9 Burning

9.1 Ecological principles and management guidelines

9.1.1 Introduction

Burning is a vegetation management technique traditionally employed in the management of upland moorland communities dominated by dwarf shrubs such as heather *Calluna vulgaris* and bilberry *Vaccinium myrtillus*. These communities are managed this way because of the importance of providing a succession of young heather for grouse and sheep and to keep scrub growth in check.

On wetter upland soils, purple moor grass *Molinia caerulea* and rushes *Juncus* spp. are burnt to prevent tussock formation and promote succulent new herbage for livestock. In Scotland this is known as muirburn.

Burning is not a management technique that has been widely employed in the lowland grasslands of the UK. The exceptions to this are the Culm grasslands of Devon and North Cornwall and on the Oolitic limestone grasslands of the Cotswolds. In the lowlands, this deliberate burning is often known as swaling. Usually the objective is to stimulate nutritious new growth for stock.

Burning alone should not normally be used as a technique to manage grasslands. In some chalk and limestone areas, eg the Wye Downs NNR, Kent, burning to promote new growth in the absence of livestock management may have led to the spread of tor-grass *Brachypodium pinnatum* which is very difficult to control once established (see Chapter 8, section 8.2). However, conversely there are situations where burning alone has been used successfully to maintain diverse calcareous grassland, especially where grazing or other techniques have proved impractical, eg at the Devil's Dyke, Cambridgeshire. This site consists of a mosaic of CG5 *Brachypodium pinnatum-Bromopsis erectus* and CG3 *Bromopsis erectus* grassland and an annual winter burn does not appear to have caused an increase in tor-grass.

9.1.2 Burning as a conservation tool

- Burning may be an effective reclamation technique when used in conjunction with grazing.
- Burning patches creates a vegetation mosaic of different ages and structures which may be beneficial to invertebrates.
- Burning can help keep scrub seedlings and coarse herbaceous vegetation in check, and prevent the loss of open habitat through natural succession to scrub and woodland.
- Burning is relatively cheap compared with other means of management (although the manpower requirements may be expensive).
- Burning can be carried out in areas inaccessible to machinery eg steep slopes, or on sites where it is difficult to remove cut material, or where grazing is impractical.

It is essential that the rules of good practice are strictly observed. Uncontrolled fires and poorly timed burning can cause great damage, not only to wildlife and its habitats but also to neighbouring property.

Burning should not be introduced to previously un-burnt sites until the implications of burning on communities and species are understood.

9.1.3 The effects of burning on flora and fauna

The effects of burning on individual species and communities depends on:

a. the life history strategies and anatomical, physiological and behavioural characteristics of the plants and animals present

b. the frequency of burning

c. the intensity of the fire

Plants that are most likely to survive burning are those that have buds in positions that escape the full effects of the fire ie buried in the soil or held just above ground. Trees and shrubs are killed by regular burning regimes. Bryophytes and lichens can be badly affected by very hot fires.

Intense fires caused by a build up of dead plant material cause more damage to plant and animal communities than frequent low intensity fires.

Inevitably some invertebrates die as a result of fire. Burning also destroys food sources and cover, exposing the over-wintering stages of invertebrates to predators and the elements. Smoke can also be very damaging. Burning is highly damaging to populations of slower moving animals, eg molluscs.

Burning can create patches of bare ground which may lead to infestation by weeds such as common ragwort *Senecio jacobaea*, thistles *Cirsium* spp and docks *Rumex* spp particularly if there is a source of propagules nearby.

Fire can remove nest building material and cover for ground nesting birds. This is especially important during the spring nesting period (April-June). Insect food sources may be reduced.

Certain mammals may be protected in their burrows, but they too are affected by loss of food.

Burning should be exercised with great caution where reptiles are present (see sub-section 13.6).

By restricting burning to late autumn or early spring, when plant growth is minimal, most vertebrates are dormant and most insects are overwintering in the base of grass tussocks, damage to flora and fauna can be minimised (Kirby 1992).

Seek specialist advice wherever possible. Further information on the ecology of fire can be found in Whelan (1995) & Bond & Wilgen (1996).

Effects of fire on soil

Poorly controlled burning (ie intensely hot fires) can damage soil structure and soil organisms may be killed. Burning can cause an increase in the availability of plant nutrients. Some of these will be re-bound in the vegetation providing that an organic mat remains intact. The water regime of an area can be changed by burning. Surface run-off may be altered and there may be a reduction in evaporation and absorption rates.

