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. A more recent IUCN UK PP publication, Briefing Note No. 8: Burning, summarised the scientific evidence from an ecological perspective, following Natural England's Upland Evidence Review: Managed Burning and Peatbogs and Carbon (Lindsay, 2010).

KEY POINTS:

1. **There is consensus, based on the current body of scientific evidence, that burning on peatland can result in damage to peatland species, microtopography and wider peatland habitat, peat soils and peatland ecosystem functions.**

2. **Healthy peatlands do not require burning for their maintenance.**

3. **Restoration management of peatlands is widely achieved without burning. Restoration is also achieved in situations where previous burning management has been stopped.**

4. **Inconsistent approaches in scientific methodology for assessing impacts of burning management on peatlands has led to difficulties in interpreting and comparing results from studies and has led to widespread misunderstandings in the wider stakeholder community.**

5. **Where there is uncertainty around the benefits of burning for peatland restoration, the precautionary principle should be applied and burning avoided.**

6. **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. Re-wetting and restoring will naturally remove the higher fuel load from degraded peatland vegetation.**

7. **There is a need for further research to support the development of practical guidance in managing wildfire risk for peatlands which are in transition to a wet and naturally fire resilient state.**

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. 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 peatland leads to drier vegetation communities (wet heath and dry heath communities) or a shift towards their dominance (e.g. of *Molinia*) (Bruneau & 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 impact on peatland biodiversity, carbon emissions, drinking water quality and flood management (Brown *et al.*, 2014).

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 (JNCC, 2011; Artz *et al*., 2019). 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 peatland is the misunderstanding as to what constitutes degraded and favourable condition, and failure to assess management trajectories. This is also reflected in some academic studies, which have inconsistent approaches to describing peatland vegetation, the state of peatland or the management objectives for the peatland. Indeed, many published journal papers do not adequately describe, or take account of, the type or current condition of the peatland under investigation.

6. The majority of peatland restoration projects across the UK are able to achieve relatively rapid development vegetation communities typical of blanket bog (within c.5-10 years) through hydrological restoration. Re-wetting a peatland tends to be sufficient that any undesirable vegetation, such as dominant heather cover, dies back naturally to be replaced by *Sphagnum*-dominated conditions associated with healthy peatbog habitat (Cris, 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.

7. Burning has been advocated by some land managers as a tool in peatland restoration to remove rank, leggy heather (*Calluna vulgaris*) (Uplands Management Group, 2017)). Burning carries a risk of causing more serious damage, further degradation and compromising 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 or "hot burns" that can damage peat forming Sphagnum species, peatland seedbanks, underlying peat soil and lower the water table for a period of several years. The role of "cool burns" as a means of reducing risks has not been assessed in the peer reviewed scientific literature and in view of the large number of successful peatland restoration schemes that do not use any form of burning, the need for a "cool burn" on peatlands is untested. So called "hot" and "cool burns" are an untested management tool with no certainty as to whether differences can be controlled and no robust studies on the relative impacts. **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.**

8. Whilst some recent studies have been used to argue that burning can be beneficial for peatland function, conservation and restoration there have been counter responses and research published and academic debate remains active. 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. 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, as species in the Sphagnum genus occur across a much wider range of wetness, nutrient and pH gradients in a typical healthy ombrotrophic bog.

    b) Inadequate methodologies to make a full assessment of baseline conditions prior to experimental treatment or summary of any potential confounding effects which may impact on results post-treatment. Existing environmental and management factors such as drainage, subsidence, grazing pressure, historic burning regime, surrounding land use pressures such as forestry plantations and atmospheric pollution can all impact on study sites. To fully consider the effects of fire on peatland carbon balance a full net balance needs to be conducted to allow for comparison between burned and unburned sites.

    c) Failure to consider the impact of land management regimes in relation to trajectory for a habitat. Simply comparing burned areas with unburned areas is unhelpful if the aims of the site 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.

    d) Comparing the burned to unburned state can produce data that shows 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 peatland back towards abundant heather.

    e) A distinction also needs to be made 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 - does not fully address, in our view, the additions and losses of carbon throughout the *whole* peat profile. It 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 & Young et al., 2021 for further details).

9. In addition to the failings to accurately describe peatland vegetation and condition 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:
   - the negative long-term carbon trends associated with atypical plant species abundance
   - 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). Past changes to deep carbon stores can also give rise to misleading conclusions about the previous rates of carbon accumulation.
   - loss of microtopography and overall reduction in environmental resilience.

HEALTHY PEATLANDS SUPPORT UPLAND MANAGEMENT GOALS

10. Bogathon and Sphagathon (Moorland Association & Heather Trust, 2015) have demonstrated that there is support for maintaining and restoring peatlands to a healthy condition. It has 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'."* **(BASC & Moorlands Association, 2016)**

WILDFIRE AND PEATLANDS

11. When examining the evidence on wildfire impacts, it is important to distinguish between studies based on dry heath/grasslands on shallow soils, as opposed to deep peat 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 prevent burning of the peat mass.

12. 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 that 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. Turetsky et al., 2015, Swindles et al., 2019; Grau-Andres et al., 2017;) or that rewetting is a better strategy than burning to achieve peatlands that are resilient to wildfire (Baird et al., 2019) . **Re-wetting peatlands is therefore viewed as crucial in mitigating wildfire risk.**

13. 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 re-wetting (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 re-wetting activity. For these sites there may be the 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.

14. There are a range of approaches to reducing fire risk in habitats. For peatlands, the approach used must not lead to increased deterioration of the peatland sites as this will exacerbate fire risk. In many peatland restoration projects, managers will seek to re-wet 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. 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.

15. 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.

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.
- Agree how the impact of burning on C storage and C accumulation should be measured.
- Instigate a number of long term monitoring and survey plots for peatlands 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.

IUCN UK Peatland Programme
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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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