FACT

FORUM FOR THE APPLICATION OF CONSERVATION TECHNIQ

Practical Solutions Handbook

2nd Edition

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FORUM FOR THE APPLICATION OF CONSERVATION TECHNIQUES

Practical Solutions

Equipment, Techniques and Ideas for Wildlife Management

Second Edition

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Introduction to Second Edition

The first edition of ***Practical Solutions*** was published in 1999 to make available to a wide audience information on new ideas and techniques that are being developed for the practical management of wildlife sites.

New Sections

This second edition updates and extends information provided in the original handbook and includes several additional subject areas. A new section on habitats, written by Tony Robinson, provides a description of all major habitat types in the British Isles, coupled with lists of issues, management techniques and practical problems for each habitat. These sections are intended to act as starting point for those seeking information on habitat management, and as a link to the solutions given in the rest of the handbook. Extensive cross-referencing to other parts of ***Practical Solutions***, habitat management handbooks and other sources of information should lead managers to answers to many of the practical problems they may be experiencing.

Another new section on alien plants, produced by Nick Barnes, Jean Tither and English Nature's Botanical Network, provides up-to-date summaries on the management of a range of problematic species, for many of which little readily available information has been published. Again an extensive bibliography suggests sources of more detailed information if this is required.

Further Information and References

For this edition we have extended the section on sources of additional information and provided a summary list of all references mentioned in the text. Contact details of the publishers plus a brief pen picture of each reference will, we hope, quickly guide readers to more detailed information.

Section Updates

The sections on machinery and equipment have been extended and updated and now include website and email contacts for suppliers wherever possible. For larger pieces of machinery, where purchase is likely to be an uneconomic proposition, a selection of contractors currently operating this equipment has been listed.

Caution

Please remember that although large machinery can result in major cost savings in land management, it can also cause considerable damage to wildlife populations and other features of interest. Care must always be taken to ensure that management activity will not cause disturbance or damage to animal and plant populations and other features of interest, including birds, reptiles, invertebrate populations and archaeological sites.

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The Future

The increasing availability of the worldwide web and its versatility for this type of publication mean that this is likely to be the last edition of ***Practical Solutions*** to be produced in a paper format. We will be working towards a web-based edition of ***Practical Solutions*** in the near future which will allow more rapid updating of information, hyperlinks to the websites of manufacturers and other organisations and provide opportunities for electronic exchange of views over the web. ***Practical Solutions*** will therefore continue to evolve and we welcome further suggestions for problem areas which need addressing and feedback on your own experiences. Please contact John Bacon, FACT co-ordinator, English Nature, PO Box 25, Church Stretton SY6 7WL, United Kingdom (Tel/Fax: 01694 723101, Email: jbacon7586@aol.com) in the first instance.

Further copies of this handbook are available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. Tel: 0870 121 4177 Fax: 0870 121 4178
Email: english-nature@twoten.press.net

Items of equipment and contractors identified in this publication are provided as examples. Listings are not intended to be complete and inclusion does not imply recommendation by the authors or publisher, or acceptance of liability.

Acknowledgements

Practical Solutions is the result of the thoughts, ingenuity, trials and hard work of scores of people, working under the umbrella of the Forum for the Application of Conservation Techniques (FACT). Formed in 1996, FACT is a forum of over 20 wildlife organisations from across the United Kingdom and Ireland, set up to address wildlife conservation land management problems.

(➤ 14.4 Advisory Services/Organisations)

The fact sheets contained within this handbook summarise the work that has been done to date both under the auspices of FACT and also by many other individuals and organisations. Contributors are too numerous to mention individually but we gratefully acknowledge the help of all those from site managers to manufacturers who have provided ideas, facilities, trial sites and engineering expertise, assisted with sourcing information and commented on draft texts.

Tim Coleshaw
English Nature, West Midlands Team

June 2001

1 Habitat Management

The 14 fact sheets in this section cover all the major terrestrial habitats found in the British Isles, with the exception of coastal habitats, urban habitats, and rock habitats such as limestone pavement. They are intended to act as starting point for those seeking information on habitat management, and as a link to the solutions given in the rest of the handbook. Although ***Practical Solutions*** *does not provide habitat management advice, it will point you towards the relevant handbooks which do.*

Each sheet starts with a simple introduction to the habitat and then lists some of the issues that affect its management. Most of the management techniques used are then listed with links to other relevant sections. For example wherever grazing is listed, the reader is referred to Section 11 on Grazing Management. The listing of a technique implies no recommendation of it, merely that it is a technique currently in use. The reader should consult the appropriate management handbook for guidance on the use of a particular technique.

A selection of specific practical problems facing managers are then listed, again with links to relevant solutions. If there is no link to a solution it does not necessarily mean that none exists, merely that it is not included in the current version of the handbook. It is intended to fill these gaps in future versions; in cases where no real solution exists they will serve to highlight the need for a solution to be developed.

P. Wakely, EN

P. Wakely, EN

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Practical Solutions
Equipment, Techniques and Ideas for Wildlife Management

1.1 Lowland Grassland

P. Wakely, EN

Semi-natural lowland grasslands can be defined as plant communities where most of the vegetation consists of a mixture of grasses and herbs, and where woody shrubs are largely absent. Lowland grassland covers downland, pasture and meadows, including enclosed pastures and hay meadows in upland valleys. Grassland, often of high conservation value, also exists in situations such as churchyards and road verges.

There are five broad categories of semi-natural grassland: calcareous, acidic, neutral, fen meadow/ rush pasture and Calaminarian grassland (usually associated with areas of former mining activity). Grassland on low-lying land subject to periodic flooding or waterlogging is generally termed wet grassland and is discussed separately (➤ 1.2 Wet Grassland).

Most semi-natural lowland grasslands are the result of centuries of human activity to provide fodder for livestock, and will not have been altered by intensive cultivation, or the application of herbicides or artificial fertilisers. Grasslands, particularly those of chalk downland, have the greatest botanical diversity of all semi-natural habitats, and there are a large number of rare grassland plants and invertebrates.

Grassland as a successional habitat is very dependent on management and most sites are managed by grazing and/or cutting to maintain botanical diversity. The management of vegetation structure is important for invertebrates and vertebrates, and there is a growing awareness of the value of grasslands for bryophytes, lichens and fungi. Semi-improved grasslands can also have a conservation interest, and there have been an increasing number of schemes to restore existing sites or to create new grasslands from former arable land.

1.1 Lowland Grassland...2

Issues

- Natural succession to rank grassland and/or scrub due to loss or lack of grazing
- Scrub management
- Use of artificial fertilisers, slurry, farmyard manure, lime, pesticides, veterinary products
- Overgrazing: inappropriate stock type/numbers/timing of grazing
- Supplementary feeding
- Compaction by heavy machinery
- Common land
- Weed control
- Tor grass in calcareous grass
- Bracken in acidic grassland
- Rushes in damp grassland
- Changing farming practices, e.g. move from hay to silage
- Management often dependent on local farming practices
- Organic farming
- Timing of hay cutting
- Re-creation and restoration
- Roadside verge management
- Pressure to plant trees

Management Techniques

Grazing	➤ 11 Grazing Management
Mowing and cutting	➤ 5 Vegetation Harvesting ➤ 12 Seed Harvesting
Weed control	➤ 2 Weed Control
Rolling and chain harrowing	
Rabbit management	➤ 9.1 Rabbit Box Traps
Controlled burning	
Scrub management	➤ 1.12 Scrub
Bare ground creation	➤ 3 Bare Ground Creation

Practical Problems

Acquiring suitable livestock	➤ 11 Grazing Management
Control of scrub	➤ 4 Scrub Removal and Control
Weed control without the use of herbicides	➤ 2.1 Weed Pulling ➤ 2.4 Hand Tools ➤ 2.5 Infra-Red Control
Sites where grazing is not an option	➤ 5.2 Cut-and-Collect Machines
Removing cut grass on difficult sites	➤ 5.1 Mini-Balers
Obtaining specialist machinery	➤ 14.4 Advisory Services

1.1 Lowland Grassland...3

Further Information

- *The Lowland Grassland Management Handbook.*
- See also: *Habitat Management for Invertebrates: a practical handbook.*
  The Upland Management Handbook.

➤ 14.1 Handbooks

- BUTTERFLY CONSERVATION. 1998. *Bracken for butterflies.* Butterfly Conservation, Wareham.
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1.1 Lowland Grassland...4

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➤ 14.3 Journals

AUSDEN, M. & TREWEEK, J. 1995. Grasslands. In: *Managing Habitats for Conservation*, ed. SUTHERLAND, W.J. & HILL, D.A. 197-229. Cambridge University Press, Cambridge.

➤ 15 References

1.2 Wet Grassland

P. Glendell, EN

Wet grasslands are a particular form of lowland grassland found on low-lying land subject to periodic flooding or waterlogging. In addition to being of botanical importance, wet grasslands are particularly valued for their breeding waders and wintering wildfowl. They usually have associated networks of ditches which often contain rare invertebrates.

There are four main types of wet grassland which have developed under differing land management systems. Floodplain grasslands are subject to periodic flooding by rivers and range from near-natural situations such as on the Insh Marshes on the River Spey, Scotland, to the more common situation where rivers have been engineered and flooding is regulated. Washlands, such as the Ouse Washes in East Anglia, are areas which have been specially embanked to provide flood storage. Water meadows, where flooding is controlled to increase the fertility of the land so as to provide early grazing for sheep and a better growth of hay crops, were once common in river valleys in the chalklands of Wiltshire, Hampshire and Dorset. The fourth type exists where the land has been drained but where water levels are highly regulated, as on the Somerset Levels.

Wet grassland which has formed on land reclaimed from saltmarsh is usually referred to as coastal grazing marsh. Those wet grasslands associated with fen vegetation on peat are usually known as fen meadows.

1.2 Wet Grassland...2

Issues

- Natural succession and scrub encroachment due to loss or lack of grazing
- Scrub management
- Use of artificial fertilisers, slurry, farmyard manure, lime, pesticides, veterinary products
- Overgrazing: inappropriate stock type/numbers/timing of grazing
- Supplementary feeding
- Weeds
- Changing farming practices, e.g. move from hay to silage
- Management often dependent on local farming practices
- Organic farming
- Timing of hay cutting
- Timing of grazing to avoid damage to nests
- Drainage
- Water level management
- Pollution and water quality
- Wildfowling
- Disturbance of wintering wildfowl
- Predation of ground-nesting birds
- Abstraction
- Eutrophication
- Sea level rise affecting coastal grazing marshes
- Development in floodplains leading to increased flooding
- Re-creation and restoration

Management Techniques

Grazing	➤ 11 Grazing Management
Mowing and cutting	➤ 5 Vegetation Harvesting ➤ 12 Seed Harvesting
Weed control	➤ 2 Weed Control
Rolling and chain harrowing	
Burning	
Scrub management	➤ 1.12 Scrub
Water level control	➤ 7 Water Level Control
Ditch maintenance	
Management of associated habitats	➤ 1.13 Veteran Trees ➤ 1.9 Standing Water ➤ 1.7 Fen and Reedbed ➤ 1.14 Farmland

1.2 Wet Grassland...3

Practical Problems

✿ Acquiring suitable livestock	➤ 11 Grazing Management
✿ Control of scrub	➤ 4 Scrub Removal and Control
✿ Weed control without the use of herbicides	➤ 2.1 Weed Pulling ➤ 2.4 Hand Tools ➤ 2.5 Infra-Red Control
✿ Sites where grazing is not an option	➤ 5.2 Cut-and-Collect Machines
✿ Removing cut grass on small/remote sites	➤ 5.1 Mini-Balers
✿ Predator control	➤ 8.3 Corvid Control ➤ 9.2 Fox Management ➤ 9.4 Mink Control
✿ Control of invasive alien plant species	➤ 10.10 Canadian Pondweed ➤ 10.12 Floating Marsh Pennywort ➤ 10.13 Australian S. Stonecrop ➤ 10.14 Water Fern (*Azolla*) ➤ 10.15 Least Duckweed
✿ Obtaining specialist machinery	➤ 14.4 Advisory Services

Further Information

The Wet Grassland Guide: managing floodplain and coastal wet grasslands for wildlife.

See also: *The Lowland Grassland Management Handbook.*
Nature Conservation and the Management of Drainage Channels.
Otters and River Habitat Management.
The Water Vole Conservation Handbook.
Waterways and Wetlands: a practical handbook.

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1.2 Wet Grassland...4

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1.3 Lowland Heathland

T. Coleshaw

Lowland heathlands occur on nutrient-poor, sandy, mineral soils below 300 metres and are composed predominantly of heather species, although some are characterised by gorse, grasses, or even lichens. Heaths are often a complex mosaic of acid grassland, bog, standing water and scrub.

There are several distinctive types of heathland which are largely the result of differences in climate and soil characteristics. These range from dry heaths on free-draining soils, e.g. Breckland, to those on waterlogged soils, e.g. some in the New Forest, with transitional types between the two. Lowland heathlands in the English Midlands and northern Britain have similarities with upland heaths (➤ 1.4 Moorland).

Heathland has a very distinctive flora and fauna and many rare species are associated with it, for example the sand lizard. All the other species of British reptile also occur on heathland, as do 60% of British species of dragonfly.

Although some coastal heathlands may have developed purely as the result of salt spray, wind and summer drought, most heathlands are the result of human clearance of forest and grazing. In addition to grazing, heaths were used as a source of fuel (gorse and turf), animal bedding (bracken) and thatch (heather), and were often quarried for underlying stone. In the absence of most of these activities, managers are resorting to techniques which mimic them in order to maintain the habitat. Grazing, however, is a form of traditional management that has been successfully reintroduced on many sites. Fragmentation of the habitat has occurred, particularly in southern England, due to the construction of roads, house building and mineral extraction. Restoration programmes to improve the condition of surviving heathlands are in existence in several parts of the UK, as are a number of schemes to re-create heaths from forestry plantation, arable land and former industrial sites.

1.3 Lowland Heathland...2

Issues

- Agricultural improvement
- Invasive pine from neighbouring plantations
- Bracken and scrub encroachment
- Increased nutrient levels including nitrogen from air pollution
- Fire
- Heather beetle
- Drainage
- Invasive exotic species
- Re-creation and restoration
- New uses for heathland products

Management Techniques

Grazing	➤ 11 Grazing Management
Rabbit management	➤ 9.1 Rabbit Box Traps
Cutting	➤ 5 Vegetation Harvesting
Controlled burning	
Scrub management	➤ 1.12 Scrub
Bracken control	➤ 2.2 Bracken Bruising
Turf cutting	➤ 3.3 Turf Lifting
Nutrient stripping	➤ 3.2 Turf Picking ➤ 3.3 Turf Lifting
Soil disturbance	➤ 3 Bare Ground Creation
Firebreak creation	
Restoring wet heaths	➤ 7 Water Level Control
Re-creation on former mineral extraction sites	
Re-creation on former land-fill sites	

Practical Problems

Control of *Gaultheria shallon*	➤ 10.9 Shallon
Control of birch	➤ 4 Scrub Removal and Control
Acquiring suitable livestock	➤ 11 Grazing Management
Control of bracken without herbicide	➤ 2.2 Bracken Bruising
Removal of cut bracken and heather	➤ 5.2 Cut-and-Collect Machines
Heather seed collection	➤ 12.1 Heather
Scarification on steep slopes	➤ 3.4 Horse Harrow
Fire control	
Removal of brash and stumps	➤ 4.4 Mulching

1.3 Lowland Heathland...3

Practical Problems...continued

- Control of wavy hair and purple moor grass ➤ 3.1 Rotoburying
- Reduction of soil fertility on old arable sites
- Control of rosebay willowherb
- Obtaining specialist machinery ➤ 14.4 Advisory Services

Further Information

- *Habitat Management for Invertebrates: a practical handbook.*
- *The Lowland Heathland Management Handbook.*
- *The Sand Lizard Conservation Handbook.*

  ➤ 14.1 Handbooks

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1.3 Lowland Heathland...4

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1.4 Moorland

P. Glendell, EN

Moorland is land above the upper boundary of enclosed farmland but below the start of the montane zone at around 600 metres above sea level, although it also occurs near sea level in the harsher conditions of the far north and north-west of Scotland.