However, if burning is properly conducted the moss, litter and upper soil layers provide excellent insulation and the rise in temperature only a few centimetres below the surface is minimal (Gimingham 1992).

9.1.4 Management objectives

Burning for conservation purposes should only be undertaken where it fulfils clearly defined objectives such as the following:

a. **To reclaim an unmanaged or undergrazed grassland**

This involves burning to remove accumulated litter (undecayed plant material) in grasslands that have not been grazed for some time, or that have not been grazed at a high enough stocking density. A layer of uneaten vegetation may develop if the sward is dominated by unpalatable species eg cock's foot *Dactylis glomerata*, false oat grass *Arrhenatherum elatius*, purple moor grass *Molinia caerulea* on wetter soils and tor-grass in chalk and limestone areas.

Litter has high fibre and low nutrient content and is broken down slowly by micro-organisms, especially on acid soils. It is generally avoided by stock when greener, more nutritious plant tissue is available. Litter can build up and smother low-growing plants which are unable to survive in the cooler, darker conditions it can create.

A layer of litter does, however, provide valuable cover for overwintering invertebrates and burning policies, and site conservation objectives need to take this into account.

Winter burning of Culm grassland in Devon and north Cornwall is an important management technique used to prevent purple moor-grass litter swamping less vigorous species.

When combined with grazing it may be possible to use burning to improve the sward by reducing the structural dominance of coarse aggressive species such as tor-grass and increasing species richness. This technique has been used on the Wye and Crundale Downs NNR in Kent. However, in most instances burning has been found to encourage the spread of this species unless it is accompanied by heavy spring grazing (see Chapter 10, sub-section 10.5 for more information on control of tor-grass).

NB: It is important to recognise that if it is not possible to introduce some sort of maintenance regime, such as grazing or mowing or increasing the stocking density, after burning, the site may

once again become dominated by coarse vegetation. In this case it might not be worth burning the site in the first place.

b. **To prevent the invasion of grassland by trees and shrubs**

Regular burning can prevent succession in the direction of scrub and woodland by killing seedlings and saplings. However, the frequent treatment required to prevent this happening could be detrimental to the flora and fauna of the site. Other treatments such as grazing, scrub cutting and the use of selective herbicides might be more appropriate (see Chapter 12).

9.1.5 Management guidelines (see also Gimingham 1992)

In developing policy, the following should be taken into account:

" The aim should be to burn within a planned programme which must be flexible enough to allow modification in case of special circumstances eg unusual weather.

" The development of a policy and plan depend on a thorough knowledge of the area and the details of terrain, local climate, soil (including drainage patterns) vegetation, fauna, grazing animals and use by the public (Gimingham 1992). Burning often attracts opposition from the public. If possible, erect a sign explaining why the site is being burnt.

" Anyone considering the use of burning as a management technique should read *The heather and grass burning code* which was revised in 1992 (MAFF 1992b) available from MAFF, WOAD and SOAFD, or *A guide to good muirburn practice* (Department of Agriculture and Fisheries for Scotland/Nature Conservancy Council 1977), available from SOAFD.

What time of year should burning be carried out?

In England (apart from the uplands), grass burning is permitted only between 1 November and 31 March. In Scotland the legal period runs from 1 October to 15 April and this applies to some upland areas in England. When adverse weather has restricted burning programmes, Scottish legislation allows proprietors to give written consent to tenants for extension of this period to 30 April or, on land above 457m (1,500ft) above sea level, to 15 May (for other legal provisions see Chapter 7, section 7.2).

" Burning in January, February or early March reduces the adverse effects of fire on flora and fauna.

" Combined with grazing, burning tor-grass or purple moor grass at this time of year can help control it's structural dominance. Spring growth is more palatable to stock which will graze the emergent shoots (see Chapter 10).

How big an area should be burnt and how often?

- The burning plan needs to outline those areas or parts of the site to be managed by burning and those parts from which fire should be excluded ie sensitive habitats and locations of species particularly susceptible to damage by fire.

- On no account should more than half of the site be burnt in any one year. This is to allow fauna to recolonise to unburnt patches where food and cover remain.

- No area should be burnt every year.

- A mosaic of burnt patches can provide the greatest variety of conditions for wildlife. However, care must be taken not to create patches of burnt and unburnt vegetation that are too small, as they might be insufficient to support viable populations of plants and animals.

- Where appropriate, areas of tall/dense vegetation should be left as cover for small mammals.

