IUCN National Committee United Kingdom

Peatland Programme

Position Statement: Burning on Peatlands

The IUCN UK Peatland Programme (IUCN UK PP) is a partnership of government, statutory agencies, environmental NGOs, 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.

IUCN UK PP Position statements are produced by the Programme and reviewed by the Programme Steering Group. They are intended to convey the broad consensus about any given topic amongst recognised peatland specialists in the field in question and take account of published evidence as well as government and statutory body publications. We review and update these Position Statements as new evidence becomes available.

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). More recent IUCN UK PP publications, Briefing Note No. 8: Burning (Lindsay et al., 2014) Wildfire Resilience: Why rewetting must play a key role (IUCN UK PP, 2025) and summarised the scientific evidence from an ecological perspective. This followed Natural England's Review of Upland Evidence NEER004 (Glaves et al., 2013) and Natural England Evidence Review NEER014 (Glaves et al., 2020) on managed burning and Peatbogs and Carbon (Lindsay, 2010). This updated Position Statement (version 5) takes account of An evidence review update on the effects of managed burning on upland peatland biodiversity, carbon and water - NEER155 (Noble et al., 2025)

This Position Statement contains a full list of all the cited references. We recommend that readers looking to gain a broader understanding of the subject read these citations.

Key points:

- **The overwhelming scientific evidence base finds that burning on peatlands causes damage to key peatland species, peatland ecosystem health, sustainability of peatland soils, and negative impacts on air and water quality.**
- **The majority of evidence finds no benefit to peatland ecosystem health in the UK from burning.**
- **Successful restoration of peatlands on hundreds of sites across the UK, without the use of fire, demonstrates that burning is not a necessary tool for peatland restoration. Burning is harmful to the prospects of the restoration of peat: repeated burning on**

already degraded areas further limits the growth of key peat forming species and hampers the recovery of the physical and hydrological properties of peat soils.

- **Many plants are found within the peat matrix, but not all are able to create the conditions to form significant amounts of peat.**
- **In the context of a changing climate, the most effective long-term, sustainable solution for addressing increasing 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. Despite a growing interest in using fire to reduce vegetation, there is currently no experimental field evidence from UK peatlands to suggest that burning is a valid wildfire management tool. Rewetting and restoring peatland will naturally, over time, remove the higher so-called 'fuel load' which arises from degraded peatland vegetation.**
- **Additional measures to control ignition risk and more effectively manage wildfire when it does occur will also be needed in tandem with any restoration action.**

i. Impact of burning on peatland habitat, function and ecosystem services

Burning on some peatlands is restricted under 'The Heather and Grass etc. Burning (England) Regulations 2021' in England and the 'Wildlife Management and Muirburn (Scotland) Act 2024'. However, debate around efficacy and usage as a wildfire management and restoration tool continues, therefore it is appropriate to regularly revisit and reappraise the evidence base.

1. There is consensus amongst peatland scientists, restoration practitioners and policy makers that burning is, or has the potential to be, damaging to peatlands. The UK Government's 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 heathland species (e.g. *Calluna vulgaris*, and the moss *Hypnum jutlandicum*) which do not contribute significantly to peat formation (Gimingham, 1972).

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 (Noble et al., 2018), 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* and *Calluna*) (Gimingham, 1972; Bruneau and Johnson, 2014; Critchley et al., 2016). This is associated with changes to the ecosystem (e.g., increased erosion rates, loss of surface structure and reduced availability of soil moisture) that can result in significant adverse impacts on peatland biodiversity, carbon emissions, drinking water quality and flood management (Yallop and Clutterbuck, 2009; Brown et al., 2014; Wilkinson et al., 2023).

4. There are also a number of negative impacts on the ecosystem service provisioning abilities of peatlands as a result of burning activities (Harper et al., 2018). Studies which have considered air quality outcomes found that burning increases atmospheric pollutants and can lead to a reduction in air quality in nearby towns (Kosyakov et al., 2020 and Graham et al., 2020). Peatlands are also the source catchments for most major UK rivers (Holden et al., 2007) with 43% of the UK population relying wholly on peatlands for their potable water supply (Xu et al., 2018). Research has shown that burning leads to alterations in water chemistry, particulate and dissolved organic content, and increases in disturbance tolerant aquatic invertebrates, all of which have implications for water quality (Brown et al., 2014).

ii. Degraded peatlands and peatland restoration

5. 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 (e.g. *Calluna*) and graminoid (grasses and sedges) abundance;
   - reductions in both *Sphagnum* bog moss abundance and diversity of typical bog species;
   - simplification of vegetation structure with reduced occurrence of bog moss hummocks and pools;
   - greater development of tussock and micro-erosion microtopography;
   - denser, more degraded surface peat;
   - a lower water table.

