Scottish Wildlife Trust Policy

Muirburn

Policy summary

- The Scottish Wildlife Trust believes that there should be less routine burning of upland heath
- There should be a strong presumption against burning any blanket peatlands or raised mires
- There is insufficient independent evidence of the impacts of muirburn, including impacts on biodiversity, soils and hydrology and there is urgent need for impartial, evidence-based research into the extent, trends and impacts of muirburn in Scotland
- There should be a precautionary approach to muirburn
- Guidance should be developed to help sporting estates move away from rotational burning and good practice guidance should be developed for the restoration of habitat diversity and blanket peatlands on deep peat grouse moors
- We welcome the cross compliance requirement of the Muirburn Code and believe that it should be maintained
- The Muirburn Code should be amended to protect vulnerable species of conservation importance, such as the otter, which may occur outside designated sites.
- Climate change means that the muirburn season should be kept under review
- Landowners and licensing authorities should move towards an initially voluntary moratorium on burning on sites where ground nesting birds or other wildlife may be at risk from muirburn.

Introduction

1. Fire has been a natural part of upland and other ecosystems for millennia and has resulted in the development of fire-influenced plant and associated invertebrate communities. The distribution of present day heathland, mires and other open upland habitats has been shaped by burning which has been used as a land management tool since at least the Mesolithic.[1,2]

2. Managed burning in the uplands now takes place for three main reasons: for grouse moor management to provide artificially high numbers of red grouse (*Lagopus lagopus scoticus*); for livestock; and to reduce the risk of unmanaged wildfires by removing fuel. Some controlled burning is also undertaken for conservation purposes.[3]

[1] Tucker, G. 2003. *Review of the impacts of heather and grassland burning in the uplands on soils, hydrology and biodiversity.* English Nature Research Report No 550. Peterborough: English Nature.
[2] Webb, N.R. 1998. The traditional management of European heathlands. *Journal of Applied Ecology*. 35: 987-990
[3] Glaves, D.J. and Haycock, N.E. (Eds). 2005. *Defra review of the heather and grass burning regulations and code: science panel assessment of the effects of burning on biodiversity, soils and hydrology*. Report to Defra Conservation, Uplands and Rural Europe Division, Uplands Management Branch.

3. Burning for grouse habitat management typically takes place on a rotational basis, the aim being to provide a range of vegetation ages to provide food and shelter for grouse. Muirburn is carried out in winter and early spring, before the grouse nest; in a well-managed burn spread is carefully controlled which in turn controls the temperature of the fire. Small areas, normally of older heather (± 15 years), are burnt in strips or patches. After 2–3 years, a dense sward of nutritious, young heather plants will have regenerated from seed or old stools that survived the fire. If the temperature of the burning is too high, or the grazing pressures are high, the critical balance of growth and competition allows fire- and grazing-resistant grass species to become dominant, and the heathland is replaced.

4. Burning on grouse moors is usually planned and controlled and carried out by burning strips of about 30 m width and typically about 0.5 ha in total area. The normal aim on heather moorland is to burn when most of the heather (*Calluna*) reaches a height of 20-30 cm. This should typically result in a fire return period of 10-15 years in which case around 7 - 10% of the land would be burnt on average each year.[4]

5. Burning for livestock is a long-established land management practice and is currently undertaken with two principal aims. First to remove built up grass litter and encourage new growth of *Molinia* and, secondly, to maintain productivity of *Calluna*, an important source of winter forage. Burning for livestock is more prevalent in the west, where conditions are typically too wet for grouse moors. This type of burning can take place on a very large scale and possibly under less controlled circumstances than burning of grouse moors. The extent of muirburn for livestock is closely related to the economics of hill farming and it is therefore important that grazing levels are kept at a sustainable level with the encouragement of appropriate land management practices that minimise the use of muirburn.

6. Conservation uses of muirburn on heaths include heather beetle (*Lochmaea suturalis)* control and providing habitat for raptors such as the hen harr*ier (Circus cyaneus) and* merlin (*Falco columbarius*).[5] Invertebrate diversity*,* measured by species richness, is typically high on managed upland heaths.[6] .

