

Bracken management and control

Bracken *Pteridium aquilinum* is a crucial component of many habitats and supports a number of scarce and declining animal species. It adds structure and colour to the landscape and is a common feature of many of England's finest areas of countryside. However, it can reduce the grazing area available for livestock, prevent effective livestock husbandry and damage wildlife habitats and underground archaeology. This note provides information on bracken management and control and strategies for vegetation recovery and aftercare. For further information on bracken see SIN011 *Bracken* and TIN047 *Bracken management: ecological, archaeological and landscape issues and priorities*.

Management and control

Before starting a bracken management or control programme it is important to identify clear goals of what is to be achieved and what problems are likely to be encountered. Bracken management should be considered as one component of a long term programme of vegetation management.

Effective chemical treatment can achieve up to 98% kill of bracken, but programmes often fail due to poor follow up treatments or post-control management failing to achieve vegetation recovery. Effective mechanical treatment can take a number of years depending on the vigour of the plant and the type of control method used.

It may not be possible to achieve total eradication, particularly on semi-natural habitats and extensively managed areas, and long term management of the population may be more appropriate than complete control. Complete control may be possible on intensively managed agricultural land, but this will require a full, intensive and systemic approach.

Key factors to consider:

- There is no merit in controlling dense bracken without considering what vegetation will replace it.
- Complete eradication is unlikely to be appropriate particularly where there is existing environmental interest.

- The best and most cost-effective results will come from treating stands that still possess some ground vegetation.
- Maintaining even low levels of bracken is likely to require ongoing control treatments and supporting grazing strategies.
- The impact of bracken control on the landscape. Avoid leaving rectangular blocks and undertaking large scale clearance at one time. Create irregular patches with boundaries against natural features.
- Evaluate the extent of any archaeological remains and the ability to effectively eradicate and maintain a bracken-free environment around and above these remains. This may require advice from an archaeologist. Appropriate control can improve the condition and visibility of archaeological sites, but inappropriate control can damage archaeological features.
- Whether control is justified on sites with limited agricultural potential or environmental value: natural succession or planting for woodland may be more appropriate.
- Possible impacts on water quality. In the past residues of asulam have been found in drinking water bore-holes in areas that have been sprayed for bracken.

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Do not control bracken where:

- Sites have important woodland ground flora (eg bluebells and wood anemones) beneath the canopy. In South West and North West England, avoid sites with violets or cow-wheat beneath the canopy as these may be important for fritillary butterflies.
- Ferns of ecological interest are present or occur nearby as they may be damaged by drifting spray. Care should be taken near rocky areas and upland watercourses that harbour many ferns.
- Bracken occurs on steep slopes which may be subject to erosion whilst without vegetation. The minimum limit suggested is 110 m on land not under cultivation. Mechanical control under these conditions could lead to soil displacement, and the erosion and movement of soil or vegetation at lower elevations. It could also encourage erosion by water including the development of gullies and rills. Chemical control of bracken on slopes can also result in run-off downhill, and risks damage to non-target species and pollution of upland water courses. If possible, carry out an erosion risk assessment.
- The long-term costs exceed the likely environmental benefits.
- Control may result in the damage of archaeological features, notably as a result of the chosen control methodology.

Before embarking on any form of bracken control inspect the site during the winter months to check for obstacles, hidden pits or ditches or anything else that could cause injury to the operator, damage or an overturn.

Legislation

On Sites of Special Scientific Interest (SSSIs) consent may be required and you should consult Natural England before undertaking any management.

Where the objective of control is the agricultural intensification of uncultivated land and semi-natural areas, the 2006 Environmental Impact Assessment Regulations, EIA apply, and Natural England will need to approve the proposals.

The EIA regulations are reinforced under Cross Compliance, Good Agricultural and Environmental Condition (GAEC). GAEC 5 specifically relates to EIA. If bracken control involves cultivation or soil management, GAEC 1, which relates to soils also applies, particularly in the uplands.

