leads to drier vegetation communities (wet heath and dry heath communities) or a shift towards their dominance (e.g., of *Molinia*) (Bruneau and Johnson, 2014). This is associated with changes to the ecosystem (e.g., increased erosion rates and reduced availability of soil moisture) that can result in significant adverse impacts on peatland biodiversity, carbon emissions, drinking water quality and flood management (Brown *et al*., 2014; Yallop and Clutterbuck, 2009).

Degraded peatlands and peatland restoration

4. The majority of UK peatlands are in a degraded state as a result of various factors including drainage, burning, atmospheric pollution and high livestock numbers (Artz *et al.*, 2019; JNCC, 2011). Compared to intact peatlands, degraded peatlands generally show:
   - a higher proportion of dwarf shrub and graminoid (grasses and sedges) abundance;
   - reduced *Sphagnum* bog moss abundance and diversity of typical bog species;
   - vegetation structural changes such as loss of bog moss hummocks and pools;
   - greater development of tussock and micro-erosion microtopography;
   - denser, more degraded surface peat;
   - a lower water table.

5. One of the sources of confusion around the impact of management activity on peatlands is the misunderstanding as to what constitutes degraded and favourable condition, and failure to assess management trajectories. Alderson *et al*. (2019) describe trajectories of ecosystem recovery for peatlands and highlight that impacts on ecosystem services vary along different stages in the trajectory. It is important, therefore, to relate observed impacts to restoration goals and the current peatland state.

   Comparisons with 'active' peatlands are also unhelpful, as the term is too generalised to be of use for this purpose. The Interpretation Manual of European Union Habitats, version EUR 28 (2013) explains that 'active' must be taken to mean still supporting a significant area of vegetation that is normally peat-forming, but include bogs where active peat formation is temporarily at a standstill.

6. Difficulties in interpreting research findings also arise from inconsistent approaches to describing peatland vegetation, the state of peatlands, or the management objectives for the peatlands. Indeed, many published journal papers do not adequately describe, or take account of, the type or current condition of the peatlands under investigation. Use of generic terms such as moorland (which encompasses peatlands as well as heathlands, grasslands and non-peat soils) also make interpretation of the results difficult.

7. The majority of peatland restoration projects across the UK are able to achieve relatively rapid development of vegetation communities typical of blanket bog (within c. 5-10 years) through hydrological restoration. Rewetting a peatland tends to be sufficient, as any undesirable vegetation, such as dominant heather cover, dies back naturally to be replaced by *Sphagnum*-dominated conditions associated with healthy peatbog habitat (Cris *et al*., 2011). Effective restoration of peatlands has been widely achieved across Scotland without the need for burning; for example, there are over 200 Peatland ACTION restoration sites in Scotland that are delivering good practice restoration and have not required burning as part of this process.

8. Burning has been advocated by some land managers as a tool in peatland restoration to remove rank, leggy common heather (*Calluna vulgaris*) (Uplands Management Group, 2017). Burning carries a risk of causing more serious damage and further degradation, that can compromise the onset of peatland recovery. The substantial plant biomass load and the often dry nature of the underlying peat beneath the heather, are susceptible to uncontrolled burns that can damage peat-forming *Sphagnum* species, peatland seedbanks and underlying peat soil, and lower the water table for a period of several years.

   In view of the large number of successful peatland restoration schemes that do not use any form of burning, more work is required before burning can be considered an effective peatland management tool. So-called ‘hot’ and ‘cool burns’ are subjective terms and untested management tools with no certainty as to whether differences can be controlled, and no robust studies on their relative impacts (Glaves *et al*., 2013).

9. A recent study (Heinemeyer, 2023) comparing burning and mowing methods for the restoration of degraded, heather-dominated, blanket bog vegetation suggest both can bring some gains for carbon, water and biodiversity. It is notable from this study that wetter areas and peatland rewetting sites provided the greatest benefits. The significance of such gains compared to unburned and rewetted peatlands and the impact of burning on the achievement of peatland restoration goals is still not clear. Longer studies are needed to allow comparison of burning and mowing with rewetted areas that are not burned and to examine the impact of burn/no-burn methods on restoration trajectories.