Moorland is the result of centuries of deforestation, burning and grazing. Soils are usually acid with most showing signs of gleying or podsolisation. The vegetation is often a complex mosaic of habitats consisting of wet and dry heath with heather and other dwarf shrubs, grass moor composed of purple moor grass or mat grass, bracken beds and blanket bog which is a feature of the tops and gentle slopes of many moorlands. Scrub, including gorse on the moors of south-west England, isolated trees and small areas of derelict woodland can also be a part of the moorland landscape. Calcareous grasslands are found in regions with limestone and support a wider range of plants. In areas inaccessible to sheep, such as rock ledges, herb-rich grassland is often able to survive.

Areas of moorland have been lost or degraded through afforestation and agricultural improvement, but despite this and the harsh climatic conditions, moorlands still support a diverse range of plant and animal life with some species such as mountain hare and red grouse being restricted to the habitat or its margins.

Most moorland is managed for either sheep grazing, red grouse, red deer or a combination of these. Cattle are less often found, except in parts of south-west England where grazing by native ponies is also common.

Recreation, mainly walking, is a popular pastime in moorland areas. Moorland management has to integrate the needs of these land uses while maintaining and enhancing a diverse mosaic of habitats.

1.4 Moorland...2

Issues

- Afforestation
- Agricultural improvement: fertilising and liming
- Overgrazing by sheep leading to grass-dominated moor
- Supplementary feeding
- Lack of cattle grazing in some areas
- Overwintering of cattle
- Common land
- High numbers of red deer
- Drainage
- Erosion of peat
- Acid rain
- Heather beetle and other invertebrate pests
- Predation
- Raptors
- Bracken
- *Molinia*
- Lack of burning
- Too frequent burning and bad burning practice
- Summer fires
- Lack of scrub and woodland
- Protection of archaeological sites
- Ticks and tick-borne diseases
- Public access
- Footpath erosion
- Heather restoration
- Wind-farm installations

Management Techniques

Controlled burning	
Heather cutting	➤ 5.2 Cut-and-Collect Machines
Grazing	➤ 11 Grazing Management
Cutting of firebreaks	
Blocking of grips	
Sowing of heather	
Predator control	➤ 8.3 Corvid Control ➤ 9.2 Fox Management
Enhancement of juniper scrub	➤ 1.12 Scrub
Scrub management	➤ 1.12 Scrub
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Woodland management	➤ 1.10 Woodland
Deer management	➤ 9.5 Lightweight Deer Fencing

1.4 Moorland...3

Practical Problems

- ✿ Returning grass to heather
- ✿ Rhododendron ➤ 10.1 Rhododendron
- ✿ Bracken control ➤ 2.2 Bracken Bruising
- ✿ Heather seed collection ➤ 12.1 Heather
- ✿ Encouraging scrub/woodland
- ✿ Obtaining specialist machinery ➤ 14.4 Advisory Services

Further Information

- *The Upland Management Handbook.*
- See also: *Bracken Management Handbook.*
  Drystone Walling: a practical handbook.
  Good Practice for Grouse Moor Management.
  Repairing Upland Path Erosion: a best practice guide.
  Upland Pathwork: construction standards for Scotland.

  ➤ 14.1 Handbooks

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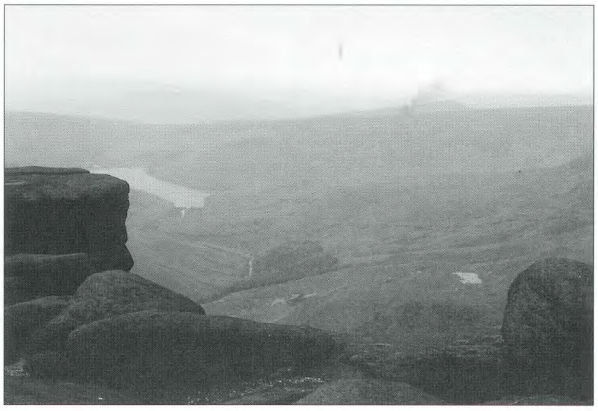
1.5 Montane Zone



T. Coleshaw

The montane zone lies above the natural treeline, which in the British Isles is around 600 metres above sea level. It is a habitat defined almost entirely by climate and the plants and animals found here are those that are capable of surviving a short wet growing season together with a long, cold and snowy winter.

The montane environment includes a range of habitats from the valley bottoms to the mountain summits, although there are few places where this natural zonation is present now, most having been modified by human activity. In a natural transition, valley side woodlands would thin out at the treeline to be gradually replaced by scrub, often including juniper or rare species of arctic-alpine willow. With altitude this in turn gives way to dwarf-shrub heath and grassland. In the harshest conditions on the mountain summits the vegetation, where present, is composed of mosses and lichens with few hardy higher plants.

Additional habitats occurring at a range of altitudes include rock crevices, ledges, screes, streams and pools or lakes. Late-lying snow patches are often present in north-facing corries and these can support characteristic bryophyte and lichen communities. Many of the plants and animals present here are relict arctic-alpine species with the richest areas being on basic rocks such as at Ben Lawers in Scotland. Three species of breeding birds, snow bunting, ptarmigan and dotterel, are confined to the montane zone.

Although natural mountain vegetation is maintained by climate and should require little management, most has been affected by human activities, associated with deer and sheep grazing, burning and drainage. The effects of recreation are usually localised and more easily managed but the less tangible effects of climate change and airborne pollution may be affecting some of the more fragile montane vegetation communities. Balancing all these effects is an important consideration in the management of montane areas.

1.5 Montane Zone...2

Issues

- Overgrazing by sheep and deer
- Concentration of sheep due to lack of shepherding
- Reduction in grazing in areas of common grazing
- Fires spreading from moorland areas
- Hill walking and mountaineering
- Mountain biking
- Skiing
- Inaccessibility
- Funicular railways and ski-lifts
- Acid rain

Management Techniques

- Grazing ➤ 11 Grazing Management
- Deer management ➤ 9.5 Lightweight Deer Fencing
- Management of public access
- Wall and fence maintenance
- Exclosures to allow vegetation development
- Enhancement of scrub ➤ 1.12 Scrub
- Restoration of damaged vegetation
- Non-intervention

Practical Problems

- Footpath repair ➤ 3.3 Turf Lifting
- Fence erection and maintenance
- Getting materials on site
- Shepherding ➤ 11 Grazing Management

Further Information

The Upland Management Handbook.

See also: *Drystone Walling: a practical handbook.*
Fencing: a practical handbook.
Repairing Upland Path Erosion: a best practice guide.
Upland Pathwork: construction standards for Scotland.

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1.6 Bog

P. Wakely, EN

Bogs are peatlands fed predominantly by rainfall and other forms of precipitation. Actively growing bogs are dominated by mixtures of bog mosses (*Sphagnum*), cotton grasses, dwarf shrubs and other plants adapted to nutrient-poor conditions. Bogs can be classified into two main types, raised bog and blanket bog, although intermediate forms also occur.

A raised bog is made up of a domed mire expanse, a more steeply sloping edge or rand, and a surrounding fringe of fen (the lagg), all of which may have formed within a larger wetland. The mire expanse is typically patterned with pools, lawns and hummocks, providing distinct niches for its characteristic flora and fauna.

Blanket bogs occur in the wettest parts of the British Isles, in the west and in the north on the undulating land surfaces and gentle slopes of hard acid rocks. They are composed of acid-tolerant plant communities dominated by *Sphagnum* or cotton grass with bilberry, crowberry and deer grass. Blanket bogs can have a substantial ornithological interest with species which include golden plover, dunlin, greenshank and red-throated diver.

The bog landscape in the British Isles is traditionally treeless, due to past patterns of clearance, burning and grazing. Both lowland raised bogs and blanket bogs have been exploited for their peat for use as a fuel. Drainage for agriculture has affected many bogs and afforestation has led to the destruction or damage of many blanket bogs while the production of peat for horticultural use has had a similar effect on lowland raised bogs. Much of the effort of bog conservation has been directed towards repairing this damage; undamaged bogs should require little management.

Bogs are important as an archive, containing both pollen and archaeological remains, they may play a role in the storage of atmospheric carbon and they act as a sponge in water catchments. These wider values are now more generally appreciated.

1.6 Bog...2

Issues

- Peat extraction: horticultural use or fuel
- Lowering or fluctuation in water table
- Degeneration of drained bogs through lack of management
- Afforestation
- Invasive conifers and birch
- Unnecessary removal of trees from undamaged bogs
- Natural erosion of peat surface
- Grazing and burning
- Drainage and agricultural improvement
- Acidification from atmospheric pollution
- Climate change
- Public access
- Moss gathering
- Eutrophication
- Hydrology of whole system
- Conservation of archaeological interest
- Restoration of damaged sites

Management Techniques

- Grazing ➤ 11 Grazing Management
- Access provision
- Water level control ➤ 7 Water Level Control
- Bunds
- Infilling of ditches
- Pumping
- Revegetating peat surfaces
- Scrub and tree control ➤ 1.12 Scrub

1.6 Bog...3

Practical Problems

- Restoration after afforestation
- Tree and brash removal ➤ 6 Timber Harvesting
- Rhododendron ➤ 10.1 Rhododendron
- Fire control

Further Information

Conserving Bogs: the management handbook.

See also: *Habitat Management for Invertebrates: a practical handbook.*
Peatland Conservation and Management Handbook.
The Upland Management Handbook.

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FACT
FORUM FOR THE APPLICATION OF CONSERVATION TECHNIQUES

Practical Solutions
Equipment, Techniques and Ideas for Wildlife Management

1.7 Fen and Reedbed

P. Glendell, EN

Fens are wetlands, often forming deposits of peat, which receive their water and nutrients from the soil, rock and groundwater as well as from rainfall.

The classification of fens is complex but there are two broad hydrological types. In topogenous fens the water supply is via the land surface (flooding) while in soligenous fens it is from seepage. In individual examples the influences are often mixed and rainfall makes a direct contribution in all of them. Fens can also be classified as poor or rich depending on the nature of their water supply. Rich fens are associated with base-rich conditions, often chalk or limestone, while poor fens are associated with acid conditions.

Fens are often found in close association with bogs, for example in the ladder fens of blanket bogs and the laggs of raised bogs.

Reedbeds are a type of fen dominated by stands of common reed. The water table is at or above ground level for most of the year and reedbeds often incorporate ditches and areas of open water. They represent one type of transition from open water to dry land and can be found on the margins of lakes and in estuaries. Extensive areas of reedbed occur in East Anglia, Lancashire, Anglesey and Tayside and the habitat is particularly noted for its distinctive birds, including bittern, marsh harrier and bearded tit.

Both fens and reedbeds have been harvested in the past for a variety of products: peat for fuel; reed, rush and saw sedge for thatching; mixed vegetation for animal fodder, bedding and grazing; and willow for baskets. Many of these traditional uses have declined or died out with the notable exception of the thatching industry which has grown and requires large amounts of reed. This, together with the growth in the use of constructed reedbeds as aids to water treatment, has helped in the revival of managed reedbeds. Reedbeds and fens are both considered useful in the wider issue of floodplain management and flood control.

1.7 Fen and Reedbed...2

Issues

- Lack of traditional management
- Rising sea levels causing increased salinity in coastal areas
- Drying out
- Scrub encroachment
- Water abstraction and drainage
- Agricultural run-off
- Enrichment
- Water quality and supply
- Choice of hydrological regime
- Creation of open water
- Creation of reedbeds
- Restoration/re-creation
- Timing of hay cutting

Management Techniques

- Fen meadow management ➤ 1.2 Wet Grassland
- Grazing ➤ 11 Grazing Management
- Burning
- Scrub control ➤ 1.12 Scrub
- Reed cutting: winter or summer
- Saw sedge (*Cladium*) cutting
- Ditch maintenance
- Sealing boundary to prevent water loss
- Nutrient removal
- Water level control and distribution ➤ 7 Water Level Control
- Pumping
- Turf pond creation
- Coppicing of carr woodland ➤ 1.10 Woodland
- Open water creation and management ➤ 1.9 Standing Water
- Reed litter layer removal
- Reed layering and planting

1.7 Fen and Reedbed...3

Practical Problems

- Starling roosts in commercial reedbeds ➤ 8.1 Bird Scaring
- Removal of cut reed in non-commercial reedbed
- Shortage of water
- Cutting non-usable fen vegetation ➤ 5.3 Wetland Harvesters
- Obtaining specialist machinery ➤ 14.4 Advisory Services

Further Information

Habitat Management for Invertebrates: a practical handbook.

Nature Conservation and the Management of Drainage Channels.

Reedbed Management for Commercial and Wildlife Interests.

Waterways and Wetlands: a practical handbook.

Wetland Restoration Manual.

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1.8 Rivers

P. Glendell, EN

Rivers are dynamic systems which in their natural state undergo constant modification in form with a diverse range of features including riffles, pools, shingle beds, sand bars and bankside vegetation.

Rivers vary according to factors such as slope, altitude, geology and climate, which in turn affect the plant and animal life that they support. Fast-flowing upland rivers, usually on acidic rocks, are characterised by little aquatic vegetation but with a diversity of stoneflies, mayflies and caddisflies which support salmon and brown trout. Lowland rivers on the other hand are slow flowing and are dominated by higher plants and coarse species of fish. Chalk rivers are fed from groundwater aquifers which give rise to clear water, regular flows and constant temperatures and so often support important plant and animal communities.

Very few rivers in Britain have not been modified, either directly, to improve drainage and navigation, or indirectly by changes in adjoining land use. Many have been canalised by straightening, deepening and the removal of bankside trees. Such work has affected the natural patterns of seasonal water flow and sediment transport. Most are managed as fisheries with the manipulation of natural fish stocks and introduction of alien species.

Lowland rivers have long been used as a communications network and many were linked by the building of connecting canals during the industrial revolution. Built to transport goods, their main use is now recreational, being popular sites for boating, angling and walking. They also act as green corridors running from the countryside into urban areas.

There has been a change in approach to the management of rivers, and techniques have been developed which integrate the needs of flood defence and land drainage with those of wildlife, amenity and fisheries management. There is also an increasing awareness that rivers should not be managed in isolation but as part of their overall catchment.

1.8 Rivers...2

Issues

- Physical modification: canalisation, dams and reservoirs
- Land drainage and flood defence works
- Use of piling and hard engineering
- Over-dredging
- Weed cutting
- Overgrazing of banks
- Coarse woody debris
- Excessive groundwater and surface water abstraction
- Water transfer schemes between rivers
- Navigation
- Catchment land use
- Development in the floodplain
- Sedimentation
- Diffuse agricultural pollution
- Sewage inputs
- Industrial pollution
- Acidification from conifer plantations
- Recreation
- Angling and fisheries management
- Decline in salmon and trout populations
- Manipulation of coarse fish stocks
- Use of grass carp in canals
- Signal crayfish
- Zander
- Invasive plant species
- Mink
- Beavers
- Restoration
- Creation of floodplain forests
- Management of the riparian zone

1.8 Rivers...3

Management Techniques

- Creation of buffer strips
- Phosphate stripping
- In-channel engineering: dredging, etc.
- Bank engineering: re-profiling, etc.
- Construction: weirs, revetments, etc. ➤ 7 Water Level Control
- Aquatic vegetation establishment and management
- Bank vegetation establishment and management
- Scrub establishment and management ➤ 1.12 Scrub
- Tree establishment and management ➤ 1.13 Veteran Trees

Practical Problems

- Mink control ➤ 9.4 Mink Control
- Alien plant control ➤ 10.5 Giant Hogweed
  ➤ 10.6 Himalayan Balsam
  ➤ 10.8 Japanese Knotweed
  ➤ 10.12 Floating Marsh Pennywort
- Reducing use of herbicides
- Reducing grazing on banks ➤ 11 Grazing Management
- Obtaining specialist machinery ➤ 14.4 Advisory Services

Further Information

The New Rivers & Wildlife Handbook.

