

IUCN UK Committee Peatland Programme  
Briefing Note N°8



# Burning

Role of fire in bog ecosystems

Natural fires

Natural time interval of 200 - 300 years

Loss of Sphagnum increases recovery time

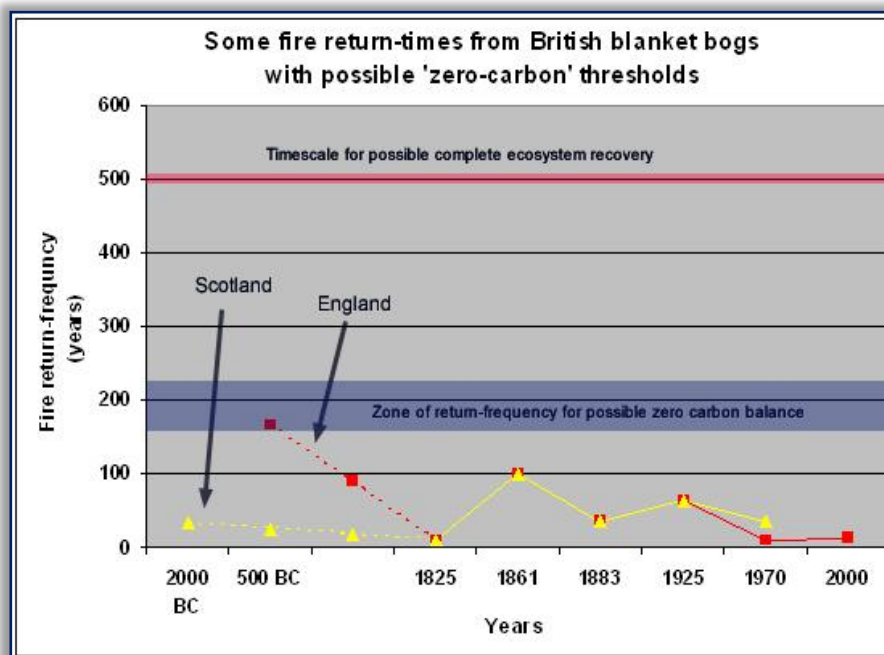
Fire return times from British blanket bogs


Most below threshold for a zero carbon balance

Controlled burning typically every 15-30 years

**Fires occur naturally on bogs, just not very often.** They are started by lightning strikes after hot weather when the vegetation is dry. Peat accumulates because it is waterlogged, but peat will burn when dry because it consists almost solely of dead plant material (see **Definitions Briefing Note 1**). **Natural fires** on wet peat bog therefore tend to **burn only the surface vegetation** and drier features such as hummocks but leave much of the wet surface relatively intact. The burning vegetation may, however, cause the peat beneath to catch fire if the peat is unusually dry as a result of previous disturbance.

The peat archive shows that the **time interval** between lightning-induced **natural fires** on any specific area of peat bog is in the **order of two to three centuries** (diagram below). This generally provides sufficient time for the bog surface and vegetation to recover. If the surface has been burnt to the point where all living *Sphagnum* has been lost, for example, **it may take more than 50 years for *Sphagnum* plants to return when burning has produced a bare peat surface**. Full recovery of the ecosystem and its characteristic features is thus a slow process, perhaps somewhat longer than a single human lifetime. **Human-induced fires on peat bogs, whether as wildfires or as part of a managed burning regime, generally occur 10x more frequently than natural fire events, with intervals between fires more typically 15-30 years. These high frequencies can lead over time to a reduction in the Sphagnum cover through damage and through increased competition from other species.**