10. **Successful restoration of blanket bog on numerous upland sites around the UK, without the use of muirburn or any other form of burning, demonstrates that burning is not a necessary tool for peatland restoration.**

11. Recent studies that have been used to argue that burning can be beneficial for peatland function, conservation and restoration have been subject to robust counter-responses, including published research. Whilst academic debate remains active, the evidence clearly points to the damaging impacts of burning on peatlands. A summary of key papers is available on the IUCN UK PP website.

    When considering the implications of research, it is important to recognise some of the limitations that have been raised in such debate. A number of common factors presented in academic literature that can hinder interpretation include:

    a. Inconsistent approaches to the description of peatland ecosystems, their current integrity with reference to an unmodified state, and previous activities that have damaged or modified them from that state. Of particular concern are studies that do not consider whether the vegetation recorded is typical of bog habitat or representative of drier conditions. It is overly simplistic to report only on the abundance of moss species or a generic ‘*Sphagnum*’ cover/frequency. Several species in the *Sphagnum* genus occupy different niches across a wide range of wetness, nutrient and pH gradients in a typical healthy ombrotrophic bog.

    b. Inadequate methodologies which fail to provide an assessment of baseline conditions prior to experimental treatment, or a summary of potential confounding effects which may impact on results post-treatment. Existing environmental and management factors such as drainage, topography, subsidence, grazing pressure, historic burning regime and surrounding land use pressures, including forestry plantations and atmospheric pollution, can all impact on study sites.

c. Failure to consider the impact of land management regimes in relation to trajectories for habitat recovery. Simply comparing burned and unburned areas of damaged peatland is unhelpful if the aims of the sites are to restore functioning peatland habitat. Burning of a heavily degraded, heather-dominated peatland may simply produce a constrained, degraded peatland state, retaining vegetation associated with drier conditions, such as *Calluna*, that could inhibit further recovery towards the near-natural state. Long-term monitoring is also essential to allow for assessment of burning impacts in relation to the different peatland recovery states.

d. Comparing the burned to unburned state, which can produce data that show a change in vegetation, including an increase in cover or frequency of generic '*Sphagnum*', often without identification to species level. However, in burned plots, consideration should be given to the type of *Sphagnum* species and whether these are typical of wet bogs, as well as the likelihood of reversion of the degraded peatlands back towards abundant heather.

e. Lack of distinction between studies of a single burn, compared with frequent managed burns on a cycle of 30 years or less. The latter can give rise to substantial cumulative impact due to long recovery times of particular blanket bog *Sphagnum* species from damage through burning (Noble *et al*., 2019).

f. Research based on the apparent rate of carbon accumulation (aCAR), reconstructed from peat cores, which does not fully address the additions and losses of carbon throughout the whole peat profile. This can be significantly different from the actual carbon accumulation rate. As a result, studies that use aCAR are, in our view, unable to say if land use or climate has had a positive or negative effect on peatland net carbon accumulation (see the discussions in Young *et al*., 2019 and Young *et al*., 2021 for further details). To properly consider the effects of fire on peatland carbon balance, a full net carbon balance including long-term carbon flux assessment, needs to be conducted, as opposed to simply assessing recent carbon stock change, or sequestration rates.

12. In addition to the failings to accurately describe peatland vegetation, condition and trajectories described above, studies can also lead to the mistaken view that burning is inconsequential or even beneficial for both the ecology and the carbon store of a bog if they do not fully account for:

- negative long-term carbon trends associated with atypical plant species abundance;
- the damaged state of the acrotelm (thin living surface layer of peat-forming vegetation);
- consequent impacts on the catotelm (permanently waterlogged peat store under the acrotelm);
- the impact of past changes to deep carbon stores that can give rise to misleading conclusions about previous rates of carbon accumulation;
- loss of microtopography and overall reduction in environmental resilience.

It is important for policy making and management planning that studies are peer reviewed and checked for robustness, as well as being allowed to operate over sufficient timescales before conclusions are drawn.