See also: *Chalk Rivers – nature conservation and management.*
Farming and Watercourse Management: a good practice handbook.
Freshwater Fisheries and Wildlife Conservation – a good practice guide.
Habitat Management for Invertebrates: a practical handbook.
Manual of River Restoration Techniques.
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1.9 Standing Water

P. Wakely, EN

Standing water includes ponds, lakes, flooded pits, and reservoirs. These are classified according to the amounts of nutrients available to support plant growth, and range from the highly productive eutrophic, through mesotrophic and oligotrophic to dystrophic which has the lowest levels of production. The amount of calcium carbonate dissolved in the water defines some lakes such as marl lakes, and acidic lakes on lowland heathland.

Ponds are small areas of standing water and can be natural or man-made. Natural ponds, because of their size, tend to be temporary features being subject to infilling by sediment. Some natural ponds dry out in summer (e.g. turloughs in Ireland and meres on Breckland), providing a habitat for rare plants and invertebrates. Man-made ponds were created for a variety of uses such as watering livestock, the provision of fish, industrial use, and for ornament. Many ponds today have been created for nature conservation reasons as they can quickly add to the wildlife interest of an area. This and their accessibility often make them suitable for educational use.

Natural lakes occupy depressions in the land which are often the result of glacial action. Many are therefore found in the uplands of the north and west of the British Isles. Some of the larger lakes such as Loch Neagh and Loch Leven are important sites for wintering wildfowl while others contain rare species of fish such as vendace, schelly and charr.

The amount of open water in Britain has been increased by the flooding of gravel, clay and peat pits, and the building of reservoirs. To some extent these have compensated for the loss of natural lakes and ponds but in some cases their creation has damaged other existing wildlife habitats.

Recreation is a major feature in the use of many natural and man-made lakes today, and the management of this, together with the maintenance of water quality, is often the most important element in the conservation of this habitat.

1.9 Standing Water...2

Issues

- Natural succession
- Siltation caused by ploughing for forestry or reseeding of pasture
- Agricultural run-off causing eutrophication
- Pesticides
- Acidification of upland lakes by conifers and atmospheric pollution
- Water abstraction
- Exotic species, e.g. signal crayfish, Canada goose, zebra mussel
- Invasive plant species, e.g. *Crassula helmsii*
- Fluctuation of levels caused by hydro-electricity generation, and in reservoirs
- Grazing of shores
- Fish farming
- Wildfowling
- Angling and stocking of fish
- Boating and water skiing
- Educational use of ponds
- Shading of margins by trees

Management Techniques

- Conifer removal from banks of lakes ➤ 6 Timber Harvesting
- Use of barley straw to inhibit growth of algae
- Dredging and shore profiling
- Shelter belts to reduce wind and wave action
- Recreational zoning
- Pond creation
- Planting
- Grazing of shores
- Vegetation management
- Water level control ➤ 7 Water Level Control
- Use of sediment traps on inflows

1.9 Standing Water...3

Practical Problems

- ✿ Wave protection on reservoirs and flooded pits
- ✿ Control of vigorous native species
- ✿ Disposal of cleared vegetation off-site
- ✿ Control of invasive alien plant species
  - ➤ 10.10 Canadian Pondweed
  - ➤ 10.12 Floating Marsh Pennywort
  - ➤ 10.13 Australian S. Stonecrop
  - ➤ 10.14 Water Fern (*Azolla*)
  - ➤ 10.15 Least Duckweed
- ✿ Overgrazing of margins ➤ 11 Grazing Management
- ✿ Canada goose control ➤ 8.2 Canada Goose Control
- ✿ Mink control ➤ 9.4 Mink Control
- ✿ Obtaining specialist machinery ➤ 14.4 Advisory Services

Further Information

- *The Pond Book: a guide to the management and creation of ponds.*
- *Gravel Pit Restoration for Wildlife: a practical manual.*
- See also: *Freshwater Fisheries and Wildlife Conservation – a good practice guide.*
  Ponds, Pools and Lochans: guidance on good practice in the management of small waterbodies in Scotland.
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1.10 Woodland

P. Wakely, EN

In primeval times much of Britain was probably tree-covered. However the wildwood has been modified by centuries of human activity and much has now been cleared. Most of today's woodland can be categorised either by its species composition, e.g. upland oakwood, by its age, e.g. ancient, or by its management, e.g. coppice.

Ancient woodlands are thought to have the closest links with the wildwood; some may never have been cleared for agricultural use and all have had at least 400 years of woodland cover. These woods are often marked by the presence of indicator species such as wood anemone which are slow to colonise the more recent secondary woodlands that are usually regarded as having a lesser value for conservation.

Amongst the management categories, high forest is woodland where trees are grown on long cycles to provide larger-diameter timber. A distinct type of high forest is the result of the planting of large areas of exotic conifers, particularly in the uplands, during the twentieth century. Coppice on the other hand is woodland where areas are cut on a short rotation to provide small-diameter wood. A third category of management, wood-pasture, is distinguished by the presence of grazing animals (➤ 1.11 Wood-Pasture and Parkland).

Most woodlands have been managed for timber at some stage in their history. In addition to timber production, many woods, particularly on small estates and farms (➤ 1.14 Farmland), have also been used for game management. Today, conservation and recreation are also important uses and the multi-purpose community forests which are being planted in many urban fringe areas represent the latest phase in the history of British woodland.

1.10 Woodland...2

Issues

- Long time-scale of management
- Balancing timber production with conservation
- Management of derelict coppice and small woods
- Markets for small/low grade timber
- Damaging nature of some forestry operations
- Public reaction to felling
- Recreation
- Community woodland
- Lack of natural regeneration
- Provenance of seed for planting
- Windblow
- Fire in conifer plantations
- Acid rain and other pollution
- Conifers causing acidification of streams
- Lowering of water table in wet woodlands
- Disease, e.g. Dutch elm disease, *Phytophera* in wet woodlands
- Effects of released pheasants
- Effects of grey squirrel, deer and rabbits
- Sheep grazing in upland woods
- Exotic tree species
- Reduction of herbicide use in forest management
- Deadwood
- Non-intervention
- Restoration of ancient woodland by removal of conifers
- Creation of 'new' ancient woodland
- Restructuring of conifer plantations

Management Techniques

- Encouragement of natural regeneration ➤ 3.4 Horse Harrow
- Planting
- Crop/tree protection by fencing or tree guards
- Weeding, cleaning, brashing, pruning
- Coppicing
- Singling/layering of coppice
- Thinning
- Veteran tree management ➤ 1.13 Veteran Trees
- Felling
- Timber extraction

1.10 Woodland...3

Practical Problems

✿ Timber harvesting in small woods	➤ 6.1 Mini-Forwarders
✿ Timber harvesting on steep slopes	➤ 6.3 Self-Extracting Trailer ➤ 6.4 Horse Logging
✿ Disposal of brash	➤ 6.2 Tracked Chippers
✿ Deer control	➤ 9.5 Lightweight Deer Fencing
✿ Rabbit control	➤ 9.1 Rabbit Box Traps
✿ Grey squirrel control	➤ 9.3 Grey Squirrel Control
✿ Rhododendron control	➤ 10.1 Rhododendron
✿ Reducing use of pesticides	
✿ Obtaining specialist machinery	➤ 14.4 Advisory Services

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- *The Dormouse Conservation Handbook.*
- *Forestry Practice Guides – The management of semi-natural woodlands.*
- *Habitat Management for Invertebrates: a practical handbook.*
- *Managing Rides, Roadsides and Edge Habitats in Lowland Forests.*
- *Restoring and Managing Riparian Woodlands.*
- *Tree Planting & Aftercare: a practical handbook.*
- *The Upland Management Handbook.*
- *Veteran Trees: a guide to good management.*
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1.10 Woodland...4

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1.11 Wood-Pasture and Parkland

P. Wakely, EN

Wood-pasture is woodland in which grazing plays, or has played, an important role in the use of the land. Examples can be found across the whole range of woodland types from lowland mixed-broadleaf to native pinewood (➤ 1.10 Woodland). Parkland is an extreme form of wood-pasture where open ground is dominant and trees are widely spaced.

In addition to parkland there are three broad types of wood-pasture: the remnants of medieval forests such as the New Forest, wooded commons which are most frequent in the lowlands, and winter-grazed woods in the uplands. Medieval forests were generally used for hunting and the production of venison, with some trees often managed by pollarding to provide small-sized wood. Some forests and wooded commons were enclosed to create parks, many of which were landscaped in the seventeenth and eighteenth centuries. In Scotland parks are known as policies.

Wood-pasture and parks are characterised by open-grown veteran trees, commonly oak and beech. Birch and sessile oak often dominate winter-grazed woods in the uplands and in some mountain areas open hawthorn or juniper scrub represents a miniature form of wood-pasture.

Several schemes are active to restore this habitat by the removal of secondary woodland, the restoration of veteran trees and the reintroduction of grazing. The management of associated habitats is an important element in the management of wood-pasture and parkland.

1.11 Wood-Pasture and Parkland...2

Issues

- Landscape in parkland
- Public safety in parkland
- Economics of park management
- Conversion of parkland to arable
- Pasture improvement: herbicides, ploughing, reseeding, fertiliser, liming
- Undergrazing and overgrazing
- Nitrogen enrichment from overstocking
- Conversion to other forms of woodland, e.g. high forest
- Natural regeneration in presence of grazing
- Lack of continuity of veteran trees
- Seed provenance for replacement trees
- Lack of management of veteran trees
- Removal of deadwood
- Air pollution
- Common rights
- Over-enthusiastic restoration

Management Techniques

- Tree planting and protection
- Maintaining veteran trees and deadwood ➤ 1.13 Veteran Trees
- Tree graveyards in landscape parks
- Grazing ➤ 11 Grazing Management
- Control of thistle, bracken and other weeds ➤ 2 Weed Control ➤ 2.1 Weed Pulling ➤ 2.3 Weed Wiping
- Bracken management ➤ 2.2 Bracken Bruising
- Deer management ➤ 9.5 Lightweight Deer Fencing

Practical Problems

- Allowing natural regeneration within grazed woodlands ➤ 11 Grazing Management
- Control of bracken around and under trees ➤ 2.2 Bracken Bruising
- Control of rhododendron ➤ 10.1 Rhododendron
- Weed control without the use of herbicides ➤ 2.1 Weed Pulling
- Obtaining specialist machinery ➤ 14.4 Advisory Services

1.11 Wood-Pasture and Parkland...3

Further Information

- *The Birch Woodland Management Handbook.*
- *Forestry Practice Guides – The management of semi-natural woodlands.*
- *Tree Planting & Aftercare: a practical handbook.*
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1.12 Scrub

P. Wakely, EN

Scrub can be defined as vegetation composed of either native or non-native shrubs and tree saplings, ranging from scattered bushes to closed canopy vegetation, usually less than five metres tall, occasionally with a few scattered trees. Scrub in the British Isles is often a transitional stage in the natural succession to woodland. It can be part of a primary succession on cliffs/screes or in quarries but is more commonly found as part of a secondary succession after the abandonment or a relaxation of grazing, burning, cutting or cultivation. There are, however, also situations where natural succession proceeds no further than the scrub stage due to exposure, altitude or the absence of a tree seed source.

Scrub occurs in a range of habitats and there are many distinctive types, including carr in wetland, and birch and gorse on heathland. In addition to native shrubs, there are numerous naturalised species such as rhododendron, many of which are very invasive (➤ 10 Problem Species – Alien Plants).

Because scrub represents change in a habitat, it has often been regarded solely as a problem, to be prevented or controlled. However, it is an important component of many habitats, adding to the range of animal species present, particularly invertebrates and birds. In the uplands it is rarely considered a conservation problem; there is generally a need to conserve the rare scrub communities that are present here. With the exception of exotic species, the emphasis is now on 'scrub management' which embraces conservation and enhancement, as well as control and clearance.

1.12 Scrub...2

Issues

- Often regarded as of low conservation value
- Imprecise knowledge of ecological role of scrub; difficult to set objectives
- Often regarded as both a nuisance and beneficial on the same site
- Causes build-up of soil nutrients
- Damages or obscures archaeological and geological features
- Public perception of scrub as untidy
- Public perception of scrub control as damaging

Management Techniques

Grazing	➤ 11 Grazing Management
Cutting	➤ 4.4 Mulching ➤ 5.2 Cut-and-Collect Machines ➤ 6.2 Tracked Chippers
Herbicide treatment	➤ 2.3 Weed Wiping
Burning	
Raising water levels to kill scrub	➤ 7 Water Level Control
Uprooting	
Bulldozing and scraping off topsoil	
Layering to enhance scrub	
Coppicing	

Practical Problems

Stump removal	➤ 4.1 Stump Grinding
Control without the use of herbicide	➤ 4.2 Root Cutting ➤ 4.3 Stump Lifting
Disposal of uprooted scrub	➤ 6 Timber Harvesting
Establishing grazing after scrub control	➤ 11 Grazing Management
Control of suckering species	
Control of regrowth from cut stumps	➤ 2.3 Weed Wiping ➤ 4.2 Root Cutting
Removal of brash on sites with poor access	➤ 6.2 Tracked Chippers
Control of alien species, e.g. rhododendron	➤ 10.1 Rhododendron ➤ 10.2 Sea Buckthorn ➤ 10.9 Shallon
Obtaining specialist machinery	➤ 14.4 Advisory Services

1.12 Scrub...3

Practical Problems...continued

- ✿ Encouraging scrub development in presence of rabbits, deer, livestock
  - ➤ 9.1 Rabbit Box Traps
  - ➤ 9.5 Lightweight Deer Fencing
  - ➤ 11 Grazing Management

Further Information

- *Habitat Management for Invertebrates: a practical handbook.*
- *The Lowland Grassland Management Handbook.*
- *The Scrub Management Handbook* – in preparation.
- *The Upland Management Handbook.*

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FACT
FORUM FOR THE APPLICATION OF CONSERVATION TECHNIQUES

Practical Solutions

Equipment, Techniques and Ideas for Wildlife Management

1.13 Veteran Trees

P. Wakely, EN

A veteran tree is a tree that is of interest biologically, culturally or aesthetically because of its age, size or condition. Some trees are instantly recognisable as veterans but many are less obvious. Old trees would have been common in the wildwood but many of today's veteran trees started life as 'working trees', being cut at intervals to provide fuel and raw materials. Continuity of ownership on many estates allowed trees to survive where they were often incorporated into designed landscapes. In other situations common land rights, reverence for the trees, or the fact that they were simply too big to fell enabled them to persist.

Deer parks, wood-pastures, commons, village greens, old orchards, hedgerows, riversides and, in the case of ancient yews, churchyards, are all places where veteran trees may be found. Due to their varied management history veteran trees exist in many forms including pollards, coppice stools, bundles (where several trees were planted together in one spot), and maiden trees.

Fungi play a fundamental role in the ecology of veteran trees, producing the wood decay relied on by numerous invertebrates, many of which depend totally on veteran trees. They are also often important for their rare lichens and roosting bats.

In the past the conservation value of veteran trees was often overlooked. Today, there is a recognition that the tree is not an isolated ageing organism but a complex habitat for a multiplicity of fungi, plants and animals. This understanding extends beyond the tree to its soil environment and the neighbouring habitat. Veteran tree management therefore embraces not only that of the trees themselves but also of the surrounding land.

1.13 Veteran Trees...2

Issues

- Safety and risk management
- Unskilled or inappropriate tree surgery
- Unnecessary felling
- Neglect
- Rapid changes in water table levels
- Fire
- Vandalism
- Pollution
- Soil compaction
- Disease
- Lack of a new generation of old trees
- Removal of standing dead trees and deadwood
- Isolation and fragmentation of populations of trees
- Shading and the development of secondary woodland
- Landscape restoration in parklands
- Inappropriate management of surrounding land, e.g. ploughing, liming, application of fertiliser

Management Techniques

Tree

- Tree surgery for maintenance
- Tree surgery for restoration
- New techniques, e.g. coronet cuts
- Mulching
- Exclusion of grazing animals ➤ 11 Grazing Management
- Exclusion of ploughing
- Exclusion of people and cars to reduce compaction
- Retention of deadwood

Surrounding Land

- Clearance of competing trees ➤ 6 Timber Harvesting
- Creation of new pollards
- Retention of deadwood
- Artificial creation of deadwood
- Planting of replacement trees
- Management of grazing animals ➤ 11 Grazing Management
- Planting of nectar-bearing shrubs ➤ 1.12 Scrub
- Glade and ride management in woodland ➤ 1.10 Woodland
- Creation and management of linear features in farmland ➤ 1.14 Farmland

1.13 Veteran Trees...3

Practical Problems

- Control of bracken around and under trees ➤ 2.2 Bracken Bruising
- Control of rhododendron around trees ➤ 10.1 Rhododendron
- Tree surgery in sites with no access for work platforms
- Obtaining specialist machinery ➤ 4.4 Advisory Services

Further Information

Veteran Trees: a guide to good management.