6. Most 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 to recover vegetation composition and structure; 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 blanket bog peatlands has been widely achieved across the UK without the need for burning; for example, in Scotland there are over two hundred Peatland ACTION restoration sites in Scotland. These are delivering good practice restoration and have not required burning as part of this process.

ii.i Interpreting the literature

There may be confusion around the impact of management activities on peatlands and this may be due to claims made around the different experimental approaches of various studies. Here we outline and discuss some of these common sources of misunderstanding.

7. Difficulties in interpreting research findings 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 or use comparisons to control areas which have been previously impacted by management. Use of generic terms such as ‘moorland’ (which can describe a mosaic of upland habitats including blanket bog, alkaline flush and fen, dry and wet heath and acid grassland) also make interpretation of the results and the comparison of studies findings difficult.

8. Burning has been advocated by some land managers as a tool in peatland restoration to remove old growth heather (*Calluna vulgaris*) (Uplands Management Group, 2017). However, it carries a risk of causing more serious damage, particularly on drained or eroding peat systems, such as burning into the deep peat layer which may result in further degradation. Burning into the peat has been shown to compromise the onset of peatland recovery

(Wilkinson et al., 2023). The substantial plant biomass load and the frequently dry nature of the underlying peat beneath heather dominated peatlands, may make the habitat susceptible to uncontrolled severe fires that can damage peat-forming *Sphagnum* species, peatland seedbanks and underlying peat soil (Davies et al., 2016), and lower the water table for a period of several years post-fire (Holden et al., 2015). In view of the large number of successful peatland restoration schemes that do not use any form of burning, more evidence is required before burning can be justified as a suitable peatland restoration tool.

9. Fire intensity and so-called 'hot' and 'cool burns' are subjective terms with little certainty as to whether the outcome and temperature of the fire can be controlled; there are no robust studies on their relative impacts (Worrall et al., 2010; Glaves et al., 2013). Where burning has been highlighted as a successful vegetation management tool in the literature, this has been based on studies of arid ecosystems such as Chaparral, where vegetation and climatic conditions are not comparable to those of UK peatlands. Studies on the use of fire in peatland systems find that it limits paludification and encourages drier conditions, making it advantageous for tree establishment (Lavoie et al., 2005; Renard et al., 2016), while other studies suggest that findings do not support the use of fire to re-establish, or promote the growth of existing *Sphagnum* (Noble et al., 2019).

10. A recent study (Heinemeyer, 2023) comparing burning and mowing methods for the restoration of degraded, heather-dominated, blanket bog vegetation suggests 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. However, an earlier study suggested that mowing is a preferable method to increase carbon storage compared to burning, but that both methods increase carbon emissions compared to unmanaged sites (Morton, 2016). 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 term 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.

11. Recent studies that have argued 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 around specifics, the weight of evidence points to burning on peatlands being detrimental to peatland health. When considering the implications of research findings, it is important to recognise some of the limitations that have been raised in the wider debate. Common factors presented in academic literature that can hinder interpretation are:

    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. This may be particularly important when it comes to the consideration and subsequent characterisation of control sites, as there are published studies where control sites have been subject to previous modification.

    b) 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 (Atherton et al., 2010). Studies have shown that *Sphagnum* species composition has changed overtime and some species have been lost coincident with increased burning activies (Blundell and Holden, 2015; McCarroll et al., 2016; Chambers et al., 2017). *Sphagnum fallax* is a poor fen species and considered to be a negative indicator of habitat condition where dominant on bog peatlands (JNCC, 2009). Therefore, identification of *Sphagna* at the species level should be an imperative. When comparing

the burned to unburned state, data may demonstrate vegetation differences, but without identification to species level, generic '*Sphagnum* spp.' do not provide a complete picture. In burned plots, the type of *Sphagnum* species is a determiner of whether these are typical of wet bogs, as well as the likelihood of reversion of the degraded peatlands back towards abundant heather. In unburned plots identification at the species level provides an understanding of whether the vegetation present is characteristic of a 'natural' bog. Similarly, increases in species abundance should fully account for increases in the presence of invasive species such as *Campylopus introflexus* which may negatively affect other species regeneration (Equihua and Usher, 1993).