<p><b>Short term carbon gains</b></p> <p><i>Failure to take account of long term carbon trends</i></p>	<p>Bogs can be shown to exhibit an <b>altered vegetation composition, structure and growth-form due to fire 80 years or more after a fire event</b>. While short term studies that focus on the immediate recovery of the vegetation often see a <b>short term carbon gain</b> due to rapid heather/ graminoid growth, such studies <b>fail to account for the negative long-term carbon trends associated with a damaged acrotelm, consequent impacts on the catotelm, loss of microtopography and overall reduction in environmental resilience</b>. This can lead to the mistaken view that burning is beneficial for both the ecology and the carbon store of a bog.</p>
<p><u>Impacts of management burning</u></p> <p><b>25-30 years Heather</b></p> <p><b>10-15 years Hare's –tail cotton grass</b></p> <p><i>Impacts of other vegetation types on peat formation</i></p> <p><b>Loss of carbon</b></p>	<p>In terms of impacts, the short 'return times' associated with human-induced fires offer <b>little prospect of full ecosystem recovery and tend to encourage 'fire-tolerant' species at the expense of other peatland species</b>. A fire interval of around <b>25-30 years</b> will tend to encourage dominance of <b>heather (<i>Calluna vulgaris</i>)</b> with a moss carpet of species which are poor formers of peat. A shorter rotation of <b>10-15 years</b> will tend to encourage dominance of the highly fire-resistant tussock growth forms of species such as <b>hare's-tail cotton grass (<i>Eriophorum vaginatum</i>)</b>, or, in the west of Britain, <b>purple moor grass (<i>Molinia caerulea</i>)</b> and, in the far north of Britain, tussocks of <b>deer grass (<i>Trichophorum cespitosum</i>)</b> with a largely bare peat surface beneath.</p>  <p>Although <b>hare's-tail cotton grass</b> is an important peat-forming species, the tussock growth form appears to be particularly associated with initial stages of peat formation and thus often becomes dominant after a peat bog has suffered a set-back (such as a fire) and is in the early stages of re-establishing peat formation. Tussocks of <b>purple moor grass</b> tend to form where the peat surface has lost its moss-rich carpet and water can thus flow readily over and through the damaged peat surface. <b>Deer grass</b> appears to take the place of hare's-tail cotton grass in the far north and west of the UK. Where there is only bare peat or a vegetation cover dominated by species which are not normally peat-forming (including heather), <b>peat formation is not possible and the bog becomes 'non active'</b>. In practice this means that, through drying out and surface erosion, the <b>bog is almost certainly now losing carbon from the long-term carbon store</b> (see <b><i>Drainage Briefing Note 3 &amp; Erosion Briefing Note 9</i></b>). Loss of 'active' condition also means that the bog has lost much of its capacity to respond to external pressures such as climate change (see <b><i>Climate Change Briefing Note 10</i></b>).</p>
<p><b>Burning as a restoration method carries a high intrinsic risk</b></p> <p><i>Time and water-level management offer a more effective,</i></p>	<p>Evidence has shown that <b>burning to remove dominance of vascular plants on degraded peat bogs as part of a restoration programme poses serious risk of damage to species associated with re-establishment of a functioning acrotelm</b>. Even with a 'one-off' attempt at a cool burn, there are difficulties in controlling the fire to avoid burning the sensitive moss species. Ultimately, in areas of damaged peat currently dominated by vascular plants such as heather (<i>Calluna vulgaris</i>), <b>a functioning acrotelm should re-develop naturally over time without direct intervention provided other negative influences are minimised or removed</b>. On current evidence it may take 80-100 years for a fully-functioning and biodiverse acrotelm to re-establish if left entirely to such natural processes, although key elements and pre-cursors of a functioning acrotelm will generally become established within much shorter timescales in the absence of burning and provided other evident forms of damage can be addressed. <b>In order to increase the speed of acrotelm development, re-wetting is generally the most</b></p>