See also: *Habitat Management for Invertebrates: a practical handbook.*
Tree Planting & Aftercare: a practical handbook.

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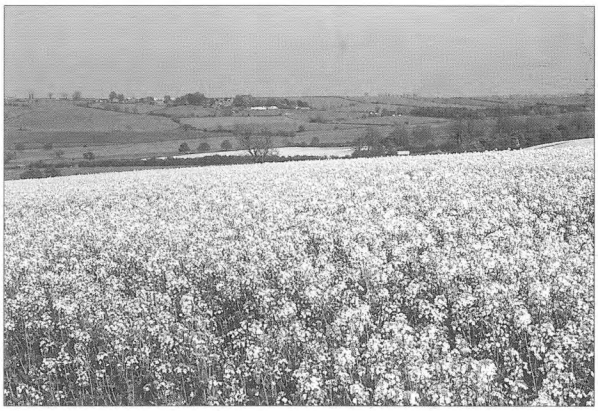
1.14 Farmland



P. Wakely, EN

Farmland makes up much of the countryside and although it encompasses the full range of habitats, the features described here are predominantly those of lowland farmland, such as arable land and hedgerows, which are not covered in other sections.

The distinctive pattern of fields, divided by hedges, banks, or walls, and dotted with small woods and other features, is often an ancient landscape, particularly in the west and north of the British Isles. Elsewhere it is generally more recent, dating from the enclosures of the eighteenth and nineteenth centuries. Mixed farming with both grassland and arable cropping was once common in this landscape but farming has undergone massive changes, particularly since the Second World War.

Developments in mechanisation, drainage, artificial fertilisers and pesticides have allowed the abandonment of rotations and under-sowing, the conversion of permanent pasture to temporary grass leys, and a switch from hay to silage. These changes have led to greater specialisation and a polarisation of farming with arable becoming dominant in the east and pasture land in the west. As well as a general degradation of the farmland habitat there has also been a direct loss of associated habitats through pond filling, woodland fragmentation, hedgerow removal and the drainage of wet meadows.

Despite intensification, arable farmland is still an important habitat for species such as corn bunting, grey partridge, brown hare and rare flowers including pheasant's-eye and cornflower. Conservation management on farmland has aimed to assist these and other species by reversing some of the negative impacts of intensification and specialisation.

Efforts have been directed at managing set-aside for wildlife, re-establishing lost habitats, and managing field margins and other habitat corridors. The growth in organic and integrated farming systems is also offering opportunities for improving the farmland environment.

1.14 Farmland...2

Issues

- Shift to winter cropping and loss of winter stubbles
- Reduction in rotation of cereal crops with other land covers – leys etc.
- Reduction in area of under-sown cereals
- Earlier spring and autumn cultivation
- Block cropping
- Soil erosion and run-off
- Decline in use of root crops in stock-rearing areas
- Broad-spectrum weed killers
- Land drainage
- Increased stocking rates
- Increase in silage making
- Use of Ivermectin
- Sheep dip
- Hedgerow neglect
- Too frequent cutting and badly timed cutting of hedges
- Spraying and fertilising of hedge bottoms
- Loss of hedgerow trees
- Field sports
- Retention of existing habitats
- Creation of structural and species diversity
- Fitting conservation work into the farming year
- Habitat corridors
- Set-aside management
- Minimum cultivation
- Integrated farming systems
- Organic farming systems

Management Techniques

- Management of livestock ➤ 11 Grazing Management
- Retention of cereal stubble
- Spring sowing of cereals with under-sown grass
- Establishment of grass rides and tracks
- Planting of game and wildlife cover crops
- Creation of wildlife strips (grass, cultivated, fallow)
- Conservation headlands
- Beetle banks
- Ditch management
- Hedgerow planting, management and restoration
- Creation of herb-rich meadows ➤ 1.1 Lowland Grassland

1.14 Farmland...3

Management Techniques...continued

- ✿ Pond creation and restoration ➤ 1.9 Standing Water
- ✿ Planting and management of woodland ➤ 1.10 Woodland
- ✿ Planting and management of scrub ➤ 1.12 Scrub
- ✿ Planting and management of individual trees ➤ 1.13 Veteran Trees
- ✿ Game management
- ✿ Pest control ➤ 8 Problem Species – Birds
  ➤ 9 Problem Species – Mammals

Practical Problems

- ✿ Sterile brome and cleavers
- ✿ Suckering blackthorn from hedges
- ✿ Notifiable weeds ➤ 2 Weed Control
- ✿ Pesticide drift ➤ 2.3 Weed Wiping
- ✿ Minimising the use of pesticides ➤ 2.1 Weed Pulling
  ➤ 2.3 Weed Wiping

Further Information

Farming & Wildlife: a practical management handbook.

See also: *Drystone Walling: a practical handbook.*
A Farmer's Guide to Hedgerow and Field Margin Management.
Farming and Watercourse Management: a good practice handbook.
The Good Hedge Guide.
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FACT

FORUM FOR THE APPLICATION OF CONSERVATION TECHNIQUES

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2 Weed Control

Currently, the commonest methods of weed and vegetation control are chemical control by spraying and topping (mowing). Alternative methods which may be more acceptable or more effective on land of wildlife importance are summarised below and detailed later in this section.

1 Weed Pulling

A non-herbicide technique for removal of ragwort, thistles, nettles and other tall weeds where a height differential has been created between the weeds and non-target species by earlier grazing.

2 Bracken Bruising

A non-herbicide technique particularly designed to bruise the stems of bracken. Reduces the number and vigour of stems in the following year. Can assist in movement of deep litter, aiding breakdown and decay.

3 Weed Wiping

A technique for applying narrow-spectrum herbicides to tall weeds, using hand-held, pedestrian, ATV or tractor-mounted applicators which 'wipe' herbicide on to weeds. Requires a height differential between target and non-target species.

4 Hand Tools

Modern versions of traditional tools for weed extraction.

5 Infra-Red Control

A technique which utilises infra-red heat to control weeds.

Eco-puller *Alvan Blanch*

Bracken breaker *J. Bacon*

Eco-wipe *J. Bacon*

JCB 1999
Revised TMC 2001

2.1 Weed Pulling

Eco-puller *Alvan Blanch*

Purpose

Originally developed as a technique to mimic the hand pulling of ragwort, it has since been found to be effective on other species, including spear thistle and nettle. In species with rhizomatous root systems which are not completely removed, pulling weakens the plants by reducing the supply of nutrients necessary for the development of buds on the roots and rhizomes. This method can result in a year-on-year reduction of up to 35% in the vigour and number of flowering stems for perennial species.

Advantages

- Suitable technique for land of organic status.
- Prevents seeding of current year's flowering stems.
- Removes all above-ground portion of stems including the basal area which can give rise to coppice bud regrowth.
- Pulling of biennial weeds (common ragwort and spear thistle) removes rosettes and root material, reducing risk of conversion to perennial growth habit.

2.1 Weed Pulling...2

Limitations

- Non-selective – all tall plant material will be pulled. Problem can be alleviated by spring and early summer grazing to create a height differential between target weeds (which are generally avoided by stock) and other plant species.
- Portions of stem missed by puller may produce weak regrowth.
- Because of its toxicity, pulled ragwort must be collected up and disposed of safely.
- The flowering stems need to be allowed to toughen before pulling takes place.
- Docks do not pull easily and then only when flower stalks have toughened and set seed.

Caution

Many weed species are important food and nectar sources for insects and other invertebrates. Consideration should be given to undertaking control operations in a manner that does not totally eradicate these sources, e.g. by leaving some plants to flower in suitable locations.

Further Information

BACON, J. & OVERBURY, T. 1998. Pulling tall weeds. *enact* **6 (2)**. 7-9.

➤ 14.3 Journals

Manufacturers

Currently only one known machine.

1. **Alvan Blanch Eco-Puller**
   Developed in conjunction with English Nature and the
   Royal Agricultural College, Cirencester.
   Alvan Blanch, Chelworth, Malmesbury, Wiltshire SN16 9SG
   Tel: 01666 577333
   Fax: 01666 577339
   Email: david.abbott@alvanblanch.co.uk
   Website: www.alvanblanch.co.uk

2.2 Bracken Bruising

Brian Otterburn Bracken Breaker *J. Bacon*

Purpose

The technique of bracken bruising has been used for many decades in rural areas of the UK. By knocking down, bruising or crushing the stem in several places along its length the plant 'bleeds' sap from its damaged cells. This induces desiccation and reduces the supply of nutrients for the development of the following year's dormant buds on the roots and horizontal rhizomes. A reduction in the number and vigour of the following year's stems of up to 50% can be achieved, depending on weather and soil conditions. The original machines developed for this purpose were concrete or metal rollers with bruiser bars attached to give bruising intervals of 100 mm to 150 mm along the bracken frond. Current designs follow this principle but incorporate additional handling features.

Advantages

- Eliminates the need for herbicide use, therefore suitable technique for land of organic status.
- By bruising the stem rather than severing it completely (as with a flail) the plant is weakened to a significantly greater degree.
- The machines are simple and robust and require minimal maintenance, a major advantage over flails and cutters on rough terrain.
- Control operations are not weather dependent.
- The action of the machine can also assist with movement and more rapid decay of deep bracken litter.

2.2 Bracken Bruising...2

Limitations

Timing can be critical, although some reduction in vigour will be achieved at any time during the active growing period. The optimal time is just after the bracken fronds have fully expanded, i.e. when the plant has expended its stored energy but before it has started to recharge storage organs for the following year.

Caution

Bracken bruising is potentially damaging to other wildlife. Care should be taken not to disturb ground-nesting birds, their nests, eggs or unfledged young, reptiles, fallen trees and rotting timber, especially if these might support important fungi or wood-boring insects.

Further Information

LEWIS, N. et al. 1997. Bracken breaking – a bruising battle. *enact* **5 (3)**. 19-22.

➤ 14.3 Journals

Manufacturers

Apart from various farm-built machines there are currently three known machines on the market designed especially for wildlife sites.

1. **Brian Otterburn Bracken Breaker**
   A low-profile machine developed in association with English Nature, the Royal Agricultural College, the Veteran Tree Initiative and the Ancient Tree Forum. Three-point linkage mounted tractor version and smaller one-, two- or three-unit version for use with ATVs and mini-tractors.
   B Otterburn, Harome, York YO6 5JE
   Tel: 01439 770265
   Fax: 01439 770525

2. **Landbase Bracken Bruiser**
   Two models for use behind ATVs, tractors or heavy horses.
   P Gotham, Landbase, Mount Pleasant, Stoneyford, Colaton Raleigh, Sidmouth, Devon EX10 0HZ
   Tel/Fax: 01395 567880
   or **T Hannah, Landbase, Batstone Cottage, East Budleigh, Devon EX9 7DT**
   Tel: 01395 443826

3. **Heavy Horses Bracken Basher**
   Horse-drawn model available for purchase or contract hire.
   Heavy Horses, D Joiner, Pencraig, Pant-y-Dwr, Rhayader, Powys LD6 5LL
   Tel/Fax: 01597 870239

2.4 Hand Tools

Lazy Dog weed puller *J. Bacon*

Purpose

Traditionally, hand tools were used for small-scale control of many weed species. Common tools, e.g. spades and mattocks, were widely used but for species such as thistles, ragwort and docks, specific tools designed to pull out roots were often developed. These traditional tools can occasionally be found at farm sales and antique markets but are also available new from specialist manufacturers.

Advantages

- Eliminate need for herbicide use, therefore suitable technique for land of organic status.
- No machinery involved, therefore fewer constraints of access or ground conditions.
- Suitable for use by volunteers and less-skilled operators.
- Control is not weather dependent.

2.4 Hand Tools...2

Limitations

- Large infestations may be beyond the use of hand tools, even when used by a team of people.
- Effectiveness may be dependent on ground conditions – tap roots may break in hard, dry soils.

Further Information

BACON, J. 2000. Weed control... with a Lazy Dog. *enact* **8 (4)**. 19-20.

➤ 14.3 Journals

Manufacturers

1. **Lazy Dog Tools**
   A range of well-engineered hand tools for the control of ragwort, thistles and docks. Can also be used for uprooting small tree saplings.
   Lazy Dog Tools, Hill Top Farm, Spaunton, Appleton le Moors, North Yorkshire YO62 6TR
   Tel/Fax: 01751 475866

2. **The Rag-Fork**
   A long-handled fork, specifically designed for pulling ragwort.
   Rag-Fork, 110 Sunderland St, Tickhill, Doncaster DN11 9ER
   Tel: 01302 750407
   Fax: 01302 750345
   Email: sales@rag-fork.co.uk
   Website: www.ragfork.com

2.3 Weed Wiping

Eco-wipe *J. Bacon*

Purpose

Developed as an alternative technique to hydraulic spraying of tall grassland weeds. Enables precise targeting of herbicide to weeds without contaminating surrounding, shorter vegetation. Latest models are more efficient than first-generation machines but are unlikely to give better results than spraying. Control levels of 70-95% can be achieved provided care is taken to optimise treatment conditions.

Advantages

- Applies herbicide only to target species with no effect on surrounding vegetation.
- No risk of spray drift (but volatilisation may be a problem with some herbicides in hot weather conditions).
- Operations are not as weather dependent as for spraying. Most of the herbicide is applied to the underside of the leaves, protecting it from rain and reducing the risk of wash-off pollution.
- Where the weed cover is not 100%, less herbicide is used.
- Low volumes of water are required – helpful in remote situations.
- Weed wiping has a better public image than spraying.

Limitations

- Requires the creation of a height differential between the weeds and other species by earlier grazing.
- Some weeds may be harder to kill after flower stalks have been produced.
- Skill and care are required for optimal results.
- Wide tractor tyres may flatten some weeds, reducing contact with the wipe heads.

Caution

Many weed species are important food and nectar sources for insects and other invertebrates. Consideration should be given to undertaking control operations in a manner that does not totally eradicate these sources, e.g. by leaving some plants to flower in suitable locations.

2.3 Weed Wiping...2

Further Information

BACON, J. 1996. Weed Wipe Notes (Technique Overview, Operator's Guide and Choosing the Herbicide). Unpublished.

➤ 14.2 Leaflets

BACON, J. 1994. A prickly problem. *enact* **2 (1)**. 12-15.

BACON, J. 1995. Removing the prickles. *enact* **3 (2)**. 10-11.

BACON, J. & OVERBURY, T. 2000. Pedestrian and scrub wipers. *enact* **8 (4)**. 4-5.