7. Upland habitats are heterogeneous and a comprehensive description of all the habitat types which may be subject to managed burns would be extremely complex. Table 1 below summarises the principal upland habitat types which may be at risk from inappropriate or poorly managed muirburn. Some National Vegetation Classification (NVC) mire communities are more sensitive than others to burning and should be avoided e.g. M18-M20 communities. However a distinction may be made for M15 - where there are four sub-communities: some are more sensitive than others to muirburn.

8. The Scottish Wildlife Trust believes that habitat quality and integrity (including associated typical species assemblages) can be impoverished in burnt areas despite observed increases in total species number.[7] A simplistic count-based view of diversity on heathlands can be a misleading measure of the health and function of the habitat. Indeed, increased species richness may be correlated with decreased 'naturalness'. Elevated arthropod species counts on burnt areas may simply reflect the successional dispersal strategies of some species and therefore reflect habitat perturbation and damage rather than overall biological diversity.

[4] Tucker, *op cit*.
[5] Thompson, D.B.A., MacDonald, A.J., Marsden, J.H. and Galbraith, C.A. 1995. Upland heather moorland in Great Britain: a review of international importance, vegetation change and some objectives for nature conservation. *Biological Conservation.* 71: 163-178
[6] Usher, M.B. and Thompson, D.B.A. 1993. Variation in the upland heathlands of Great Britain: conservation importance. *Biological Conservation*. 66:69-81
[7] Usher, M.B. and Thompson, D.B.A. 1993. Variation in the upland heathlands of Great Britain: conservation importance. *Biological Conservation*. 66:69-81

Table 1: Habitat types associated with muirburn[8]

UK BAP Broad Habitat (bold) / Habitats Directive Annex 1 type	Annex 1 code	EU Priority Habitat	NVC Code	UK BAP Priority Habitat
Dwarf shrub heath				
Northern Atlantic wet heaths with *Erica tetralix*	4010		M15, M16, H4, H16, H21	Upland heathland
European dry heaths	4030		H4, H9-10, H12, H16, H18, H21	Upland heathland
Fen, marsh and swamp				
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinia caeruleae*)	6410		M26	
Transition mires and quaking bogs	7140		M5, M8, M9 & others	
Alkaline fens	7230		M9, M10, M13	
Alpine pioneer formations of *Caricion bicoloris-atrofuscae*	7240	Yes	M10, M11	
Bogs				
Active raised bogs	7110	Yes	Includes M1, M2, M18, M19 & others	
Degraded raised bogs still capable of natural regeneration	7120		Includes M3, M15, M16, M20, M25 & others	
Blanket bog (active only)	7130	Yes	M1, M15, M20, M25 & others	Blanket bog
Montane habitats				
Alpine and boreal heaths	4060		Alpine heaths: H13, H19 Boreal heaths subalpine forms of H10, H12, H16, H18, H21	

9. Peatlands in particular tend to support low numbers of specialist species[9] which do not occur elsewhere and peatland restoration should be an objective of balanced upland habitat management. Burning for conservation purposes should only be carried out where there is strong scientific evidence that such action would be beneficial to conservation objectives which incorporate function and integrity, as well as overall (*i.e.* regional/national/global) species richness.

10. Muirburn in Scotland is regulated by the Hill Farming Act 1946 as amended by the Wildlife and Natural Environment (Scotland) Act 2011 (WANE Act) and the Climate Change (Scotland) Act 2009. The legislation covers the burning of all vegetation on moorland, including plants such as gorse (*Ulex spp*.). It does not refer to just the burning of *Calluna*.[10]

11. Muirburn is just one of a number of pressures on upland biodiversity, alongside grazing pressure, nutrient enrichment from high stock levels, *Calluna* monoculture for red grouse (which muirburn is used to support), climate change, pollution (e.g. acid deposition) and drainage. Inappropriate burning is now cited as the second most important *reason* for the poor condition of conservation sites in the uplands [11]

[8] Adapted from Tucker, *op cit*
[9] Upland heather moorlands, for example, are low in botanical diversity; a survey of 10 grouse moors yielded 40 species of vascular plants and 31 species of mosses, representing 2.2 and 4.5% of the British flora, respectively. Usher, M. B. 1992. Management and diversity in *Calluna* heathland. *Biodiversity and Conservation*. 1: 63-79.
[10] Scottish Government 2011. *The Muirburn Code*
[11] Yallop, A.R., Thacker, J.I., Thomas, G. Stephens, M., Clutterbuck, B., Brewer, T. and Sannier, C.A.D. 2006. The extent and intensity of management burning in the English uplands. *Journal of Applied Ecology*. 43: 1138-1148.