If considering the use of pesticides the Environment Agency should be consulted and they may need to give their consent if there are water courses in the vicinity. For further information see:

- Application to use herbicides in or near water www.environment-agency.gov.uk/commondata/acrobat/wqm1_form_1797463.pdf and
- accompanying guidance notes www.environment-agency.gov.uk/commondata/acrobat/wqm1_notes201_1797478.pdf.

Burning bracken is controlled by the Heather and Grass Etc. (Burning) (Amendment) Regulations 1987 (SI 1987 No 1208) made under Section 20 of the Hill Farming Act 1985.

Health and safety

See appendix at the end of this leaflet.

The risks to drinking water from pesticides used to control bracken

Residues of asulam have been found in drinking water bore-holes on land that has been subject to chemical bracken control. Careful assessment must be given to mitigating the risks of over-spraying and drift on water sources and abstraction points whether they are privately owned or owned by a water company. For further advice contact your local Environment Agency office or the Natural England National Pesticides and Toxic Substances Specialist.

Methods of bracken control

Control should be considered as a staged process, with at least two stages. The first is treatment to reduce the cover of bracken and open up the stand for either natural regeneration, re-vegetation treatments or grazing.

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The second stage involves the use of either:

- intensive follow-up treatments aimed at eradication; or
- less intensive treatment aimed at managing bracken at low levels.

All follow up treatments need the appropriate commitment of resources to ensure success and this should be considered before starting the control programme.

Mechanical methods

Cutting The aim is to cut twice each season. First cut in about mid-June (mid-July if ground-nesting birds may be present) when the bracken is 50-75 cm high (this cut may have to be later in the uplands) and again six weeks later. This twice yearly cutting is likely to be required for at least 3 years. An alternative is a single cut in late July, repeated for at least 5 years. The two-cut system allows earlier access to vegetation under the bracken by grazing stock as well as further weakening the rhizome by forcing additional growth during the season.

Cutting will need to be repeated when the bracken shows signs of recovery. Complete eradication will not be achieved by cutting alone. Considerations about whether to cut or not should be made in respect to ground-nesting birds. On sensitive archaeological sites, cutting should be carried out using hand-held strimmers and it may be possible to remove bracken litter across small archaeological areas by raking.

On some sites, a follow-up cut can be carried out using a double-chop forage harvester, provided there are no obstacles or stone/rocks to cause damage. Where possible the forage (including large areas of dense bracken litter) can be collected and used as mulch or sold to plant nurseries. There is evidence that the scraped areas will re-colonise well where dense bracken litter has been removed.

Crushing This is less effective than cutting, but is sometimes suitable for difficult terrain which might damage cutter blades. It is usually best carried out repeatedly on young fronds that are brittle and easily snapped. All Terrain Vehicles (ATV) can be used to treat areas where a larger machine cannot go such as amongst gorse or

under trees. Repeat the treatment for at least 3 years if two crushings per season, and 5 years if only crushed annually.

This technique is useful as a follow-up treatment on a sprayed areas. Use a flat or ring roller. Special bracken crushing rollers fitted with deep cross-ribs (eg Cuthbertson, Holt), or purpose-built machines (eg Landbase, Bracken Bruisers) may be available locally.

Where tractors or ATVs are unsuitable, consider using horse-drawn rollers or bracken-bruiseers. There is a risk of erosion if this method is used on sloping ground. It should not be used where ground-nesting birds are present or on sensitive archaeological sites. Crushing rollers may damage low level archaeological remains which are obscured by the height of the bracken. No crushing should be undertaken in the proximity of such remains and instead hand-held strimmers should be used. This method is also unlikely to eradicate bracken but can help to keep it in check.

Livestock treading Winter-feeding can be used to attract livestock onto the site so that:

- bracken buds and developing fronds which are close to the surface or just emerged are damaged by stock treading (cattle are more effective than sheep); and
- the litter is disturbed and broken up (this also encourages frost penetration to the rhizomes).