➤ 14.3 Journals

Manufacturers

1. **Allman Eco-Wipe**
   Rough-terrain, ground-hugging model developed in conjunction with English Nature and the Royal Agricultural College. Suitable for tractor or ATV towing, available in 2.0 m, 3.3 m and 4.6 m widths. Scrub-wiping version and single unit pedestrian (rickshaw) machine also available. **E Allman & Co Ltd, Birdham Road, Chichester, West Sussex PO20 7BT**
   Tel: 01243 512511 **Fax:** 01243 511171
   Email: sales@allman-sprayers.co.uk **Website:** www.allman-sprayers.co.uk

2. **Weedswiper**
   Tractor version 4.7 m adjustable, ATV version 2.3 m adjustable. Only machine currently fitted with automatic feedback control of pad wetness. **Available on hire from Interfarm UK Ltd, Kinghams Yard, 36 Newgate Street, Doddington, March, Cambridgeshire PE15 0SR**
   Tel: 01354 741414 **Fax:** 01354 741004 **Email:** sales@interfarm.co.uk
   Website: www.interfarm.co.uk

3. **Rolla Weed**
   ATV carpet wiper, 2.4 m in width. **Port Agric Ltd, Dene Farm, Mark Cross, East Sussex TN6 3PD Tel:** 01892 783424 **Fax:** 01892 782063

4. **Contact 2000**
   Trailed models, 1.5 m, 2.5 m and 3.0 m in width. **Logic Manufacturing, Foundry Industrial Estate, Bridge End, Hexham, Northumberland NE46 4JL**
   Tel: 01434 606661 **Fax:** 01434 608143 **Email:** sales@logic.gb.com

5. **Carier Rollmaster**
   1.2 m, 2.0 m, 3.0 m and 6.0 m wide models which can be fitted to a three-point linkage, trailed or fitted to a long-reach arm. Dedicated models for bracken and forestry work. **Carier Rollmaster Ltd, East Street, Braintree, Essex CM7 3JL**
   Tel: 01376 331025 **Fax:** 01376 552562 **Email:** rollmaster@carier.co.uk

6. **Mobile Cord**
   Three-point linkage mounted model, 7 m wide. **Mattro UK, Crossways, Cockfield, Bury St Edmunds, Suffolk IP30 0LN Tel:** 01284 828888 **Fax:** 01284 828173
   Email: geoff.avis@virgin.net

JCB 1999
Revised TMC 2001

2.5 Infra-Red Control

Infra-red weed burner *Thermoweed*

Purpose

The use of infra-red heat technology for weed control as an alternative to chemicals has been widely practised in Holland for over 20 years. Unlike flame guns which use large amounts of energy to incinerate the weeds, this technology utilises propane-fired burners to briefly expose plants to a stream of hot air, causing the cell walls to burst and the plants to wither. Development so far has been largely aimed at municipal parks/gardens and the horticultural industry but the technology merits trialling on wildlife conservation sites.

Advantages

- Eliminates need for herbicide use, therefore suitable technique for land of organic status.
- More efficient use of energy than flame throwers.
- No disturbance to soil (thereby avoiding creation of potential new seedbed).
- Control is not weather dependent.

2.5 Infra-Red Control...2

Limitations

- Larger versions are non-selective, therefore unsuitable for controlling individual weeds within a sward.
- Limited penetration below soil level. A regular programme of control is therefore required and regrowth may occur from deep-rooted species.

Further Information

Product information available from UK importers.

Manufacturers

1. **The Hoaf Weedmaster and Weedstar Series**
   A range of wheeled, pedestrian-controlled and tractor-mounted burner/blowers. Also a hand-held model for spot-treatment of docks, nettles and ragwort and a version designed for heather burning.
   UK Importers: Thermoweed, Fourways, Snape, Saxmundham, Suffolk IP17 1SH
   Tel: 01728 689015
   Fax: 01728 687520
   Email: thermoweed@compaqnet.co.uk
   Website: www.thermoweed.com

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3 Bare Ground Creation

The creation of bare ground on wildlife sites may be desirable for a number of reasons, including the stimulation of dormant seeds, the preparation of seedbeds and as important habitat for warmth-loving invertebrates and reptiles. Previous methods have included the use of rotovators, excavators and scrapers to completely remove the upper layers of vegetation and soil. Three alternative techniques have now been developed which reduce the volume of spoil and subsequent cost of disposal plus a horse-drawn harrow for ground scarification in situations where motorised equipment cannot be used.

1 Rotoburying

An economical technique which uses stone-burying machines from the landscaping industry to bury grasses, turf and humus to a depth of 15–20 cm. No spoil is created by this operation.

2 Turf Picking

The use of stone-picking machines to cut and lift turves, separate from the soil and collect in a tipping hopper. A useful technique where nutrient burial is unacceptable.

3 Turf Lifting

In some parts of the UK, e.g. the New Forest, the lifting of turves was traditionally undertaken with a turbary spade. A mechanised version of this is now available, in the form of an attachment for a walk-behind power unit which cuts grass and heath turves for manual rolling-up and lifting. Useful on uneven terrain and with coarse vegetation.

4 Horse Harrow

A horse-drawn harrow for ground scarification in situations where motorised equipment cannot be used.

Blec Blecavator *D. Briggs*

Saga Dan Green Master *J. Bacon*

Classen Sod cutter *J. Bacon*

JCB 1999

3.1 Rotoburying

Blec Blecavator *D. Briggs*

Purpose

A technique for the creation of bare ground which has been borrowed from the landscaping industry. Stone-burying machines are used to bury grasses, turf and humus to a depth of 15–20 cm and leave a bare ground surface. The rotoburiers are similar in principle to rotovators except that they rotate against the direction of travel, throwing material up and over the rotating cylinder to a sifting screen behind. Stones and turf hit the screen and fall into the trench which is then backfilled with the soil passing through the screen. The technique is particularly suitable for creating bare ground for invertebrates and reptiles and for the regeneration of grass-dominated heaths.

Advantages

- Most of the vegetation is buried, leaving a bare ground surface.
- Nutrients associated with turf and humus layers are buried 15–20 cm deep, out of the reach of seedling roots.
- Dormant seeds in the seed bank may be exposed and brought to the surface where they have a greater chance of germination.
- Produces a good seedbed for subsequent sowing of collected seed.
- Minimal cost compared with traditional methods as there is no spoil to remove (£50–£200 per ha compared with up to £2000 per ha with an excavator).

Limitations

- Mixing of soil horizons may be unacceptable on some sites, e.g. sites with archaeological interest.
- Nutrients may remain, at least temporarily, in the lower soil horizons. These can be reduced by removing vegetation and surface litter prior to burying.
  ➤ 5 Vegetation Harvesting

3.1 Rotoburying...2

Limitations...continued

- Rotoburiers work best on light soils and may be less efficient on very wet or waterlogged soils.
- A tractor of at least 100 hp is required to power these machines. The weight of this outfit may be unacceptable on wet sites without twin or cage wheels.
- The seedbed created by the rotoburier may be liable to invasion of unwanted species, e.g. birch.

Caution

Always ensure that this operation will not cause damage to archaeological sites and reptile populations before commencing work.

Further Information

ENGLISH NATURE. 1998. *Management of bare ground on dry grasslands and heathlands.* English Nature, Peterborough.

WALSALL MBC. 1996. *Soil surveys at Pelsall North Common and Brownhills Common*. Walsall MBC.

➤ 14.2 Leaflets

BACON, J. 1996. Tussling with turves. *enact* **4 (2)**. 12-16.

➤ 14.3 Journals

Manufacturers

1. **Blec Blecavator**
   A series of robust machines, trialled in association with English Nature and the Royal Agricultural College. Available in widths of 1.4–2.3 m with adjustable sieve which allows variation in the size of material buried. **Blec Landscaping Equipment Company Ltd, Global Centre, Spalding Road, Deeping St James, Lincolnshire PE6 8SD Tel:** 01778 346222 **Fax:** 01778 346777
   Email: sales@blec.co.uk **Website:** www.blec.co.uk

2. **Kilworth RotoBurier**
   A selection of machines, ranging from light-duty machines for use with 2-wheeled tractors to a heavy-duty, 3 m wide model suitable for tractors of >70 hp. **Kilworth, Annwell Lane, Smisby, Ashby de la Zouch, Leicestershire LE6 5TA**
   Tel: 01530 412690 **Fax:** 01530 560002 **Email:** kilworth@btinternet.com
   Website: www.kilworthmachinery.co.uk

3. **Rotadairon RX Stoneburiers**
   A range of heavy-duty machines, from 1.3 m to 3 m in width. **Available from: Turfmech, New Road Industrial Estate, Hixon, Stafford ST18 0PJ**
   Tel: 01889 271503 **Fax:** 01889 271321 **Email:** sales@turfmech
   Website: www.turfmech.co.uk

JCB 1999
Revised TMC 2001

3.2 Turf Picking

Saga Dan Green Master *J. Bacon*

Purpose

A machine and technique borrowed from the landscaping industry which utilises stone-collecting machines to 'pick' turves. A horizontal blade is lowered into the upper soil horizons to skim and lift turves on to a screening and shaking bed which separates turf from soil. The soil falls back to the ground under the machine whilst the turves are elevated into a tipping hopper for disposal. The technique should be considered in preference to the use of scrapers and excavators but only after the use of stone buriers has been ruled out.

➤ 3.1 Rotoburying

Advantages

- The shaking out of soil from the lifted turves reduces the weight and volume of material which has to be composted or dumped by up to two thirds compared to similar excavator or scraper operations. Disposal costs are correspondingly reduced.
- The shaking of the turves helps return dormant seed to the soil surface.
- Nutrient-rich material is completely removed from the soil.

Limitations

- Collected material has to be disposed of by composting or dumping.
- Stones are collected as well as turves.
- Mixing of soil horizons may be unacceptable on some sites, e.g. sites with archaeological interest.
- The machines work best on light soils and may be less efficient on wet or waterlogged soils.

3.2 Turf Picking...2

Limitations...continued

- A tractor of at least 100 hp is required to power these machines. On wet sites the weight of this outfit may be unacceptable without twin or cage wheels.
- The seedbed created by the picker may be liable to invasion of unwanted species, e.g. birch.
- Use of this machine up and down steep slopes should be avoided to minimise the risk of soil erosion.

Caution

Always ensure that this operation will not cause damage to archaeological sites before commencing work.

Further Information

ENGLISH NATURE. 1998. *Management of bare ground on dry grasslands and heathlands.* English Nature, Peterborough.

WALSALL MBC. 1996. *Soil surveys at Pelsall North Common and Brownhills Common*. Walsall MBC.

➤ 14.2 Leaflets

BACON, J. 1996. Tussling with turves. *enact* **4 (2)**. 12-16.

➤ 14.3 Journals

Manufacturers

Examples of machines currently on the market include the following:

1. **Saga Dan Green Master**
   Designed as a stone picker, this machine can pick stones and turves in the range of 25 mm to 250 mm in diameter, working at a depth of 10 cm. Available in widths of 1.1 m to 1.6 m with a 1.7 m high tipping facility. Trialled in association with English Nature and the Royal Agricultural College.
   Blec Landscaping Equipment Company Ltd, Global Centre, Spalding Road, Deeping St James, Lincolnshire PE6 8SD
   Tel: 01778 346222
   Fax: 01778 346777
   Email: sales@blec.co.uk
   Website: www.blec.co.uk

3.3 Turf Lifting

Classen SC-18 Sod cutter *J. Bacon*

Purpose

This technique makes use of a small, low-priced machine to create small and irregularly shaped areas of bare ground for habitat improvement work. Can also be used for cutting turves for re-laying on re-creation projects or path repair work. The machinery has been adapted for small-scale use on uneven terrain and with coarse vegetation. Attached to a small walk-behind power unit, the reciprocating blade cuts underneath grass or heath turves at depths of 3–7 cm. Turves can be rolled up for relocation or composting. Humus and nutrients are also removed by being locked up in the turf.

Advantages

- Even-sized and shaped turves cut quickly and efficiently to required thickness with minimum effort.
- Turves easy to roll up for removal for composting, re-use or disposal.
- Adjustable turf thickness allows re-use on path repairs according to site conditions.
- Small walk-behind machine is easy to use with semi-skilled labour.
- Dual wheels and cleated tyres give extra grip and stability on uneven ground.
- Low capital outlay for a very flexible working system.

3.3 Turf Lifting...2

Limitations

- Cutting blade may be forced out of the ground by large stones and tree roots.
- Although designed for rough terrain and tough vegetation this machine does not cope well with all situations and may struggle, for example, with dense mats of rush or *Molinia*.

Further Information

ENGLISH NATURE. 1998. *Management of bare ground on dry grasslands and heathlands.* English Nature, Peterborough.

➤ 14.2 Leaflets

BACON, J. 1999. A new turf lifter. *enact* **7 (3)**. 20-21.

➤ 14.3 Journals

Manufacturers

Only one known specialist rough-terrain machine currently on the market:

1. **Classen SC-18 Sod Cutter**
   A small 5 hp, walk-behind machine, specially developed and adapted in association with English Nature. The machine has dual wheels and cleated tyres for maximum grip and stability on uneven ground and is fitted with a 45 cm blade that cuts turves 3–7 cm thick at the rate of about 10 metres per minute.
   Blec Landscaping Equipment Company Ltd, Global Centre, Spalding Road, Deeping St James, Lincolnshire PE6 8SD
   Tel: 01778 346222
   Fax: 01778 346777
   Email: sales@blec.co.uk
   Website: www.blec.co.uk

3.4 Horse Harrow

HRH Horse Harrow *J. Bacon*

Purpose

A lightweight harrow that has been designed to be dragged behind a heavy horse on heathland rehabilitation sites. Where the needle carpet has been left behind after the removal of conifers, the harrow scarifies the ground to release seed from the seed bank and to provide improved germination conditions. It is designed for use in situations where motorised equipment cannot gain access due to the steepness of the terrain, undulating ground, or the presence of remaining tree stumps, rocks and boulders.

Advantages

- A low-tech, sustainable solution to overcome access problems on some heathland sites where scarification of the litter layer is required.
- Horses can pick their way through a minefield of stumps, boulders, ridges and ditches.
- The harrow's special design ensures flexing over contours and bending around obstacles.
- Access on steeply sloping sites is not weather dependent.
- Robust, economical to purchase and maintain.
- Produces a good seedbed for brought-in seed.

3.4 Horse Harrow...2

Limitations

- Requires a heavy horse!
- Compared with mechanised techniques, the ground area covered per hour is low.
- The effectiveness of the operation is reduced if brash remains on the ground surface.

Further Information

BACON, J., JOINER, D. & WALL, T. 1999. Back to purple with heavy horses. *enact* **7 (4)**. 4-5.

➤ 14.3 Journals

Manufacturers

Only one known manufacturer.

1. **The Heathland Rehabilitation Heavy Horse Harrow**
   Available for purchase or contract hire.
   Heavy Horses, D Joiner, Pencraig, Pant-y-Dwr, Rhayader, Powys LD6 5LL
   Tel/Fax: 01597 870239

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4 Scrub Removal and Control

Ideally, scrub should be controlled by the browsing activities of suitable livestock but in many situations grazing is not possible or is insufficient to prevent scrub development. Whilst cutting followed by herbicide application can prevent regrowth, the technique often produces poor results and many managers are now looking for better mechanical techniques, especially where the application of herbicides is undesirable, e.g. for use on organically registered land. The following are some recent developments in mechanical techniques.

NB. This fact sheet does not deal with techniques that only cut off stems at or near to the ground and which allow regrowth, e.g. chainsaws, clearing saws and horizontally operating blade or chain flails. A large variety of such machines are already available and widely used.

1 Stump Grinding

Portable stump grinders which are suitable for the control of small-diameter shrubs and tree saplings on rough terrain.

2 Root Cutting

A new development which utilises a specially adapted chainsaw to cut shrub and tree sapling roots.

3 Stump Lifting

Adapted use of a tree nursery root-balling machine which uses a root-cutting blade to sever shrub and tree sapling roots close to the stump, enabling complete shrub and stump removal with minimal disturbance of the ground.

4 Mulching

The use of proprietary forestry mulchers to knock down and chip standing shrubs and small trees and also to grind stumps down to ground level.

Root-cutting chainsaw *J. Bacon*

Holmac root-baller *J. Bacon*

Berti Ecoforestal *J. Bacon*

JCB 1999

4.1 Stump Grinding

Husqvarna portable stump grinder *J. Bacon*

Purpose

A non-herbicide technique for the removal of shrub and tree sapling stumps to prevent coppice regrowth and the need for repeated cutting operations. Soil disturbance is minimal. The grinder comprises a chainsaw body fitted with a toothed grinding wheel instead of the normal wood-cutting chain. The saw body is fitted to a small trolley to enable controlled use on rough terrain for the grinding of stumps of small-diameter shrub and tree saplings. Successive passes over the stump may be required until all bud-producing parts of the stump have been removed.

Advantages

- Removes the need for repeated treatment of coppice regrowth.
- A non-herbicide technique that is acceptable on organic sites.
- Portable, lightweight pedestrian trolley enables use on most habitats including hillsides and wet terrain.
- Low capital cost.
- Utilises equipment (chainsaw body) likely to be already owned by land managers.

