



UNITED KINGDOM

Country Report for the United Kingdom

Introduction

Wildland fire in the UK was described in detail in an earlier Country Report for the United Kingdom by Bruce (2000). This report is compiled as a contribution of the UK to the Fire Management Global Assessment (2005) and summarises the main findings of the earlier document and highlights some developments that have been made over the five-year period 2001-2005.

Summary of the fire situation in the UK

Prescribed burning is used extensively in upland Britain for habitat management for red grouse (*Lagopus lagopus scoticus*), an upland game bird that lives on heather (*Calluna vulgaris*) moorland. Fire is also used extensively to regenerate heather moorland and grassland (principally where dominated by purple moor grass, *Molinia caerulea*) for cattle, sheep and deer. In forests, fire is used to clear branches or heather from sites as a ground preparation tool prior to forest establishment by planting or natural regeneration. Firebreaks are also sometimes created alongside forests by burning. Fire is used occasionally on farmland in Scotland to burn straw, a practice that is now prohibited in England and Wales. Prescribed burning is used more frequently on privately owned estates than on publicly owned land.

Wildfires are also common in lowland heathland (dominated by heather, sometimes with western gorse, *Ulex gallii*) and in stands of gorse (*Ulex europaeus*), especially where these are close to urban sites. Fires within forests are uncommon, though do occur either in young plantations of conifers, especially where adjacent to heather or grass-dominated vegetation, or where heather has re-invaded older stands after thinning. A very high proportion of wildland fires in the UK are anthropogenic in origin, though lightning fires do occur on rare occasions (Bruce 2000).

Fire hazard is increasing in many areas. The main reason for this has been a reduction in staff available for heather burning operations on many estates due to economic pressures (Hudson 1992) which, combined with a reduction in sheep grazing pressure, has resulted in an increase in the average age and biomass of heather plants. There is also a move from some conservation organisations to extend the recommended fire cycle for heather moorlands from 10-15 years (Gimingham 1972) to 20 years in some places and to retain larger areas of unburned heather (Backshall et al. 2001), to reduce deer numbers, and to plant native pinewoods for biodiversity objectives. All of these are likely to increase fuel loads and hence future fire hazard. Recent legislation has also widened public access to the countryside both in Scotland (Land Reform (Scotland) Act 2003) and in England and Wales (Countryside and Rights of Way Act 2000, the so-called CROW Act). It is widely expected that this will increase the frequency of accidental ignition in some areas.

There is currently no systematic method established for recording wildfire events in the UK and there are no reliable statistics on numbers, sizes or causes of wildfire. Statistics published by the Home Office Statistical Bulletin (ODPM 2005), for example, include intentional straw and stubble burning as well as wildland fires, but only include fires attended by the Fire and Rescue Services and do not include management fires or wildfires that were dealt with solely by land managers. However, the statistics do show that 2003 was a particularly bad year for wildland fires with 152,700 fires reported; second only to the 174,600 fires in the dry summer of 1995. Interestingly, many of the 2003 fires (twice the monthly average) were during a particularly dry spell in March and April, rather than during the hotter summer months. Some of these fires were very severe, burning many square kilometres and, in some cases igniting peat and burning for many days.

A recent questionnaire sent by the Game Conservancy Trust and the Scottish Gamekeepers Association to private estates who practice moorland management elicited responses from 42 estates.

Seventeen wildfires were reported by 13 estates during 2003, averaging about 150 ha. Four estates used helicopters to extinguish the fires, though most used a combination of hand tools and water carried on all-terrain vehicles. The Fire Brigade were only called to six of these fires, though six required help from at least 50 people to extinguish, usually workers from neighbouring estates. The causes of fires were mostly (nine fires) escaped management fires in between February and April; two were recorded as having been started by crofters (graziers), three as accidental, two as arson and one unknown.