In spring, as new fronds expand, remove the livestock to prevent bracken poisoning. This is not a reliable method but can help damage surviving fronds as a follow-up on sprayed areas. It should not be used where the vegetation is easily damaged by trampling (eg heather), where particularly vulnerable archaeological deposits are located or where unsightly fencing has to be erected.

Burning of bracken litter is useful to ease cultivation and seeding success. Burning of dead litter without follow-up is of no benefit, constitutes an unnecessary fire risk and may increase frond production. Burning may also be unsightly in the landscape.

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Ploughing and cultivation On suitable areas bracken cover can be significantly reduced by ploughing between late June and early August. Aim to invert deep furrows to expose the bracken rhizomes and leave these undisturbed over winter and follow with a spring sowing. Deep tine cultivation in two directions has been used to successfully control bracken without ploughing. Some regeneration will occur, so a follow-up programme using another method must also be used.

This method should not be used on sites with a valuable ground flora or with archaeological remains. This method can also damage the intrinsic value of the soil being cultivated, and so should not be used on undisturbed semi-natural and/or ancient soils. Environmental Impact Assessment regulations will need to be considered.

Chemical methods

Two herbicides are recommended for bracken control: asulam (Asulox) and glyphosate. Recommended dose rates for overall application are: Asulam 11 litres/ha: Glyphosate 5 litres/ha.

Asulam is selective and has relatively little permanent effect on underlying vegetation, but it will kill other ferns. It is approved for aerial application. Glyphosate is cheaper, but being a systemic chemical should only be sprayed in areas of deep litter bracken with little underlying vegetation as it will kill any grass or heather present. It is not approved for aerial application. Weed-wipers can be used to create selectivity within the vegetation canopy. Livestock should be excluded from treated areas until after senescence to reduce the risk of bracken poisoning.

Both chemicals should be applied after full frond expansion, but before tip die-back. This ensures maximum absorption and translocation into below-ground rhizomes. This normally occurs between mid-July and late September depending on altitude, locality and season. Both chemicals can achieve > 90% control.

An advantage of glyphosate is that it produces visible symptoms soon after application allowing treatment of missed strips in the same season. In all cases, spot treatment of missed areas in

the same season or in the following year and the treatment of regenerating areas, will considerably increase the duration of effective control. Eradication requires annual spot treatment.

Tractor mounted sprayers Spray booms must be set high enough for an even coverage of the fronds. Areas to be controlled should be walked the previous winter to mark dangerous obstacles. Tractor mounted sprayers should not be used in the vicinity of sensitive archaeological sites.

Aerial application (by helicopter only) Only asulam is approved for aerial application. Control by aerial spraying is most successful where there are large areas of uninterrupted bracken, if there is underlying archaeology and on slopes too steep to allow safe use of a ground-based vehicle. Where there are obstacles that prevent a constant flying height, control will be poor. The area to be treated each year should not exceed the area that can be managed by follow-up treatment.

Knapsack spraying Useful for small areas, but limited by the weight of water carried, the need for frequent refilling and the effort required to keeping the boom above the fronds. Suitable for archaeological sites and for follow-up treatment on limited areas.

Low volume drift spraying with the Micron Ulva Comfortable and easy to use but bracken control is less reliable than for other spray methods. A steady wind of 5 to 10 km per hour is required. Asulam is used in mixture with wetters, eg Adder or Actipron.

Weed wipers Generally, these are ATV or tractor-mounted rotating pressurised systems. Only glyphosate is approved for use in weed wipers.

Spot treatment This approach can be used to control missed areas, fronds of recovering bracken after an overall spray, or patches that are inaccessible or otherwise unsuitable for tractor mounted equipment. Both asulam and glyphosate are approved. They should be applied to wet the foliage thoroughly, but not to the point of run-off. Spot-guns and hose and

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lance on ATV/quad bikes are suitable application methods.

Mixed mechanical/herbicide methods

A combination of mechanical methods and herbicide application is often effective. For example, a single aerial spray will give good primary control that can be maintained by regular cutting. Cutting alone may not have been safe in the previously dense bracken. A winter or late autumn cut of the dead stems may also help to increase the uptake of the chemical into the rhizome which, if combined with a frost, will weaken the plant still further.