4.1 Stump Grinding...2

Limitations

- ✿ Rather slow if used on stumps with a diameter greater than 10 cm.
- ✿ Trolley needs to rest on ground near to stump.
- ✿ High noise levels as for a chainsaw.

Manufacturers

An example of a small, portable machine currently on the market is described below.

1. **Husqvarna 272S Portable Stump Grinder**
   A portable grinder with 72 cc engine as used on the 272K chainsaw.
   Used with a trolley which has a folding handle for transport.
   Husqvarna Forest & Garden, Oldends Lane Industrial Estate,
   Stonedale Road, Stonehouse, Gloucestershire GL10 3SY
   Tel: 01453 822382
   Fax: 01453 826936
   Website: www.husqvarna.co.uk

   A range of larger, petrol-driven portables and tractor-mounted stump grinders are also available but fall outside the scope of this handbook.

4.2 Root Cutting

Root-cutting chainsaw equipment *J. Bacon*

Purpose

A specially adapted chainsaw that allows the cutting of shrub and tree sapling roots below ground level for the clinical removal of small stumps. Successive cuts are made around the stump to sever all roots at a depth which ensures that all bud-producing material is removed with the stump, thereby preventing regrowth. The saw can be used with care in a range of soil types including chalk, limestone, sand/gravel and peat.
The equipment, which was originally developed by Husqvarna in Japan, comprises a chainsaw body fitted with a sealed clutch to prevent ingress of dirt and a specially modified guide bar which has been drilled to increase oil flow. The chain has carbide-capped teeth which can be sharpened in the field using a rechargeable drill equipped with a diamond-tipped bit.

Advantages

- Eliminates coppice regrowth on a wide range of tree and shrub species.
- A non-herbicide technique that is acceptable on organic sites.
- Fully portable in all habitat situations as with a standard chainsaw.
- Equipment allows extended use of existing chainsaws with minimal additional cost.
- Low capital cost.

4.2 Root Cutting...2

Limitations

- Cannot be used where there are embedded flints or hard pebbles or rocks which will damage chain teeth.
- Wear and tear on guide bar and chains is more than with a standard wood-cutting chain and replacement costs will be greater.
- Additional training of operators and protective clothing and equipment are required, including a full (not mesh) visor.
- Some species, including willow, poplar, privet, blackthorn and dogwood, may send up shoots from remaining roots, thereby necessitating further treatment.

Further Information

BACON, J., NEWMAN, N. & OVERBURY, T. 1998. Modernising the mattock. *enact* **6 (4)**. 15-18.

➤ 14.3 Journals

Manufacturers

1. **Husqvarna 371 Root Cutting Chainsaw**

   A chainsaw with specially adapted clutch, guide bar and chain for cutting roots below the ground surface.
   Availability: see below

   Supply of this equipment was originally delayed whilst CE approval was obtained for marketing the equipment in the UK. Although this has now been granted, Husqvarna do not feel that sales volumes would justify marketing the product in Europe. English Nature has consequently contracted the Royal Agricultural College and other partners to further develop the initiative, including the securing of a manufacturer, production of maintenance schedules, safety advice and training modules. At the time of going to print (June 2001) field trials have just recommenced and it is hoped that the equipment will be available in late 2001.
   Marketing and sales information, when complete, will be available from: John Bacon, English Nature, PO Box 25, Church Stretton, Shropshire SY6 7WL.
   Fax: 01694 723101 **Email:** jbacon7586@aol.com

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4.3 Stump Lifting

Holmac Root-balling machine *J. Bacon*

Purpose

Tree nurseries use several different machines for the lifting of trees for replanting in amenity situations. These involve the undercutting or root-balling of soil and roots with a curved, vibrating blade which traverses through 180° cutting through small roots as it passes underneath the stump. Trials have shown that one machine, the Holmac root-balling machine, can be used with its smallest diameter root-cutting blade to sever shrub and tree sapling roots close to the stump to enable complete stump removal, including all bud-producing material, with minimal disturbance of the ground.

Advantages

- Removes the need for repeated treatment of stump or coppice regrowth.
- A non-herbicide technique that is acceptable on organic sites.
- Use of a small, 30 cm diameter blade causes minimal disturbance of the ground around the stump, reducing or eliminating subsequent weed infestations in bare ground.
- Can be used to remove shrubs and small tree saplings with stems attached in one operation or to remove stumps left behind after earlier chainsaw operations.
- No root plates to remove, therefore reduced disposal costs.
- Can be used in chalk, limestone, sand/gravel, peat and other soil types provided large embedded stones or rocks are not present.

4.3 Stump Lifting...2

Limitations

- A heavy machine (1080 kg) on fairly narrow rubber tracks producing a ground pressure of 0.32 kg/sq cm, so may not be suitable for wet or boggy sites.
- Blade wear or damage may occur in soils with hard stones or rocks.
- High capital cost.
- Although a tracked machine, it cannot currently traverse slopes greater than 1 in 3.
- Suitable only for shrub and small tree sapling stump roots of up to 7 cm diameter at 30 cm depth.
- Some species, including willow, poplar, privet, blackthorn and dogwood, may send up shoots from remaining roots, thereby necessitating further treatment.

Further Information

BACON, J., NEWMAN, N. & OVERBURY, T. 1998. Modernising the mattock. *enact* **6 (4)**. 15-18.

➤ 14.3 Journals

Also see: www.plantoregon.com

Manufacturers

1. **The Holmac HZC 16-22 Root-balling machine**
   A 91 cm wide machine equipped with a 16 hp water-cooled diesel engine and 30 cm diameter cutting blade.
   MJF (sole UK Agents), Machinelaan, Chiddingfold Road, Dunsfold, Surrey GU8 3PB.
   Tel: 01483 200711
   Fax: 01483 200699.
   Email: sales@m-j-f.co.uk
   Website: www.m-j-f.co.uk

4.4 Mulching

Universal forestry mulcher *J. Bacon*

Purpose

The new generation of vertically acting hammer and toothed cylindrical flails generically known as forestry mulchers are now being widely used in the forestry industry for the flailing of brash and scrub. Trials with these machines on wildlife management operations have shown that they are sufficiently robust not only to knock down and chip standing shrubs, small trees and stumps but also to grind stumps down to ground level. This greatly reduces the potential for coppice regrowth. On soils where there are no large rocks the machine can grind stumps to a depth of 5 cm into the soil thereby further reducing coppice bud formation. These machines are likely to have particular application in heath rehabilitation schemes following the removal of conifer timber to break down the brash, grind the stumps and create a seedbed in one or sometimes two passes. The machines are also ideal for cutting out fence lines through dense scrub.

Advantages

- Heavy-duty machines that can reduce dense scrub (including 15 m high rhododendron) to matchsticks and grind stumps to a depth of 5 cm into the soil.
- 3 in 1 operation on heath rehabilitation sites to pulverise brash, grind stumps and produce a seedbed in one or two passes.

Limitations

- PTO-driven versions require heavy, high-powered tractors from 80 to 145 hp for medium-duty machines, rising to 200 hp for heavy-duty mulchers. The combined weight of these outfits may make them unsuitable for boggy sites, unless a tracked power unit is used.
- Seedbed preparation not possible on soils with large embedded stones and rocks because of likely excessive wear to machine.
- High capital outlay and high wear rates on abrasive soils reflected in high hourly rates charged by contractors.

4.4 Mulching...2

Further Information

BACON, J. 1999. Back to purple with mean machines. *enact* **7 (2)**. 4-6.

➤ 14.3 Journals

Manufacturers

1. **Universal Forestry Mulcher**
   Various machines, including models with fixed teeth and swinging hammers.
   JPS & Sons Machinery Ltd (sole importing UK agent), 31 Elm Grove, Maidstone, Kent ME15 7RT.
   Tel/Fax: 01622 205920.

2. **Berti Ecoforestal 1400 to 2500**
   Heavy-duty models with swinging hammers or fixed teeth.
   Lamberhurst Engineering Ltd (sole importing agent), Priory Farm, Lamberhurst, Tunbridge Wells, Kent TN3 8DS.
   Tel: 01892 890364. **Fax:** 01892 890122. **Email:** lamengltd@aol.com
   Available on contract hire from **Alaska Contracting, Tel:** 01929 463301, **Cloverleaf Groundcare, Tel/Fax:** 01606 76640, and **Gorsebusters, Tel:** 01703 601528.

3. **Vandaele Forestmaster**
   A range of medium-duty mulchers with 1.2, 1.5 and 1.8 m wide models.
   Votex Hereford Ltd, Votex Works, Newtown Road, Hereford HR4 9LN
   Tel: 01432 274361. **Fax:** 01432 352743.
   Email: sales@votex.co.uk **Website:** www.votex.co.uk

4. **Seppi Mulcher**
   Heavy-duty models with fixed teeth and swinging hammers.
   Lamberhurst Engineering Ltd (sole importing agent), Contact details as above.
   Also available on contract hire from **Cloverleaf Groundcare, Tel/Fax:** 01606 76640.

5. **Ahwi Mulchers**
   A range of heavy-duty mulchers, 1.0 to 2.3 m in width for three-point linkage or excavator mounting. Also, self-propelled, tracked models, 150 to 530 hp, with swinging hammers.
   Importers and Contract Hirers: Ascot Tree Services, Graffham, New Road, Holyport, Berkshire SL6 2LQ. Tel/Fax: 01628 777661.
   Tracked model also available for hire from **Kingwell Holdings, Tel:** 01376 550989, **Gristwood & Toms, Tel:** 01923 859500 and **Practicality Brown, Tel:** 01753 652022.

6. **Ryetec Gladiator**
   A range of heavy-duty machines to suit tractors of 90–600 hp. Range includes Variotrac model built with its own tractor (26–520 hp).
   Ryetec Industrial Equipment Ltd, Town Green Lane, Settrington, Malton, N Yorkshire YO17 8NR. Tel: 01944 768232. **Fax:** 01944 768443.
   Email: info@ryetec.co.uk

JCB 1999
Revised TMC 2001

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5 Vegetation Harvesting and Collection

Removal of vegetation is often required on wildlife sites, particularly to prevent aggressive plant species from becoming too dominant. However, narrow access routes, inhospitable terrain, soft ground and often the small size of the site itself may preclude the use of standard agricultural machinery. Special techniques are therefore often required and several low-ground-pressure machines are now on the market.

1 Mini-Balers

Small walk-behind, or mini-tractor-mounted baling machines that produce traditional small oblong or round bales. Originally developed in Europe for alpine meadows, they are now valued on wildlife sites for their light weight and low centre of gravity. They are ideal for baling hay or other vegetation in a variety of sensitive situations.

2 Cut-and-Collect Machines

Small machines that cut and collect vegetation in one operation for removal off-site. The type of cutting head varies from reciprocating blade to vertical flails, with most machines having draught-assisted collection methods.

3 Wetland Harvesters

New, large-capacity, low-ground-pressure, all-terrain harvester machines that can operate on very wet and soft ground to cut and collect or blow material for removal off-site.

Mountain Press baler *R. Southwood*

Long Equipment Hi-tip *R. Long*

Fen harvester *P. Lacey*

JCB 1999

5.1 Mini-Balers

Mountain Press mini-baler *R. Southwood*

Purpose

Originally developed in Europe for baling hay on alpine meadows, these new mini-baling machines, available for fitting either to mini-tractors or to walk-behind power units, are being used for baling hay or other vegetation on sensitive wildlife sites. On these sites small machines are required that are light in weight with low ground pressure and a low centre of gravity. The small bales produced by these machines also facilitate small-scale handling operations using volunteers and small trailers. These mini-balers also have the ability to pick up and remove 'failed' hay or weedy meadow-edge vegetation or even hedge cuttings which could otherwise form a smothering mulch or unwanted nutrient enrichment.

Advantages

- Minimal soil compaction and rutting on sensitive wildlife sites due to low ground pressure and traditionally sized, lightweight bales.
- Suitable for slopes and uneven terrain due to low centre of gravity and light weight.
- Small lightweight bales enable handling by volunteers and untrained staff.
- Small size facilitates use on sites where there is narrow or restricted access and use in small meadows.
- Ability to collect 'failed' hay and other ruderal vegetation reduces smothering and unwanted nutrient enrichment.

5.1 Mini-Balers...2

Limitations

- ✿ Although small in size and having a large appetite for work (< 300 bales per day) they may be considered inefficient for really large sites.

Further Information

BACON, J., HARRIS, S. & SOUTHWOOD, R. 1997. Making hay in a small way. *enact* **5 (2)**. 8-11.

➤ 14.3 Journals

Manufacturers

1. **CAEB Mountain Press MP550**
   A walk-behind mini-baler which produces small round bales.
   Imported by: Ben Burgess & Co, Agricultural Engineers, 38 Europa Way, Martineau Lane, Norwich NR1 2EN.
   Tel: 01603 628251. **Fax:** 01603 762194.
   Also suppliers of CAEB 1700 bale wrapper.

2. **CAEB Mountain Press MP550 TPL and AV550 ATP wrapper**
   Mini-tractor-drawn models.
   Imported by: Rekord Sales (GB) Ltd, Manor Road, Mancetter, Atherstone, Warwickshire CV9 1RJ.
   Tel: 01827 712424. **Fax:** 01827 715133. **Email:** sales@rekord.com
   Also suppliers of CAEB 'Mountainsilos ATP' film binder for silage bales.

3. **Wolvo Super-R500 Super**
   A trailed mini-baler which produces small round bales.
   Imported by: Nutri-Mech UK, Lower Moss Farm, Malpas, Cheshire SY14 7JJ.
   Tel: 01948 860175. **Fax:** 01948 860176.

5.2 Cut-and-Collect Machines

Long Equipment Hi-Tip 2004 *R. Long*

Purpose

Trailed or three-point linkage mounted machines that cut and collect unwanted vegetation in one operation for removal off-site. Most of the machines currently available use vertically operating rotary flails with a variety of flail types to create enough draught to blow the cut material into an associated hopper which then tips or in some other way periodically discharges the collected material.

Advantages

- Operation removes all vegetation growth above a pre-determined height.
- One-pass operation to both cut and collect.
- A varied vegetation structure can be created by selective driving and by adjustment of cutting height.
- Scarifying blades can be used to disturb the soil surface and create a seedbed.

Limitations

- To stand up to high-revolution wear and tear, the machines need to be of a heavy-duty construction which makes them expensive to purchase.
- Wear and tear of flails is excessive on stony ground.
- Scarifying flails cannot be used if the soil contains stones.
- Collected material requires disposal.

5.2 Cut-and-Collect Machines...2

Further Information

BACON, J. 1996. Tussling with turves, *enact* **4 (2).** 12-16.

➤ 14.3 Journals

Manufacturers

1. **The Long Equipment Range**
   A range of cut-and-collect machines, including the RL 2004 trailed high-tip flail cutter or scarifier, the RL 2003, the smaller trailed RL 1502 and the three-point linkage mounted F-M 1501.
   Long Equipment Ltd, Wood Street North, Meadow Lane Industrial Estate, Alfreton, Derbyshire DE55 7EZ.
   Tel: 01773 520301. **Fax:** 01773 521370.
   Email: info@long-equip.co.uk **Website:** www.long-equip.co.uk

2. **The Wessex Range**
   A range of pick-up flail mowers and multi-function collectors/tippers, including the Wessex GR flail mowers and the HTC 18 multi-function collector.
   Wessex Farm Machinery Sales Co, Trading Estate, Oakhanger Road, Bordon, Hampshire GU35 9HH.
   Tel: 01420 478111.

3. **The Amazone Range**
   A range of mowers, scarifiers, collectors and tippers, including the Groundkeeper HD and G models.
   Amazone Ground Care, Blyth Road, Harworth, Doncaster, S Yorkshire DN11 8NE.
   Tel: 01302 751200. **Fax:** 01302 751202.