(with grazing being the principal driver of poor condition) and it is the view of the Scottish Wildlife Trust that alternative management methods to burning should be further developed and promoted and that activities which depend on routine burning should be reduced.

12. Alternatives to rotational burning include conservation grazing (the Scottish Wildlife Trust has an established conservation grazing scheme), cutting and swiping. Each implies a change in traditional management practice and each has pros and cons. It is the Scottish Wildlife Trust's view that alternatives to burning should be promoted to and by upland managers as a way of reducing the negative impacts of burning.

Negative impacts of burning

13. A comprehensive review for English Nature[12] identified seven significant detrimental impacts of burning:

Negative impacts on biodiversity

- Reduction in structural and species diversity and vegetational composition changes if carried out too frequently or over *large* areas. In particular, frequent burning debilitates *Calluna* and this has probably contributed significantly (together with high grazing pressures to the loss of *Calluna* cover and replacement by grasses such as *Molinia caerulea* (purple moor-grass) over much of the uplands. Burning also exacerbates severely overgrazed habitats if grazing animals are not controlled.
- Post-fire establishment of invasive species such as *Pteridium aquilinium* (bracken), for example where old *Calluna* stands are burnt.
- Destruction and long-term exclusion of fire sensitive (e.g. juniper *Juniperus communis*) and slow colonizing species.
- Removal of cover for ground-nesting wildlife and destruction of birds**'** nests and clutches during spring burning periods.

Negative impacts on soils and hydrology

- Ignition, combustion and loss of peat and humus layers by hot fires in dry conditions.
- Increased run-off and erosion, particularly after hot fires and where large or old stands of *Calluna* are burnt, and on steep slopes.
- Reduction of peat accumulation, even under well controlled prescribed burns, and potentially emission of carbon dioxide and other greenhouse gases from carbon stores in peat if these ignite or dry out as a result of hot burns.

Evidence base

14. Published evidence on the impacts of burning on upland biodiversity, erosion and hydrology and on its interactions with other upland pressures such as grazing, increased nutrient inputs (through atmospheric deposition and increased stocking densities), pollution and drainage (including peat-cutting) is sparse and often contradictory. There is an urgent need for impartial, evidence-based research into the extent, trends and impacts of muirburn in Scotland.

15. Although there is limited evidence of the extent and impacts of muirburn[13], a recent report into the state of the UK's peatlands indicates the in some areas, such as the east central highlands, over 70% of heather is under burning management.[14] The Scottish Wildlife Trust believes that, given the widespread use of muirburn as a management practice in the Scottish uplands, priority should be given to independently evaluating its impacts, including impacts on biodiversity, soils and hydrology.

[12] Tucker, *op cit.*

[13] The 2005 Defra Science Panel review (Glaves and Haycock, op cit) comments that "the impact on soils, hydrology and biodiversity, and indeed on wider interests, is not clear cut."

[14] JNCC. 2011. *Towards an assessment of the state of UK peatlands*. JNCC Report No. 445

16. The Scottish Wildlife Trust further believes that there should be a case for a precautionary approach to muirburn because of the absence of clear evidence to show the positive or negative impacts of muirburn on biodiversity.

Blanket peatlands

17. Blanket peatlands are a UK BAP priority habitat and they have declined in extent by around 44% since the Second World War.[15] Recent work[16] underlines the extent of the damage burning can do to blanket peatland, turning it into vegetation more akin to dry heath, often dominated by *Molinia caerulea*.

18. This leads to a reduction in the range of ecosystem services associated with blanket bogs (or mires) which are widely acknowledged and include: genetic resources; drinking water supply; carbon storage; preventing greenhouse gas emissions; flood prevention; detoxification and purification; soil formation; and biodiversity. All are negatively affected by burning[17] which results in peat degradation.

19. The Muirburn Code[18] recommends but does not require that blanket and raised mires on deep peat (>50 cm deep) should not be burnt unless heather constitutes more than 75% of the vegetation.

20. The Scottish Wildlife Trust believes that there should be a strong presumption against burning any blanket peatland or raised mire on deep peat (i.e. peat >50 cm deep) other than in the most exceptional circumstances such as part of a restoration programme or to meet wider conservation/environmental objectives and that such burning should only be permitted under licence from Scottish Natural Heritage.