A single cut in the year before spraying produces an even canopy, a higher density of fronds and more active buds on the rhizome, all of which increase the efficacy of the herbicide.

Long-term control

Mechanical and chemical control can effectively reduce bracken infestation, but monitoring and follow up treatments together with grazing management are essential to maintain control.

Vegetation re-establishment

Where there is existing valuable ground flora vegetation management should be aimed at maintaining this desired cover. Where there is little existing ground vegetation, then bracken control should be supported by methods to re-instate other vegetation: typically upland grassland, heathland or moorland, or on agricultural areas, productive grassland.

The choice of vegetation type should be agreed prior to starting bracken control and, where appropriate, should be included within agri-environment agreement objectives. Factors to consider during vegetation re-establishment include:

Litter disturbance

This can be achieved by burning, incorporation, livestock trampling or removal. All methods increase the speed of re-vegetation and can be initiated before bracken treatment begins. Trampling may be encouraged by the judicious use of supplementary feeding (including mineral licks), although care should be taken to avoid damaging other existing semi-natural vegetation.

This option is not appropriate on steep slopes susceptible to soil erosion or on sensitive archaeological sites.

Seeding

Heather re-instatement requires the use of seed from other areas of heathland or moorland. This can be applied as litter (at about 1 tonne/ha) or as cut shoots collected in November or December (at 5-15 tonnes/ha). Stabilisation of the soil whilst heather establishment takes place can be accomplished with forestry brushings or with a nurse sward of suitable grasses (eg common bent *Agrostis capillaris*, wavy-hair grass *Deschampsia flexuosa* or sheep's fescue *Festuca ovina*) sown at 20-40 kg/ha (50/50 bent/fescue mixture). Recently, a novel technique has been developed where cleaned heather seed is pre-treated by smoke/chemicals to stimulate germination and then broadcast by hydraulic sprayer.

Grass re-establishment

For agriculturally productive grassland, routine practices can be followed. For upland grazing a mix of bents and fescues may be appropriate. Adding a range of wildflowers to the mixture will produce grassland with higher conservation interest, although seed and establishment costs will be higher.

Fertiliser and lime

For productive grassland a slow release phosphate fertiliser with nitrogen may be required. If soil pH is < 4.5, lime may be applied to aid grassland establishment and growth.

Recommendations should be based on recent soil test results, ensuring adequate sampling intensity for the number of fields or area of land being treated.

Grazing control

Where vegetation is being re-instated, grazing should be carefully managed. Reduce or prevent grazing during the establishment phase and carefully monitor in subsequent seasons to avoid overgrazing. The slower growth of heather plants means they must be protected from overgrazing for a longer period, generally five years. Any new fencing should be sited carefully to avoid damage to archaeological features or

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landscape value. On conservation sites, it may be necessary to exclude rabbits from areas where heather regeneration is desired. This can be done by erecting temporary fencing: either electric close-weave fencing (polywire type), or rabbit fencing with overlapped netting pinned or dug into the soil or turf.

Conversion to woodland

In circumstances where it is not environmentally or agriculturally cost-effective to control bracken, it may be appropriate to plant trees or allow natural succession to woodland and/or scrub. Depending on eventual tree cover, bracken may be shaded out, although its control will almost certainly aid establishment during planting. The potential for natural succession can be tested by assessing the density of tree and shrub seedlings, with and without litter removal in trial areas. Woodland will not be appropriate on archaeological sites, or where the existing wildlife or landscape value is greater.