It is important that these wildfires are put into context both of normal prescribed burning and the particular causes of wildfires in 2003. Twenty of the 42 respondents in the survey reported active management by burning during 2003 with an estimated 4300 fires; one estate estimated that they had burned 900-1000 fires during the season. It is likely that this rather small sample of estates is biased towards those who experienced wildfires as they are perhaps more likely to respond to the questionnaire. The survey also targeted moorland estates managed for game and does not include information about the many wildfires that occurred on public land or land managed for other purposes. Some of the largest landscape-scale fires occurred during exceptional weather conditions over the period 16-25 April after the prescribed burning season had finished and in areas usually considered low risk. One such fire on the Ardnamurchan peninsula on the normally wet west coast of Scotland was 70 km² in extent.

The environmental and economic cost of these fires cannot be estimated but is considerable. The economic costs include the loss to property (forestry, fencing, etc.) and of income of up to 70 pounds sterling per ha per year from grouse moors. Re-establishment of the mosaic structure of different aged heather stands required by grouse may take some 15 years. The environmental costs are also considerable, particularly where peat was ignited resulting in destruction of the seedbank, a high risk of erosion and a complete change in ecosystem function. One such fire at Fylingdales in the North York Moors National Park effectively removed the surface peat and seedbank from 258 ha, affecting over 30 Scheduled Ancient Monuments; the cost of restoration work is estimated at 290,000 pounds sterling excluding staff time.

Fire prevention and control

The traditional tools used for extinguishing heather fires are long handled fire beaters or scrubbers with wire mesh or metal heads. More recently "pump and roll" techniques using very high-pressure fire fogging units mounted on all-terrain vehicles have become popular; wetting agents and foam may also be used though this remains relatively uncommon. Generally helicopters are only used when either a fire is completely out of control or is threatening a forest. There are no helicopters or fixed-wing aircraft in the UK dedicated to fire fighting. This means that commercial helicopters have to be called in when required and availability is usually limited and dependent on other work. On rare occasions helicopters have been placed on standby during periods of extreme risk, though this is expensive (ca 1500 pounds sterling per day on standby, plus 1000 pounds per hour flying time). The cost of helicopters is usually borne by the land owner or insurance companies, though insurance cover has become more difficult to obtain since 2003.

The Met Office Fire Severity Index is a web-based predictor of fire weather conditions and fire risk that has recently been produced for England and Wales (Met Office 2005). This system provides a five-day forecast using a five-point fire risk index that has been designed specifically in response to the new countryside access legislation (CROW Act) which provides for National Park Authorities to close public access to parts of the countryside during periods of exceptional fire risk.

Organisational developments

A number of Fire Groups have been established throughout the country (Bruce 2000). These are agreements between a number of neighbouring estates within a region and the local Fire Brigade to coordinate efforts at fire control. Their primary aims are to provide access to labour and equipment at short notice, to improve effectiveness, efficiency and communication on the fire ground, and to improve safety, training, cost sharing and general mutual assistance. Of particular value is the communication between estate managers and the Fire and Rescue Services as the estate workers have local knowledge and suitable equipment for working in remote and rough terrain that is not available to the professional fire fighters trained and equipped for structural fires.

The establishment of a Scottish Wildfire Forum was proposed at a wildfire conference in Aberdeen in October 2004 and the Forum met in December 2004 under the chairmanship of Mr Jeff Ord, Her Majesty's Chief Inspector of Fire Services, Scotland. The Forum arose largely from the large number of severe wildfires in 2003 which stretched fire-fighting capacity and demonstrated some inadequacies of the present system for coping with such events. The aims of the forum are to bring together the fire services, land managers, and relevant agencies in Scotland in order to develop and communicate wildfire protection strategies to ministers and stakeholders. One of the first tasks of the Forum is to identify key issues and priorities for partner agencies and to stimulate research and development where necessary. To this end the Forum has identified the need for more precise data on the incidence and nature of wildfires and is discussing suitable formats for collecting statistics that will be of value in planning and in managing wildfire events in the future. There is discussion of the extension of the Met Office Fire Severity Index to Scotland and the development of a related, fuel-type specific, Fire Behaviour Prediction System through collaboration between the Met Office and the University of Edinburgh. The Forum has also highlighted the need for the Fire and Rescue Services to have access to personal protective equipment (PPE) that is more appropriate for fighting wildfires. The Scottish Wildfire Forum is recognised by the Scottish Executive as a national forum.