c) A misrepresentation or misunderstanding of the difference between plants which are able to actively *form peat* and not just be passively included as peat forms. *Sphagnum* is able to engineer its surroundings to outcompete other plants and its decomposition rates are much slower than those of most plants (Clymo, 1983; Dickinson, 1983; Moore, 1989; van Breemen, 1995). The low nitrogen content of *Sphagnum* is one of the key factors in its ability resist decomposition and to form peat. Increases in coverage of *Sphagna* is sometimes cited as evidence of a benefit from burning, this incorrectly assumes that all species can or do contribute equally to peat formation. Of the common species, *Sphagnum papillosum* which is known to be one of the key peat-forming species, has a very low nitrogen content which slows the decay rate (Clymo and Hayward, 1982).

d) Study methodologies which fail to provide adequate assessment of baseline conditions prior to experimental treatment, and/or a summary of potential confounding effects which may impact on results post-treatment. Studies which have failed to provide these should not be broadly extrapolated or used as the basis for policy decisions as 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 the sites and ultimately, the study findings.

e) Failure to consider the impact of land management regimes in relation to trajectories for habitat recovery. Comparing burned and unburned areas of damaged peatland is of minimal value where the overarching aim of society- as evidenced through policy and public funding- is to restore functioning peatland habitat. Burning of a heavily degraded, heather-dominated peatland may simply produce a constrained, degraded peatland state, retaining fire adapted vegetation that is 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.

f) 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 certain blanket bog *Sphagnum* species from damage through burning (Noble *et al*., 2019).

g) 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). 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 (see annex for detail), studies can also give the misleading 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, from recognised experts in the field and checked for robustness, as well as being allowed to operate over sufficient timescales before conclusions are drawn. Outliers should be accounted for but should not drive the decision-making process; rather, policy should be informed by consensus from the *majority* of research findings.

iii. Wildfire and peatlands

The IUCN UK Peatland Programme acknowledges that research has found that as a result of human mediated climate change there will be a significant increase in the occurrence of wildfire across the UK (Burton et al., 2025). However, this issue is increasingly entangled with land management debates around the use of fire to control vegetation growth. Furthermore, the equation of overseas arid systems (such as chaparral) with UK temperate peatlands in public discourse has added to the confusion around habitat differences and appropriate management.

13. 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 (as defined by NVC typology), including their peat depth and characterisation as damaged/dry/healthy/wet. 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.

14. However, a large proportion (c. 80%) of UK peatlands are considered to be in a degraded condition. Degraded peatlands with abundant heather have been described by some land managers as a fire risk when naturally high water tables are absent. The larger proportion of combustible vegetation 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 highlight that wet peatlands are more resistant and resilient to wildfire (e.g., Grau-Andres et al., 2018; Swindles et al., 2019; Turetsky et al., 2015; Rein and Huang, 2021; Qin et al., 2022). Evidence demonstrates the importance of restoration and rewetting (raising the water table) in creating firebreaks (Lin et al., 2021) and supporting peatlands that are resilient to wildfire (Baird et al., 2019; Andersen et al., 2024). This growing body of evidence demonstrates that rewetting peatlands is a crucial part of mitigating wildfire risk, alongside taking steps to aid the prevention and early detection of fires in the early recovery stages post-peatland restoration.

15. On UK peatlands, the dominance of combustible heather and grasses and dry exposed peat are consequences of lower water tables from drainage, compounded by over-grazing and repeated burning (McCullagh et al, 2025). A healthy peatland, with high, stable water tables and *Sphagnum* growth, naturally suppresses excess heather and other drier vegetation types.

For many sites, rewetting 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 or on sloping ground) may still have significant areas of drier peat, excess heather and other dry vegetation following rewetting activity. For these sites, there may be a need to consider extra measures to control fire risk during the transition period, such as cutting fire breaks or aiding *Sphagnum* colonisation with planting in certain areas or managing ignition risks.

16. 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 the long-term and leads to an increased societal burden from degraded peatlands. 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.

17. There is evidence that managed burning acts as a direct source of ignition for some wildfires that occur on peatland, although uncertainty remains regarding this proportion (Holland et al., 2022). A report by Natural England (2020) suggested approximately 68% of wildfires in the English uplands were linked to land management burns (Noble et al., 2025). 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 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.
- A systematic review of the response of peatlands following restoration under different management treatments e.g. cutting and grazing.
- 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.
- Research into air quality that considers the effect of both prescribed burning and wildfire on peatlands from comparable peatland habitats.
- There have been recent changes to legislation and guidance in both Scotland and England, such as the introduction of the Wildlife Management and Muirburn (Scotland) Bill and the Heather and Grass etc. Burning (England) Regulations. Periodic assessment of the efficacy of the current mix of both statutory measures and voluntary guidance relating to burning activity on UK peatlands should be carried out by government and the statutory bodies to inform future policy direction and ensure peatland conservation and restoration delivery targets are supported.

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

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