- In practical terms the size of burnt patches will be influenced by the nature of the terrain and the number of staff and kind of equipment available to control the fires. There is no set frequency for burning a particular area. Use the amount of accumulated litter as a guide and, if known, the rate of re-establishment of cover following fire. In lowlands, burn frequency is determined by conservation objectives allied to livestock requirements.

Too frequent burning may be damaging to both the grassland and its associated wildlife. On the other hand, if the interval between fires on a site is too long and no grazing or cutting has taken place in the intervening period, the litter may have built up to a great extent. In these instances accidental fires can destroy wildlife and its habitats due to intense heat generated by the extra fuel load.

What kind of weather conditions are right for burning?

- The weather conditions over a period of days prior to the burn are as important as the day itself. The vegetation must neither be too wet (which will make it difficult to ignite) or too dry (which may create too hot a fire).

- The best time to burn is on a dry winters day when the ground is cold or wet.

- The best wind conditions for burning are usually those provided by a steady gentle breeze (about 7-10 knots or 8-12 miles per hour).

- Burning with the wind is less damaging to invertebrates as the fire travels faster and is cooler, giving insects in the ground and base of tussocks a chance of survival. The majority of standing dry matter and leaf litter is removed without affecting the soil and ground layer. The danger with this type of fire is that it is less easy to control.

- Burning into the wind or `back-burning' results in a more controllable fire, but it is hotter and more intense because it moves more slowly. Such fires may result in damage to flora and fauna.

9.1.6 How to plan and carry out a burn

" Make sure you are thoroughly familiar with your area: local climate, vegetation, soils, grazing use etc.

" Be clear about your burning policy including:

a. the precise areas to be managed by burning;

b. the burning rotation;

c. the size of the area to be burnt;

d. the parts from which fire must be excluded.

" No fire should be started without a clear knowledge of where and how it is to be brought to a stop.

" Identify natural firebreaks and, where necessary, arrange for firebreaks to be prepared in advance. Firebreaks can take the form of features such as tracks or streams.

If natural firebreaks are not available they need to be created. Firebreaks may be created by:

a. removing vegetation from strips of land by rotovating or discing or by 'backburning'. These should never be less than 5m in width;

b. spraying strips of vegetation with a fire-retarding chemical such as mono-ammonium sulphate or sodium alginate. These coat the vegetation with a layer of liquid which is slow to evaporate and hence inhibits the fire.

" Prepare a list of people to be notified before burning takes place and the length of notice required (see Chapter 9, section 9.2). These must include the adjacent proprietors and the local fire brigade.

" Ensure that you have the sources of manpower and numbers needed to carry out and control the burn. For safety reasons no individual should be expected to control more than 5m of fire front and the fire front should be no more than 55m in total.

" Make sure that you have the relevant equipment before you start.

Equipment

(Extract from Gimingham, 1992)

a. To start the fires, paraffin burners (or similar) mounted on long handles, or Calor gas blow torches may be used. With one or two of those the fire is started along one edge of the patch at close-set points.

b. To control the fire (ie control the margins as it advances and to extinguish it when the patch is covered), the traditional method has been to equip a number of people with beaters. These usually consist of a head of wire netting or a piece of rubber conveyor belting (or car tyre) attached to a 2m pole, but an even more traditional method is a birch broom made by wiring a cluster of birch branches to the end of the pole. Scrapers are also useful for smothering flames; their heads consist of a rectangle of two or more layers of wire netting or a perforated tin sheet on a frame welded at right angles to the end of the handle, which may be made from a piece of aluminium alloy tubing.

c. Further control which can, to some extent, compensate for fewer people, can be achieved by provision of additional equipment. This ranges from knapsack sprayers and a supply of water or a fire-retarding chemical such as mono-ammonium sulphate or sodium alginate, to tractor-drawn water tanks equipped with motor-driven sprayers. Using this equipment, burning can be carried out safely with two to four people who operate the `fire engine' and act as beaters. Improved control may be obtained by mixing sodium alginate with the water, but then the equipment must be specially modified to cope with the `sticky' water. Agitators are needed in the tank, and this adds to the expense.

Foam Spreader

The equipment is mounted on the back of a pick-up truck or on a trailer. The patch to be burnt is surrounded in advance with a foam barrier, which creates an effective firebreak. Small patches can be burnt safely by a team of three or four people.

Tractor drawn water sprayers and foam spreaders, although adding to the expense, can increase the safety margin of burning and ability to control or extinguish a fire if an emergency should arise. Their usefulness is also confined to areas accessible with a tractor, whereas fires controlled by beaters are possible on much rougher terrain.