Grouse moors

21. Scotland's grouse moors are often run by highly skilled and experienced land managers who fully appreciate the importance of careful burn-management and of diverse habitat mosaics. Many are instrumental in working to restore dry heath to its former blanket peatland status and it is essential that they continue to be so. The Scottish Wildlife Trust contends that diverse grouse moors with diverse vegetation mosaics are better for grouse[19] and better for wildlife than *Calluna* monocultures.

22. The Scottish Wildlife Trust believes that grouse moors are an accepted part of the rural economy and the Scottish landscape and that they can benefit wildlife but that intensively managed single-species dominated grouse moors are detrimental to biodiversity and wider ecosystem services. The Scottish Wildlife Trust supports greater habitat diversity in the uplands. In order to achieve this we believe that there should be less burning and that there should be incentives to promote the restoration of degraded raised bog to active bog through re-wetting.

23. Guidance for sporting estates should be developed to help move away from routine rotational burning to the development of good practice for the restoration of natural active raised bog and blanket bog on deep peat grouse moors.

Water quality

24. Water quality and especially water colour is a major concern in drinking water catchments. The balance of evidence, as assessed by the IUCN UK Peatland Programme, suggests that moorland burning impacts on raw water quality and results in increased colour in raw water.[20] Other reasons for increased

[15] UK National Ecosystem Assessment (UK NEA) 2011. Chapter 5 Mountains, moorlands and heaths
[16] JNCC. *Op cit.*
[17] UK NEA *op cit*
[18] http://www.scotland.gov.uk/Resource/Doc/355582/0120117.pdf
[19] Pearce-Higgins, J.W. and Grant, M.C. 2006. Relationships between bird abundance and the composition and structure of moorland vegetation. *Bird Study,* 53**:** 112-125.
[20] Holden, J., Chapman, P.J., Palmer, S.M., Kay, P. & Grayson, R. 2011 *A review of moorland burning impacts on raw water quality with a focus on water colour*. Report to Yorkshire Water Services.

dissolved organic carbon put forward include recovery from the effects of acid rain.[21] These processes act at a large spatial and temporal scale, while land management influences individual catchment characteristics at a local scale over shorter time scales.[22] Vegetation type may be an important driver influencing water colour[23] with *Sphagnum* associated with the lowest levels of colour.[24] Areas of heather dominant vegetation on deep peat, and areas of new burn on deep peat have been associated with increased water colour,[25] though more work is needed to disentangle the effects of these inter-related factors. Further work is required to determine whether the source of this colour results from the act of burning itself or indirectly through the subsequent dominance of vascular plants over Sphagnum.

25. *Sphagnum* dominated vegetation is more effective in slowing run-off than bare peat or other types of vegetation.[26, 27] A *Sphagnum* rich blanket peatland, in comparison to a damaged one with little moss cover, may t**h**erefore help reduce run-off and ameliorate flood risks.

Carbon storage and sequestration and climate change

26. The IUCN UK Peatland Programme reports that studies suggest that there are benefits for carbon budgets from the absence of burning on deep peat compared to burning and that there is a net carbon loss for a ten year burning cycle.

27. The balance of evidence, as assessed by IUCN, suggests that vegetation type is an important factor for greenhouse gas balances. *Sphagnum* dominated vegetation with a high water table is shown to have greenhouse gas benefits over heather dominated bog on deep peat. If management alters the vegetation cover of sites then this might alter the greenhouse gas balance. In active blanket peatland, the growing *Sphagnum* acrotelm layer, holds more carbon than upper layers of heather and can transfer more carbon into the peat for long term storage. In contrast, heather-dominated deep peat tends to have a greater concentration of subsurface peat pipes, associated with peat drying and potential loss of stored carbon.

The Muirburn Code

28. The Muirburn Code, revised by the Scottish *G*overnment in 2011 to inc**o**rporate changes in the law resulting from the passage of the Wildlife and Natural Environment (Scotland) Act 2011, is not in itself a statement of the law, but provides guidance on the mandatory and discretionary aspects of burn management. The cross compliance requirements of the Single Farm Payment require moorland to be maintained in Good Agricultural and Environmental Condition and the Muirburn Code is used as the standard expected of managers.