Further information

Natural England Technical Information Notes are available to download from the Natural England website: www.naturalengland.org.uk. In particular SIN011 and TIN047:

- *Bracken*
- *Bracken management: ecological, archaeological and landscape issues and priorities*

For information on other Natural England publications contact the Natural England Enquiry Service on 0845 600 3078 or e-mail enquiries@naturalengland.org.uk

This leaflet has been developed from various sources including the RDS Technical Advice

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Other information

- *Scottish Environment Agency, Bracken Control: A Guide to Best Practice*
www.sepa.org.uk/publications/leaflets/bracken/
- *Bracken and high brown fritillary butterflies*
[www.butterfly-conservation.org/uploads/high_brown_fritillary\(1\).pdf](http://www.butterfly-conservation.org/uploads/high_brown_fritillary(1).pdf)
- *Defra, Controlling soil erosion*
www.defra.gov.uk/ENVIRONMENT/land/soil/pdf/soilerosion-combinedleaflets.pdf
- *Environment Agency, Application to use herbicides in or near water*
www.environment-agency.gov.uk/commondata/acrobat/wqm1_form_1797463.pdf

Appendix - Health and Safety, and guidelines for herbicide use

Safety: Working on slopes - spraying and mechanical treatment

- No slope is safe.
- Use four-wheel drive tractors fitted with approved safety cabs or frames, or appropriate ATV equipment.
- Drivers must be experienced in working on steep and uneven ground and be particularly aware of the dangers of operating trailed equipment on slopes. Walk the site the winter before treatment or cutting operations are planned to check for hidden obstacles, ditches etc. Beware of buried pipes and cables, and any overhead wires.

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- Consult Engineering Consultants for advice if in doubt. A charge will be made for this service.

Health

- There is a possibility that bracken spores are carcinogenic. The H&S Executive recommends that a suitable face mask should be worn while cutting or working in spore-producing bracken (ie during late July, August and September).

Herbicide use

- Always follow the instructions on the herbicide label and your COSHH assessment.
- Make a preliminary assessment to establish the precautions for safeguarding the environment.
- The Code of Practice for the Use of Approved Pesticides in Amenity and Industrial Areas states that before use, there should be contact or notification of those responsible for habitats requiring special consideration. This requirement can normally be met by liaison with local wildlife trusts. Environment Agency (EA) must also be consulted. Notification is not necessary on every occasion on which spraying is carried out, but it is the responsibility of the landowner and not the contractor.
- Herbicides are likely to be listed as a 'potentially damaging operation' for Sites of Special Scientific Interest (SSSIs). Under the Wildlife and Countryside Acts of 1981 as amended, written agreement must be obtained from the relevant country agencies (Natural England, Countryside Council for Wales, Scottish Natural Heritage), giving 4 months notice, before bracken can be treated inside an SSSI or within ½ mile of one.
- Glyphosate is approved for use in or near water, but as far as possible, over-spraying of ditches and streams should be avoided. A 20 m strip must be left around reservoirs and lakes, with an extra 10 m if drift machines (eg CDA sprayers) are being used. Asulam may also be used as long as contamination is avoided using the same guidelines.
- Members of the public must be protected from possible hazards. Rights of way (roads, bridle paths, and footpaths) should not be sprayed and warning signs may be needed to tell people to keep to them. Signs warning that spraying has been carried out must be posted in areas where there are berries that might be picked.
- Aerial application of herbicides requires consultation with the country agencies (Natural England, Scottish Natural Heritage or Countryside Council for Wales) and the EA or SEPA. There must also be notification of neighbours and the Chief Environmental Health Officer for the area before spraying takes place.
- Buffer zones for spraying operations close to water courses and areas with a conservation designation should be set in consultation with EA and the relevant country conservation agency. As a guide, aerial spraying requires a 160 m buffer zone with conventional nozzles and a 50 m zone with raindrop nozzles. Conventional nozzles on tractors or knapsack sprayers require a 20 m buffer zone, or a 5 m zone if equipped with low-drift nozzles. ULVA requires a 50 m buffer zone.
- Care must be taken to avoid damage to neighbouring crops by spray drift. In most areas where bracken is being treated, forestry plantations are the only crops at risk. Most trees are tolerant of asulam at the normal application rate, although there may be some scorch if young specimens are sprayed directly when actively growing. Western hemlock and willow are more sensitive and should not be sprayed. Glyphosate should never be used near trees except as directed applications.