Post-burn monitoring

After the fire, the area burnt should be carefully mapped, dated and annotated on a large scale site map to help interpret post-fire changes and to improve the scientific basis of future fire management at the site.

9.2 The regulations governing heather and grass burning

The following information is taken from Gimingham (1992).

Regulations controlling the burning of heather *Calluna vulgaris*, grass, gorse *Ulex* spp, bracken *Pteridium aquilinum* and bilberry *Vaccinium* spp. were revised in 1992. The aim is to ensure that at all times, the practice of burning is carried out safely and without undue risk to either the operators or the environment.

The following controls apply throughout the year:

- Burning must not take place between sunset and sunrise.

- Sufficient people and equipment must be on hand at all times to control the burning.

- At least 24 hours but not more than seven days notice of intent to burn must be given in writing to the owners or occupiers of the land concerned and persons in charge of adjacent land; this should include dates, time, place and extent of the burn.

- Railway authorities burning cut vegetation on railway land are not subject to the notice requirements in the above point. In the case of uncut vegetation instead of the requirement to notify persons in charge of adjacent land, authorities must give notice of any proposed burning at least seven days and not more than 28 days before burning is to commence by publicising details in one or more local newspapers and by other suitable means.

Licences

The remaining controls relate to burning during specific times of the year between 15 April and 1 October in upland areas and between 31 March and 1 November elsewhere. This can only be done under licence.

Licence applications must be made in writing to the local office of the Ministry of Agriculture, Fisheries and Food (MAFF), the Welsh Office Agriculture Department (WOAD), the Scottish Office Agriculture and Fisheries Department (SOAFD) or the Department of Agriculture, Northern Ireland (DANI):

- At least 28 days before burning is to commence.

- No more than 56 days before burning is to finish.

Application forms are available from MAFF/WOAD/SOAFD/DANI offices. Applications must include the date(s), method and area of the burning and sufficient information to show that it is necessary and expedient for the purpose of improving the land. Written notice of the application must be given, no later than the date of application, to the owners or occupiers of the land concerned and to persons in charge of adjacent land. Recipients of the notice must be informed that they may make representations to the relevant office dealing with the application within seven days of receipt of notice. On common land, the notice must be prominently displayed on that land.

Special provisions again apply in respect of burning by railway authorities on railway land.

Fines

Any person who contravenes any provision of the Heather and Grass etc (Burning) Regulations 1986, commits an offence under section 20(2) of the Hill Farming Act 1946, as amended by section 72(2) of the Wildlife and Countryside Act 1981 may be liable to a fine not exceeding £1,000.

Other legal requirements

Also remember:

- It is an offence under the Highways Act 1980 (as amended in 1986) to light a fire so as to cause injury, interruption or danger to road users.

- Emission of smoke so as to be prejudicial to health or a nuisance constitutes a statutory nuisance under the Environmental Protection Act 1990.

Contact the relevant country agriculture department for a free copy of the Code of Good Agricultural Practice for the Protection of Air.

- Emission of dark smoke from land occupied by an agricultural business is an offence under the Clean Air Act 1968.

- It is an offence under the Health and Safety at Work Act 1974 to endanger anyone including the public by burning operations.

- There are special rules for Sites of Special Scientific Interest or Areas of Special Scientific Interest (SSSI/ASSIs) under the terms of the Wildlife and Countryside Act 1981 and the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985. Certain operations, normally including burning, can only be carried out after a specific procedure has been followed. Owners and occupiers of the land must:

    a. give written notice to English Nature, the Countryside Council for Wales, Scottish Natural Heritage or the DOE Northern Ireland;

    b. have received written agreement unless four months have elapsed since written notice was given.

Failure to comply with the provisions may result in a fine not exceeding £2,500 (the above is an extract from MAFF 1992b).

Scotland

Burning in Scotland is governed by the Hill Farming Act 1946. The provisions differ from those in England and Wales only in certain respects, among which are the following:

Prohibition of muirburn at certain times

1. Burning is permitted between 30 September and the 16 April. However, burning may be permitted until the end of April with the landowner's permission.

2. In the case of land more than 1,500 ft above sea level the burning period is extended to 15 May.

3. In certain years the Secretary of State for Scotland may give general consent for such extension.

Notice of intention to burn should be given in a local newspaper.

Subject to direction from the Secretary of State, a tenant may be given permission to burn despite prohibitions in his lease. (NCC/SOAFD)

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