29. The Scottish Wildlife Trust welcomes the cross compliance requirement referred to in paragraph 28 and believes that it should be maintained. We further believe that adherence to the code should be subject to rigorous monitoring by the Scottish Government.

30. We note that the Muirburn Code advises land managers that, where possible, burning should avoid tall vegetation at the edge of watercou**r**ses. The Scottish Wildlife Trust believes that watercourses provide important habitats which are vulnerable to damage from burning and that burning along watercourses should be prohibited. We further believe that watercourse habitats should be protected from potentially poorly managed burning by 20 m buffer strips where burning is prohibited.

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[21] Monteith, D.T., Stoddard, J.L., Evans, C.D., de Wit, H.A., Forsius, M., Hogasen, T., Wilander, A., Skjelkvale, B.L., Jeffries, D.S., Vuorenmaa, J., Keller, B., Kopacek, J. & Vesely, J. (2007) Dissolved organic carbon trends resulting from changes in atmospheric deposition chemistry. *Nature,* 450**:** 537-U539.

[22] Clark, J.M., Bottrell, S.H., Evans, C.D., Monteith, D.T., Bartlett, R., Rose, R., Newton, R.J. & Chapman, P.J. (2010) The importance of the relationship between scale and process in understanding long-term DOC dynamics. *Science of the Total Environment,* 408: 2768-2775.

[23] Holden, et al. op cit

[24] IUCN Peatland Programme 2011. *Burning and peatbogs*

[25] *Ibid*.

[26] Holden, J., Kirkby, M.J., Lane, S.N., Milledge, D.G., Brookes, C.J., Holden, V. & McDonald, A.T. (2008) Overland flow velocity and roughness properties in peatlands. *Water Resources Research,* 44: W06415

[27] Grayson, R., Holden, J. & Rose, R. (2010) Long-term change in storm hydrographs in response to peatland vegetation change. *Journal of Hydrology,* 389: 336-343

31. The Muirburn Code does not address the impacts of burning on protected species of conservation concern other than birds. In areas such as the West Highlands and Islands, heather moorland is often associated with freshwater features such as rivers and lochs. The widespread distribution of the otter (*Lutra lutra*), a European Protected Species, in areas where burning is a regular management practice highlights the inadequacy of the Muirburn Code with respect to this species.

32. The Scottish Wildlife Trust believes that the Muirburn Code and associated guidance should be amended to highlight the potential impa**c**ts on protected species and that greater emphasis should be placed on educating and informing land managers in areas where otter and other European Protected Species occur about responsible muirburn and when muirburn should not be undertaken.

Muirburn season

33. The Code, and the Wildlife and Natural Environment (Scotland) Act 2011, specify that muirburn can only normally be undertaken in the muirburn season or the extended muirburn season (1 October – 15 April at all altitudes extendable to 30 April by permission of the proprietor of the land).

34. Out of season, muirburn may be licensed by Scottish Natural Heritage for the following purposes: conserving, restoring, enhancing or managing the natural environment; research; or public safety.

35. The Scottish Wildlife Trust believes that the participative approach taken to resolving differences of opinion between upland stakeholders regarding the muirburn season have been beneficial to the sustainable management of the uplands and welcomes the recent restriction of the muirburn season for the protection of ground nesting birds.

36. The Scottish Wildlife Trust believes that potential changes in breeding season, species composition and bird behaviour as a result of climate change require that the length and dates of the muirburn season should be kept under active review.

37. The Scottish Wildlife Trust believes that in some circumstances further restrictions on the muirburn season may be justified and urges land managers, the Scottish Government and other stakeholders to work towards the introduction of an initially voluntary moratorium on burning where ground nesting birds or other wildlife may be at risk from muirburn.

How the Scottish Wildlife Trust will use this policy

38. The Scottish Wildlife Trust will continue to advocate the principles outlined in this policy statement to Government, the upland management sector, the wider public and other key stakeholders to promote less ecologically damaging and more sustainable land management practice.

39. The Scottish Wildlife Trust will enact this policy on its own estate.

Cross-reference to other Scottish Wildlife Trust polices

- Upland Vision (2009)
- Economics of Ecosystem Goods and Services (2010)
- Policy Futures 3: *Climate Connections; towards low carbon high biodiversity economies* (2011)
- Lowland Peat and Horticulture (2011)