The Welsh Forum for the Control of Countryside Fires is a similar forum recently established by the Countryside Council for Wales with the objective to prevent, reduce and control illegal fires in the countryside. This Forum comprises the fire and police services and the major agencies responsible for countryside management in Wales.

Research

Wildland fire research in the UK has mostly concentrated on the ecological effects of fires and the post-fire succession of vegetation (e.g. Gimingham 1981, Hobbs and Gimingham 1984a), though a small number of fire behaviour research programmes have been completed (e.g. Kayll 1966, Thomas 1968, Hobbs and Gimingham 1984b, Hamilton 2000). Recent research conducted by the University of Edinburgh and The Game Conservancy Trust has looked at the relationship between fuel, weather and fire behaviour. A simple technique based on visual obstruction has been developed to enable field surveying of heather fuel loading and structure. The technique is able to predict loading for total above-ground biomass, fine fuels and the moss/litter layer. The methodology also provides an index of canopy density which can be compared to the bulk density of the canopy. It has been adopted as the survey method of choice for a number of fire research programmes.

Extremely low fuel moisture was implicated as a potential causal factor for many of the large fires seen in the spring of 2003. Fuel moisture measurements conducted at a number of spatial and temporal scales have revealed how live heather fuel moisture contents vary on a seasonal, day to day and diurnal basis as well as over landscapes and between different heather stands and plants.

Replicated burning experiments with fires of constant size have successfully been completed in a range of different fuel loadings. Relationships between fuel loading, fuel moisture and weather conditions will be established which will allow the prediction of rate of spread, fireline intensity and flame length which are vital to fire control.

Finally data on fire behaviour from these and previous studies will be used to begin the process of testing, ground-truthing and calibrating existing fire behaviour models including BehavePlus and the Canadian Forest Fire Behaviour Prediction System.

Other fire related research projects on going in the UK include experimental fire conducted within Scots pine (*Pinus sylvestris*) forest at both Abernethy forest by the RSPB and at Glen Tanar (Bruce and Servant 2003). The primary objective here has been to test the potential use of surface fire for conservation management of habitat for capercaillie (*Tetrao urogallus*). The heather is being burnt off beneath mature pine canopy to encourage the growth of blaeberry (*Vaccinium myrtillus*). It is anticipated that fire will have the added benefits of encouraging seedling regeneration of the pine and reducing fire hazard by removing the excess fuel that has accumulated following a reduction in deer numbers.

The Urban Heaths Life Programme, funded by the EU Life Programme has developed a comprehensive GIS system for recording disturbance events, including fires, in the lowland heaths of Dorset in the south of England (Dorset County Council, undated). This project has developed from the reports by Kirby and Tantram 1999 and Tantram *et al.* 1999, and permits detailed spatial and temporal

analysis of the occurrence of wildland fires in a semi-urban environment. This project has a strong educational component with the objective of reducing the incidence of accidental and malicious fires in this threatened habitat.

As well as the Wildfire conference in Aberdeen in 2004, two other very successful seminars and equipment demonstration events have been held: 'Wildfire 2003' and 'Wildfire 2005', both organised by Northwoods. These events brought together people from the Fire and Rescue Services, National Parks and countryside agencies from across the UK. A questionnaire survey of some of the participants at Wildfire 2005 showed the value of the recently developed Met Office Fire Severity Index, but also showed the perceived need to develop other tools for predicting fire behaviour including both simple nomographs for predicting rate of spread and flame length for typical UK fuels and more complex computer-based models of fire spread. An essential task in order to achieve this will be the development of a fuel moisture model for heather. Initial data indicates that heather can, under certain circumstances, have very low live-fuel moisture levels. This is particularly true in late winter and early spring and when the ground is frozen and when plants have been damaged by frost. At such times this can significantly increase fire intensity under quite moderate fire weather conditions.



Figures 1 and 2. Prescribed burning in the Scottish Highlands – a method, which meanwhile successfully transited from experimental stages into practice. Photograph: Michael Bruce

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