4. **The Ryetec Range**
   A range of flail mower collectors and scarifiers with choice of emptying methods, including ground-tip and 2 m high-lift models.
   Ryetec Industrial Equipment Ltd, Town Green Lane, Settrington, Malton, N Yorkshire YO17 8NR.
   Tel: 01944 768232. **Fax:** 01944 768443.
   Email: info@ryetec.co.uk

5.3 Wetland Harvesters

Loglogic fen harvester *P. Lacey*

Purpose

A number of new machines are just coming on to the market that are the equivalent of agricultural combine harvesters for the wildlife management industry. They have the capacity to work on large sites to cut and collect vegetation for removal off-site but differ from previous machines in that they are not only specially designed for very-low-ground-pressure work on very wet and boggy sites but they are also self-propelled and have PTO or hydraulic drives to enable the use of cutting, collecting and blowing attachments.

Advantages

- One-pass operation to cut and collect, so minimising compaction damage.
- Very low ground pressure enables work on very wet and boggy sites with minimal damage.
- Large-capacity machines which can cover several hectares in a day.
- Ability to cut very rough, tough vegetation to start reclamation of habitats (e.g. derelict fens).

Limitations

- High capital cost, so purchase may only be justifiable for shared use or by contractors / machinery rings etc.

  ➤ 14.4 Advisory Services/Organisations

- Collected material requires disposal.

5.3 Wetland Harvesters...2

Further Information

LACEY, P. 1999. Going Dutch – a new wetland solution. *enact* **7 (1)**. 19-20.

LACEY, P. & THORLEY, T. 1999. New wetland harvests. *enact* **7 (1)**. 16-18.

➤ 14.3 Journals

ANDREWS, R. 2000. *New Wetland Harvests – final technical report.* Broads Authority, Norwich.

➤ 15 References

Manufacturers

1. **Loglogic Fen Harvester**
   A large, self-propelled, tracked machine with tipper which cuts, chops and collects vegetation. Also a Fen Blower which blows collected material down a pipe and off the site for use or disposal.
   Loglogic, Unit T9, Elm Park, Blundells Road, Tiverton, Devon EX16 4BZ.
   Tel: 01884 243699. **Fax:** 01884 243300.
   Email: loglogic@aol.com

2. **The Wetlandtrack**
   A large, self-propelled, tracked machine with tipper which cuts and collects vegetation. Other implements can be attached.
   WMS Bv, Hoofdweg 199, 8474 CE, Oldeholtpade, Netherlands.
   Tel: (+31) 561 688950. **Fax:** (+31) 561 688951.
   Email: Dolenko@wxs.nl

3. **The Moose**
   An ultra-low-ground-pressure harvester, suitable for large-scale tree and scrub removal from wetland sites. Designed and operated by the Alaska group.
   Alaska Environmental Contracting, Stokeford Farm, East Stoke, Wareham, Dorset BH20 6AL.
   Tel: 01929 463301. **Fax:** 01929 463889.
   Email: will@alaska.ltd.uk **Website:** www.alaska.ltd.uk

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6 Timber Harvesting

The harvesting of timber from very wet or steep sites causes many problems for land managers. Many wildlife sites have timber and timber products which could provide an economic return to help pay for management work if only extraction could be done with minimal collateral damage. This is especially the case where trees have colonised or have been planted on very wet boggy ground or where tree removal is required to manage for earlier stages of plant succession. It is also applicable to woodlands on steep sites where conventional forestry harvesting equipment is too large or too heavy to gain access. There have been several developments in new techniques and revivals of old ones which may provide alternative methods in these situations.

NB. This account does not describe 'sky-line', 'high lead' or 'shute' systems which are widely available within the forestry industry and which provide useful alternatives.

1 Mini-Forwarders

Miniature versions of the large forwarders working in the forestry industry but designed around low-ground-pressure mini-tractors. Although small, they have a very good work rate and timber extraction capability either as whole-tree extraction (with brash attached) or as pole lengths.

2 Tracked Chippers

The chipping of timber products, brash and scrub is a favoured alternative to burning for many managers but most chippers need supports, platforms or skids in order to gain access to wet sites. A number of low-ground-pressure tracked chippers are now on the market.

3 Self-Extracting Trailer

On very steep sites the use of all-terrain vehicles may not be possible for the extraction of timber products. A self-extracting winched trailer for the removal of timber, brash or woodchips from such sites is now on the market.

4 Horse Logging

An effective, quiet and pollution-free method of extraction, of particular benefit on steep or wet terrain, or where damage to the ground/ground flora needs to be minimised.

Vimek Mini-master *J. Bacon*

Arboreater tracked chipper *J. Bacon*

Horse logging *D. Joiner*

6.1 Mini-Forwarders

Vimek Mini-master 101 *J. Bacon*

Purpose

Machines that can pick up and extract whole trees, timber lengths or brash from wet and boggy terrain. They are mini-tractor versions of the larger forestry industry forwarders and are therefore very lightweight and have a very low ground pressure. With dual wheels and a PTO-driven trailer they are also able to traverse vegetation overlying very wet or boggy ground. Loading of trees, timber, brash or scrub is fully mechanised by the use of seven-lever loader arms. Although small, they have a large capacity for work and produce commercially acceptable extraction rates. There are also benefits in their ability to extract timber from woodlands on steep slopes without damage to the soil and to achieve whole-tree extraction of conifers from bogs to enable timber conversion away from the sensitive parts of a site.

Advantages

- The provision of an extraction technique for timber and timber products on wet and boggy sites.
- Small size and light weight result in very low levels of collateral damage during timber extraction operations.
- Commercially acceptable extraction rate of whole conifer trees (with brash attached) to edge of wet and boggy sites using clamp-bunk attachments, enabling sale of products that would otherwise go to waste.
- Use of loader arm and carrying-cage attachment provides an economical technique for the handling of brash and scrub to ensure material is removed and is not left to form a mulch which may result in nutrient enrichment on sensitive sites.

6.1 Mini-Forwarders...2

Limitations

- ✿ Equipment requires a skilled operator to attain economical output.
- ✿ Machine needs to be kept hard at work to repay capital investment.

Further Information

BACON, J. & LORD, B. 1996. Troublesome trees. Taking trees off bogs. *enact* **4 (3)**. 12-15.

➤ 14.3 Journals

Manufacturers

1. **Vimek Mini-Master 101**
   A 4x4 mini-forwarder, loader and powered bogie trailer.
   Imported by: Machinery Sales, 92 Whitelaw Drive, Bathgate EH48 1RJ.
   Tel: 01506 656478.
   Available on contract hire from **D Lewis, Tel:** 01654 761327.

2. **Alstor Mini-Forwarder**
   An 8x8 mini-forwarder, loader and powered bogie trailer.
   Available on contract hire from **Home Forestry, Tel:** 01746 718658 and **Lincolnshire Wood Works, Tel:** 01472 398854.

6.2 Tracked Chippers

Arboreater 140 tracked chipper *J. Bacon*

Purpose

Currently, most chippers are wheeled and need to be run on to wet sites using supports and platforms. This can be time consuming and therefore costly. Several companies now produce self-powered, tracked chippers capable of working on wet, boggy ground, thereby enabling in situ chipping of brash, scrub and other tree products.

Advantages

- In situ processing of timber and scrub waste products on wet, boggy sites.
- Reduction of ground pressure and therefore ground damage.
- A technique that encourages efficient disposal of brash products to prevent mulching and nutrification effects.

Limitations

- Large quantities of bagged chips still need to be moved off-site.
- Expensive to buy, compared with trailed models.

6.2 Tracked Chippers...2

Further Information

BACON, J. & LORD, B. 1996. Troublesome trees. Taking trees off bogs. *enact* **4 (3)**. 12-15.

➤ 14.3 Journals

Manufacturers

1. **Arboreater 200TC**
   Self-powered, tracked chipper with ground pressure of 0.8 lb per sq inch (0.29 kg/cm^2) and capacity of 8 inch diameter timber. Larger model capable of processing 10 inch diameter timber also available.
   Arboreater Brushwood Chippers Ltd, Unit 3, Faygate Business Park, Faygate Lane, Faygate, Nr Horsham, West Sussex RH12 4DN.
   Tel: 01293 852652. **Fax:** 01293 852858.
   Website: www.arboreater.co.uk

2. **Greenmech Trak-Chip TC252 Tracked Chipper**
   Self-powered, tracked chipper with ground pressure of 0.8 lb per sq inch (0.29 kg/cm^2) and capacity of 10 inch diameter timber.
   Greenmech Ltd, The Mill Industrial Park, Kings Coughton, Alcester, Warwickshire B49 5QG.
   Tel: 01789 400044. **Fax:** 01789 400167.
   Email: sales@greenmech.co.uk **Website:** www.greenmech.co.uk

3. **Timberwolf Tracked Chippers**
   A range of petrol and diesel fuelled models with timber capacities of up to 6 inches. Purpose-built road trailers also available.
   ArborPlant, The Log House, Kiln Lane, Binfield Heath, Oxon RG9 4EN.
   Tel: 0118 940 1740. **Fax:** 0118 940 4739. **Website:** www.arborplant.co.uk

6.3 Self-Extracting Trailer

Self-Extracting Trailer-Sledge *J. Bacon*

Purpose

Some sites are extremely difficult to work with conventional machinery. This self-winching, sledging trailer has been developed by the Forestry Commission's Forest Research Technical Development Branch and English Nature to provide a piece of very low weight, low-tech, low-cost equipment for the extraction of timber products where the terrain is inaccessible for standard equipment. The trailer is able to winch itself out on to site for loading and then winch itself back for unloading or hitching directly to a road vehicle. Underslung skids prevent sinking into soft ground. It is suitable for use with volunteers and work parties on sites which are too small, too steep or too soft for the use of standard forestry machinery or other specialist equipment.

Advantages

- Low capital outlay.
- Can be used in association with volunteers and unskilled work parties.
- Can be used on small sites or on difficult ground which is otherwise unsuitable for machinery.

Limitations

- Suitable winching anchors required at each end of the hauling route.
- Maximum load of one tonne.

6.3 Self-Extracting Trailer...2

Further Information

FORESTRY COMMISSION. 1998. Forest Research Technical Development Branch. *Phase 1 Technical Note No. 24/98: Smallwood Extraction Sledge*. Forestry Commission.

➤ 14.2 Leaflets

BACON, J., JONES, D. & VAN LOOCK, S. 2001. The self-extracting sledging-trailer. *enact* **9 (1)**. 20-21.

➤ 14.3 Journals

Manufacturers

1. **Self-Extracting Trailer-Sledge**
   Manufactured to order by:
   M Dickens, Welding and Engineering, Platt Lane, Whixall, Shropshire SY13 2PA. Tel/Fax: 01948 880286.

6.4 Horse Logging

Horse logging *D. Joiner*

Purpose

Horses can be effectively used for the removal of timber, generally first and second thinnings, from a variety of woodland situations where extraction might otherwise be difficult. A wide variety of extraction equipment is used, including chain harnesses, timber arches and horse forwarders. Horse logging can be used either as the sole method of timber extraction or in association with mechanical harvesting systems. In the UK, horse logging is co-ordinated by the British Horse Loggers Specialist Group of the Forestry Contracting Association (for contacts see *Further Information*).

Advantages

- Can be used for extraction on steep ground or wet terrain that is unsuitable for mechanical harvesting systems or on sites where there are few tracks or rides.
- Minimal damage to ground, therefore minimising damage to soil horizons, flora and drainage systems.
- Horses are able to work amongst the standing crop, therefore minimising damage to remainder of timber stand and enabling truly selective thinning to be undertaken, without necessity for racks or line thinnings.
- Horses work quietly and produce no pollution.

6.4 Horse Logging...2

Limitations

- ✿ Limited workload compared with large, modern machinery.

Further Information

- SELLWOOD, N. 1996. Heavy horses – a sure-footed success. *enact* **4 (4)**. 12-14.
- Regular articles appear in *FCA News* and *Heavy Horse World*.

  ➤ 14.3 Journals
- Further information is also available from the British Horse Loggers Specialist Group of the Forestry Contracting Association (Chairman, D Joiner **Tel:** 01597 870239) or via the BHL pages of the FCA website (see below) where details of regional representatives can also be found.

Manufacturers

1. A variety of equipment, generally imported from Scandinavia, is owned and operated by UK contractors. Contractors can be contacted via:
   Forestry Contracting Association Ltd, Dalfling, Blairdaff, Inverurie, Aberdeenshire AB51 5LA.
   Tel: 01467 651368 **Fax:** 01467 651595.
   Email: members@fcauk.com **Website:** www.fcauk.com
2. Equipment can also be purchased from several UK contractors. See advertisements in above journals.

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7 Water Level Control

Water level control is an integral part of management in many wildlife habitats. Traditional wooden dams and sluices can be difficult to install, are notoriously difficult to make absolutely watertight, and have a limited lifespan. Several new products are now on the market which provide alternative choices for dam builders.

1 Plastic Pile Dams

A modern version of the interlocking steel piles used in the construction industry. Constructed from rigid recycled PVC and available in a variety of lengths.

2 Glass-Fibre Dams

Pre-formed glass-fibre reinforced units which bolt together to form an adjustable dam. Easy to install without heavy machinery.

3 Soil Pipe Sluices

Standard lengths of uPVC soil pipe, available from most builders' merchants, which are connected with standard 90° bends to form a simple adjustable sluice.

Plastic pile dam *F. Mawby*

Glass-fibre reinforced dam *F. Mawby*

Soil pipe sluice *T. Coleshaw*

7.1 Plastic Pile Dams

Plastic pile dam *F. Mawby*

Purpose

Interlocking piles of rigid, recycled PVC which are slotted together to form a long-lasting, simple dam. The piles are pushed into the ground with a rubber mallet or tractor, excavator or ATV bucket until at least 50% of the pile is buried below the ditch bottom. The dam can be stiffened with a horizontal rail if required. Ideal for use in peat.

NB. Advice from a consulting engineer should be sought if pile lengths of greater than 3 m are being considered.

Advantages

- Long lasting, will not rot or rust; with anticipated lifespan of over 100 years.
- Piles are light and easy to transport.
- Easy to install using a rubber or wooden mallet or tractor, excavator or ATV bucket.
- Can generally be installed without damaging peat or soil horizons.
- Available in lengths to suit most situations.

7.1 Plastic Pile Dams...2

Limitations

- Roots or underlying sand/gravel may make installation with hand tools difficult.
- Not readily adjustable once installed, although adjustable weirs can be fabricated and attached.
- Dam needs to be flexed slightly against the water pressure to form a 100% seal. This can be difficult to achieve if a horizontal rail is attached. These dams are generally more difficult to seal on shallow drains.
- Will melt in a fire, a severe disadvantage on some sites.

Further Information

MAWBY, F. 1997. Peat dams. *enact* **5 (1)**. 18-19.

➤ 14.3 Journals

Manufacturers

1. **Plastic Piling**
   Rigid, lightweight recycled PVC piling available in lengths of 0.5 m to 8 m. Can be slotted together to give either a Z-ribbed or a stronger box-ribbed configuration.

   HL Plastics, Duffield Road Industrial Estate, Little Eaton, Derby DE21 5EH.
   Tel: 01332 832389. **Fax:** 01332 830867.
   Email: sales@hlplasticsltd.co.uk **Website:** hlplasticsltd.co.uk

2. **Plastic Piles**
   A more flexible, interlocking, recycled PVC pile available in a variety of lengths.

   Recycled Plastics Dept, Environmental Polymer Products, Bold Industrial Park, Neills Road, Bold, St Helens, Merseyside WA9 4TU.
   Tel: 01744 810001. **Fax:** 01744 810626.

7.2 Glass-Fibre Dams

Glass-fibre reinforced dam *F. Mawby*

Purpose

Specially designed for peat bogs, these dams comprise pre-fabricated glass-fibre reinforced cement dam sections that are driven into the ground with a tractor, excavator or ATV bucket and bolted together to form an adjustable dam with spillway. Used where control of water levels is essential.

Advantages

- Water levels are fully adjustable, with plastic weir plate.
- Long lasting, will not rot or rust.
- Easy to assemble and easy to push into peat using a tractor, excavator or ATV bucket. Need to be dug into mineral soil.
- Individual sections which are assembled on site make the unit relatively portable (can be carried by hand over short distances).
- Built-in spillway minimises erosion.