<b><i>Low-risk approach</i></b>	<b>effective means of hastening the process</b> , but may on occasion be further assisted by cutting or mowing of the vascular-plant layer.
<b><i>Areas at risk</i></b>	<b>All areas of bog peat are vulnerable to the impacts of fire.</b> Shetland is unusual in the UK because evidence for burning in the peat record is comparatively rare, apart from certain areas of central Mainland which, in recent centuries, are known to have been subject to burning management for grazing. Across the remainder of the UK, the evidence stored in the <b>peat archive reveals that during the last few centuries burning has been ubiquitous, and often frequent, even in the remotest parts of the UK.</b> This burning has been generally <b>associated with grazing management for sheep or sporting management for grouse.</b>
<b><i>Other benefits from addressing the issue</i></b>	Preventing fire damage will <b>assist in the re-establishment and maintenance of active bog habitat</b> , with resulting ecosystem resilience, maintenance of carbon stores, and other ecosystem-service benefits.
<b><i>Gaps in Knowledge</i></b>	<p>Identified gaps are:</p> <ul style="list-style-type: none"> <li>• The effect of different fire behaviours, fire intervals, and fire intensity, on the full range of ecosystem characteristics, including particularly active bog condition.</li> <li>• Recovery times for full ecosystem recovery in differing parts of the UK.</li> <li>• The long-term carbon balance of burning and recovery.</li> </ul> <p>Comprehensive reviews of the evidence for impacts resulting from managed burning of upland peatland on biodiversity, carbon and water have been published recently by Natural England and University of Leeds. See: <a href="http://publications.naturalengland.org.uk/publication/5978072">http://publications.naturalengland.org.uk/publication/5978072</a> and <a href="http://www.wateratleeds.org/fileadmin/documents/water_at_leeds/EMBER_full_report.pdf">http://www.wateratleeds.org/fileadmin/documents/water_at_leeds/EMBER_full_report.pdf</a></p> <p>The NE report provides a systematic review of published evidence, while the University of Leeds report provides recent research evidence. Both reports identify gaps in existing knowledge.</p>
<b><i>Practical Actions</i></b>	<p>Practical actions:</p> <ul style="list-style-type: none"> <li>• The cessation of managed burning on peat bog systems.</li> <li>• Establishment of wildfire-control systems.</li> <li>• Restoration, through re-wetting and re-vegetation, of 'non-active' areas, particularly those most at risk from fire.</li> </ul>
<b><i>More Information</i></b>	<p>Underpinning scientific report:  <a href="http://www.rspb.org.uk/Images/Peatbogs_and_carbon_tcm9-255200.pdf">http://www.rspb.org.uk/Images/Peatbogs_and_carbon_tcm9-255200.pdf</a> (low resolution)  <a href="http://www.uel.ac.uk/erg/PeatandCarbonReport.htm">http://www.uel.ac.uk/erg/PeatandCarbonReport.htm</a> (high resolution : downloadable in sections)</p> <p>IUCN UK Peatland Programme:  <a href="http://www.iucn-uk-peatlandprogramme.org/">http://www.iucn-uk-peatlandprogramme.org/</a></p> <p>Natural England Uplands Evidence Review:  <a href="http://www.naturalengland.org.uk/ourwork/uplands/uplandsevidencereviewfeature.aspx">http://www.naturalengland.org.uk/ourwork/uplands/uplandsevidencereviewfeature.aspx</a></p> <p>Scottish Natural Heritage Report on peat definitions:  <a href="http://www.snh.org.uk/pdfs/publications/commissioned_reports/701.pdf">http://www.snh.org.uk/pdfs/publications/commissioned_reports/701.pdf</a></p>

	<p><b>Peatland Action:</b> <a href="http://www.snh.gov.uk/climate-change/what-snh-is-doing/peatland-action/">http://www.snh.gov.uk/climate-change/what-snh-is-doing/peatland-action/</a></p> <p><i>This briefing note is part of a series aimed at policy makers, practitioners and academics to help explain the ecological processes that underpin peatland function. Understanding the ecology of peatlands is essential when investigating the impacts of human activity on peatlands, interpreting research findings and planning the recovery of damaged peatlands.</i></p> <p><i>These briefs have been produced following a major process of review and comment building on an original document: Lindsay, R. 2010 'Peatbogs and Carbon: a Critical Synthesis' University of East London. published by RSPB, Sandy. <a href="http://www.rspb.org.uk/Images/Peatbogs_and_carbon_tcm9-255200.pdf">http://www.rspb.org.uk/Images/Peatbogs_and_carbon_tcm9-255200.pdf</a>, this report also being available at high resolution and in sections from: <a href="http://www.uel.ac.uk/erg/PeatandCarbonReport.htm">http://www.uel.ac.uk/erg/PeatandCarbonReport.htm</a></i></p> <p><i>The full set of briefs can be downloaded from: <a href="http://www.iucn-uk-peatlandprogramme.org.uk">www.iucn-uk-peatlandprogramme.org.uk</a></i></p> <p><i>The International Union for the Conservation of Nature (IUCN) is a global organisation, providing an influential and authoritative voice for nature conservation. The IUCN UK Peatland Programme promotes peatland restoration in the UK and advocates the multiple benefits of peatlands through partnerships, strong science, sound policy and effective practice.</i></p> <p><i>We are grateful to Scottish Natural Heritage, Natural England, Natural Resources Wales, the Forestry Commission RSPB Scotland and the Peter de Haan Charitable Trust for funding support.</i></p>
<p><b>Authors Date</b></p>	<p><b>Richard Lindsay, Richard Birnie, Jack Clough</b> <b>Version Date: 5th November 2014</b></p> 