Healthy peatlands support upland management goals

13. Bogathon and Sphagathon (Moorland Association and Heather Trust, 2015) have demonstrated that there is support for maintaining and restoring peatlands to a healthy condition. They have also demonstrated recognition among land managers that healthy peatlands can support driven grouse shooting and stock grazing;

> *"Landowners and grouse moor managers appreciate that raising the water table builds resilience into their land to provide protection from the impacts of climate change and the increasing risk of damage from wildfire – 'wetter is better."* (Moorland Association and Heather Trust, 2015).

Wildfire and peatlands

14. When examining the evidence on wildfire impacts, it is important to distinguish between studies based on dry heath/grasslands on shallow soils, or generic 'moorland', as opposed to peatland sites. Concerns over wildfire risk do not generally apply to wet blanket bog habitat where there is naturally minimal dry biomass load and high water tables to prevent burning of the peat mass.

15. However, a large proportion (c. 80%) of our peatlands are considered to be in a degraded condition. Degraded peatlands with abundant heather have been described by some managers as a fire risk when naturally high water tables are absent.

    The larger fuel load on a damaged peatland can mean that if a fire occurs, it is more damaging: greater fuel load ≈ greater heat intensity ≈ prolonged fire ≈ potential for greater damage to vegetation and ignition of the underlying peat soil.

    There are numerous scientific studies which demonstrate that wet peatlands are less prone to wildfire (e.g., Grau-Andres *et al*., 2018; Swindles *et al*., 2019; Turetsky *et al.*, 2015; Wilkinson *et al*.,2023), or that rewetting is a better strategy than burning to achieve peatlands that are resilient to wildfire (Baird *et al*., 2019). **Rewetting peatlands is therefore viewed as crucial in mitigating wildfire risk, alongside taking steps to aid the prevention and early detection of fires in the recovery stages.**

16. On UK peatlands, high fuel loads of heather and grasses and dry exposed peat are consequences of lower water tables from drainage, compounded by over-grazing and repeated burning. A healthy peatland, with high, stable water tables and *Sphagnum* growth, naturally suppresses excess heather and other dry understory ground vegetation.

    For many sites, rewetting (raising the water table) is a rapid process following restoration works and there will be no need for additional vegetation management. However, some severely degraded sites or sites with complex topography (e.g., sites with severe peat hags) may still have significant areas of drier peat and excess heather and other dry vegetation following rewetting activity. For these sites, there may be a need to consider measures to control fire risk during the transition period, such as cutting fire breaks in certain areas and restricting burning on adjacent areas.

17. There are a range of approaches to reducing fire risk in different habitats. For peatlands, the approach used must not lead to increased deterioration of peatland sites, as this will exacerbate fire risk. In many peatland restoration projects, managers will seek to rewet and diversify the vegetation composition to naturally reduce biomass. This may involve vegetation cutting in strategic locations; seeking to influence visitor behaviour; responding directly to visitor behaviour at high-risk times and participating in local fire response groups, including deployment of a voluntary force to detect fires.

    We recognise that there is a need to investigate the most effective mechanisms for wildfire risk mitigation to support the development of management plans for restoration projects during transition periods.

18. There is evidence that muirburn directly causes a proportion of wildfires that occur on moorland, although uncertainty remains regarding this proportion (Holland *et al*., 2022). Wildfires on peatland are rare outside of situations where people have been involved in the origin of the fire, whether as a result of an out-of-control managed burn, arson or carelessness (Glaves *et al.*, 2020).

Areas for further consideration and research

- An agreed methodology for defining different peatland states should be developed for use in academic studies, along with protocols for describing peatland vegetation which include vegetation type and structure.
- Agreement on how the impact of burning on carbon storage and carbon accumulation should be measured.
- Instigation of a number of long-term monitoring and survey plots for peatlands, with baseline and pre-experimental data, under different management conditions, to determine the impact of burning on the trajectory towards peatland restoration.
- A systematic review of the response of peatlands following restoration under different management treatments.
- Further research to support the development of accessible good practice guidance in managing wildfire risk for peatlands which are under restoration and are in transition to a wet and naturally fire-resilient state.

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Any comments or queries relating to this position statement should be directed to info@iucn.org.uk

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