7.2 Glass-Fibre Dams...2

Limitations

- Difficult to install if large roots are present.
- Can be difficult to seal if dug into ground rather than driven.
- Can only be used on ditches up to 1 m in width and 0.6 to 0.7 m in depth.
- Relatively expensive.

Further Information

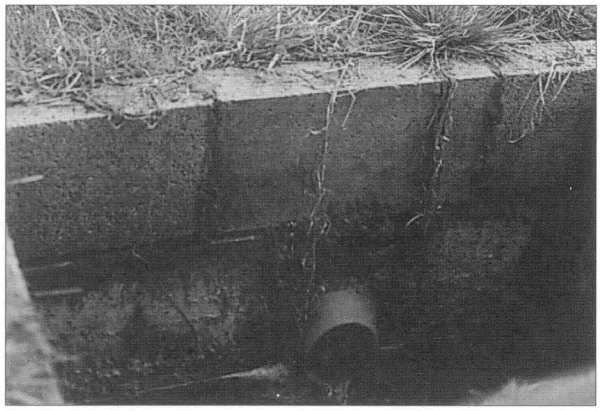
MAWBY, F. 1997. Peat dams. *enact* **5 (1)**. 18-19.

➤ 14.3 Journals

Manufacturers

1. **Glass-fibre reinforced cement dams**
   Pre-fabricated glass-fibre reinforced cement dams with plastic spillway.
   BCM Contracts, Unit 22, Civic Industrial Park, Whitchurch, Shropshire SY13 1TT.
   Tel: 01948 665321. **Fax:** 01948 666381.
   Email: BCMGRC@aol.com

7.3 Soil Pipe Sluices



Soil pipe sluice *T. Coleshaw*

Purpose

Standard lengths of uPVC soil pipe which are buried horizontally in an earth dam within a ditch or drain. With the addition of a 90° bend and a shorter, vertical length of pipe, the level of water can be simply and accurately controlled before it escapes down the pipe. The same principle can be incorporated in sediment chambers and rodding points in underground drains.

Advantages

- Simple to construct and maintain; no need for sluice boards etc.
- Materials are cheap and easy to obtain from most builders' merchants.
- These sluices are very unobtrusive and are therefore unlikely to be tampered with.
- Long lasting, will not rust or rot.
- Wide variety of pipe sizes available (from 100 mm diameter upwards) to suit most situations. Twin pipes can be used if necessary.

7.3 Soil Pipe Sluices...2

Limitations

- Can only be used on ditches and drains with relatively low flow rates (to prevent earth dam overtopping and eroding in flood conditions).
- Vertical pipe needs to be checked regularly to make sure that it is not blocked with leaves or branches.
- The earth dam may need to be fenced against stock to prevent them using it to cross the ditch.

Further Information

COLESHAW, T. 1995. Rising to the water level challenge. *enact* **3 (1)**. 7-9.

➤ 14.3 Journals

Manufacturers

1. **uPVC Soil Pipe**
   Rigid, uPVC soil pipe available in 2 m or 3 m lengths; 100 mm or 150 mm diameter sections are recommended for most situations. **Manufactured by Marley, Osma etc. and available from most builders' merchants.**

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8 Problem Species – Birds

Managers of wildlife sites are charged with managing their sites for identified communities and species but this often necessitates the prevention or reduction of the harmful effects of other species. Reducing the effects of pests can be time consuming and ways of minimising this commitment are under continuous review. This section highlights a few noteworthy recent developments and one recommended, traditional method of control.

1 Bird Scaring

Information is presented on some recent bird scaring devices that are now available and which need wider trial to evaluate under what circumstances and applications they may give beneficial results.

2 Canada Goose Control

A method of catching large numbers of Canada geese is presented.

3 Corvid Control

A description of Larsen trapping, a recommended method of controlling crows and magpies on wildlife sites.

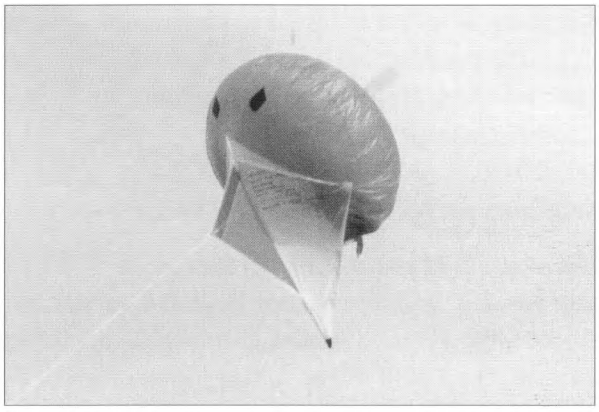
Allsopp Helikite *Allsopp Helikites*

Canada goose cull *English Nature*

Carrion crow *P. Glendell, EN*

JCB 1999
Revised TMC 2001

8.1 Bird Scaring



Allsopp Helikite *Allsopp Helikites*

Purpose

Although wildlife managers are normally involved in encouraging and providing suitable habitat for birds, there are occasions when particular species cause disturbance or damage and need to be scared away from nature reserves or adjacent areas. The agricultural industry has long used various scaring techniques (shooting, rope bangers, floating silhouettes) for preventing damage to agricultural crops and the aviation industry has used 'alarm calls' to good effect at airports. More recently, several new or modified techniques have become available which are being used widely within agricultural situations. There is a need for these to be trialled to ascertain what application they may have in ameliorating management problems on wildlife sites.

Advantages

- Reduced disturbance and improved breeding success of protected bird species.
- Reduced damage to farm crops, e.g. by geese, and therefore less pressure to license the control of protected species.
- Improved relations with adjacent landowners, hopefully leading to more support for establishment of wildlife sites.
- Reduction in staff time or contractor costs on bird scaring activities.

Limitations

- Devices may need frequent maintenance or inspection.
- Devices may only have a temporary effect with the birds becoming habituated and ultimately ignoring the deterrent. Longer habituation periods are generally achieved with scarers which mimic birds of prey.

8.1 Bird Scaring...2

Limitations...continued

- There may be a need for the use of several devices over a period of time.
- Effectiveness may vary according to species.

Manufacturers

1. **The Scary Man Fall-Guy**
   A repeatedly inflating bright red scarecrow with timer, noise production and night illumination, working off a battery.
   Clarretts Ltd, Hollow Farm, Toseland, St Neots, Cambridgeshire PE19 4RU.
   Tel: 01480 476376. **Fax:** 01480 476464.
   Email: enquire@clarretts.com **Website:** www.clarretts.com

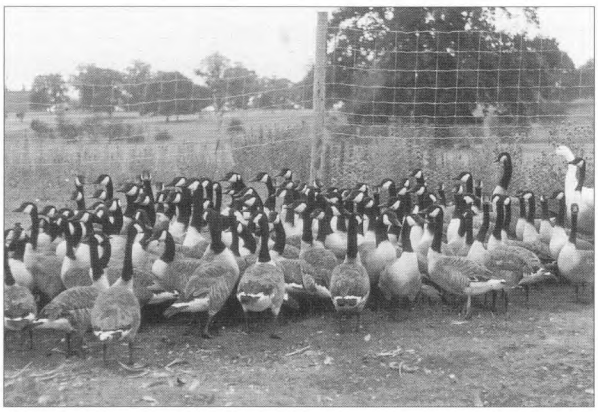
2. **The Peaceful Pyramid Birdscarer**
   A noise-free, rotating, battery-operated, reflective pyramid. Winner of the 1996 Science into Practice Award. List of uses on different bird species available.
   Bacton Wood Mill Farm, Edingthorpe, North Walsham, Norfolk NR28 9SJ. Tel: 01692 402213.

3. **The Pestoff Bird Scarer**
   A battery-operated ultrasound device with intermittent flashing strobe light for day or night operation.
   Martley Electronics, Top Barn Business Centre, Holt Heath, Worcester WR6 6NH. Tel: 01905 621313.

4. **Allsopp Helikites**
   A tethered kite/helium balloon combination that can be flown at a height of 70 metres and scare birds off an area of up to 10 hectares. Mimics a hovering bird of prey which gives a long habituation period.
   Allsopp Helikites Ltd, South End Farm, Damerham, Fordingbridge, Hampshire SP6 3HW.
   Tel: 01725 518750. **Fax:** 01725 518786.
   Email: Allsopp@Helikites.com **Website:** www.helikites.com/birds

5. **The Flashman**
   A low-cost bird scarer with mirrors and eyespots which rotate in the wind. Very sensitive – will rotate in slightest of thermals.
   Available from Allsopp Helikites Ltd. Contact details as above.

8.2 Canada Goose Control



Canada goose cull *English Nature*

Purpose

Canada geese can cause problems of grazing, nutrient enrichment and aggressive behaviour towards other waterfowl. Geese numbers can be controlled by egg-pricking (under licence) or shooting in the open season but neither method is very effective where a dramatic reduction in flock numbers is required.

During a two-week period in the summer (generally early July in the UK) adult geese are flightless and goslings as yet unable to fly. During this period whole flocks of geese can be herded off water bodies with canoes and into a funnel trap on the shore where they can be humanely despatched.

Advantages

- Large numbers of geese can be rounded up and despatched quickly and humanely.
- The operation is completely silent, therefore minimising disturbance to other wildlife and allowing operation to be carried out discreetly.

8.2 Canada Goose Control...2

Limitations

- Likely adverse public reaction precludes this method on sites to which there is open access.
- If a complete catch is not made at the first attempt, geese become very wary and extremely difficult to re-catch.
- The water body needs a suitable site for the location of a catching pen into which the geese can be driven.
- Round-up party need to be competent in the handling of canoes/kayaks.

NB: As this operation needs to be undertaken outside the open season for goose control, a licence is required, obtainable either from DEFRA if geese are causing agricultural damage, or from English Nature/Countryside Council for Wales/Scottish Natural Heritage if damage affects wildlife interest.

Further Information

DETR. 1999. *The Management of Problems Caused by Canada Geese – a guide to best practice*. DETR, Bristol.

➤ 14.2 Leaflets

PHILLIPS, V. 1995. Canada Geese: a growing problem. *enact* **3 (4)**. 4-6.

➤ 14.3 Journals

8.3 Corvid Control

Carrion crow *P. Glendell, EN*

Purpose

Corvids, particularly carrion crows and magpies, can cause problems of both disturbance and predation to a range of valued bird species, including lapwing, curlew, red grouse and grey partridge. Various methods of deterring and/or controlling crows and magpies are available, including shooting, nest destruction and trapping. On wildlife sites, the use of Larsen traps is often favoured because it causes minimal disturbance of other species. This technique involves the use of a rectangular, double-compartment or triple-compartment wire netting cage with trapdoor. Magpies can generally be attracted via bait (bread and broken eggs are recommended) whereas the catching of carrion crows normally requires the use of a decoy bird. If trapping is undertaken in March, April and May, corvids will have set up breeding territories and the chances of new birds colonising the now-vacant territory will be minimised.

Advantages

- Trapping enables a balanced control of population numbers by periodic use.
- Traps, particularly if purchased with green netting, can be sited so as not to attract attention of site visitors.
- The trapping operation is completely silent (although decoy birds can be noisy), therefore minimising disturbance to other wildlife and allowing operation to be carried out discreetly.
- A safe and simple method which does not require licences or certificates and presents no danger to others.
- Live, humane traps enable the release of any non-target species.

8.3 Corvid Control...2

Limitations

- ✿ Daily inspection essential (as with any control device) to remove caught birds and free any non-target species that may have entered the trap. If a decoy bird is used, a strict welfare code regarding feeding, watering, shelter and length of confinement must be observed.
- ✿ Training is required in humane methods of despatch.

Further Information

BRITISH FIELD SPORTS SOCIETY. 1985.
Predatory Birds of Game and Fish. BFSS, London.

➤ 15 References

Manufacturers

1. **Larsen Traps**
   Double-compartment and triple-compartment Larsen traps are widely available from agricultural merchants throughout the UK.

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9 Problem Species – Mammals

Managers of wildlife sites are charged with managing their sites for identified communities and species but this often necessitates the prevention or reduction of the harmful effects of other species. Reducing the effects of problem species can be time consuming and ways of minimising this commitment are under continuous review. This section highlights a selection of both noteworthy recent developments and longer-established methods of control.

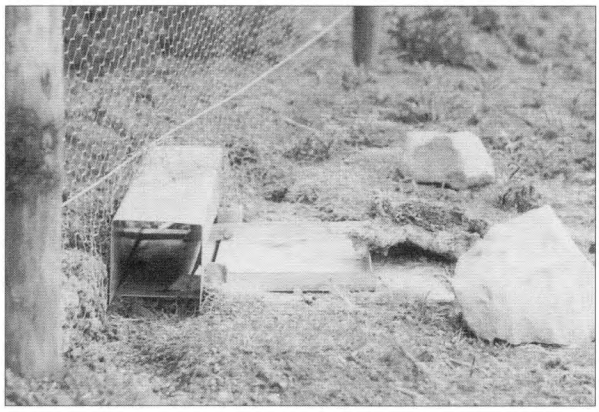
1 Rabbit Box Traps	Sunken boxes with trapdoor which can be used to remove large numbers of rabbits from sites where they are causing excessive damage. Once installed they catch rabbits of all ages with minimal labour input.
2 Fox Management	A review of current methods of control and deterrence.
3 Grey Squirrel Control	Describes a recommended method of control on wildlife sites.
4 Mink Control	Describes a recommended method of control on wildlife sites.
5 Lightweight Deer Fencing	Information on latest Forestry Commission developments in deer fencing.

Rabbit box trap *J. Bacon*

Fox *P. Glendell, EN*

American mink *English Nature*

9.1 Rabbit Box Traps



Leader rabbit box trap *J. Bacon*

Purpose

Multi-catch box traps are used for catching large numbers of rabbits in situations where they are causing severe damage through either grazing, scraping, or burrowing activity. The traps comprise a large box with tunnel and trapdoor lid which is dug into the ground on the line of a rabbit run through a fence. Once installed a trap can catch many rabbits each time it is set, as the rabbits drop into the holding box for later removal and humane despatch. Regular use of the traps can enable major reductions in rabbit numbers, whilst periodic use allows a degree of control to be exerted on rabbit numbers between any desired maximum and minimum grazing effect.

Advantages

- Enable rapid reduction of rabbit numbers where damage levels are unacceptable.
- Enable balanced control of population numbers by periodic use.
- Large holding containers enable multiple catches in a trap each night it is set.
- Catch all ages and sizes of rabbit.
- Operation and inspection of traps only requires semi-skilled labour, unlike other forms of control (e.g. gassing and shooting).
- Live, humane traps enable the release of any non-target species.

9.1 Rabbit Box Traps...2

Limitations

- The box part of the trap has to be dug into the ground, rendering the trap relatively immobile. Several traps may therefore need to be installed on large sites.
- Daily inspection essential (as with any control device) to remove rabbits and free any non-target species that may have entered the trap.
- Care required in location of trap to ensure it is sited on well used rabbit runs, ideally between burrows and feeding areas.
- Pre-setting period required to allow rabbits to get used to using the trap tunnel.

Further Information

BACKSHALL, J., MANLEY, J. & REBANE, M. eds. 2001.
The Upland Management Handbook. English Nature, Peterborough.

➤ 14.1 Handbooks

Manufacturers

1. **Leader Rabbit Box Trap**
   Traps made of hot dipped galvanised steel.
   Lauderdale Engineering, Whitlaw Road Industrial Estate, Lauder, Berwickshire TD2 6PA.
   Tel: 01578 718718. **Fax:** 01578 718719.
   Email: jim@rabbittrap.co.uk

2. **Solway Rabbit Drop Box**
   Produced in toughened black plastic. Likely to be discontinued after 2001.
   Solway Feeders Ltd, Orroland, Kirkcudbrightshire DG6 4QS.
   Tel: 01557 500253. **Fax:** 01557 500652.
   Email: mail@solwayfeeders.com

3. **Janus Multi Rabbit Drop Box**
   Manufactured in untreated softwood.
   Janus Contract Services, Mount Barn, Shalford Road, Rayne, Braintree, Essex CM7 5XA.
   Tel: 01376 342111.

9.2 Fox Management

Fox *P. Glendell, EN*

Purpose

Disturbance and predation by foxes on many valued bird species have resulted in poor or even failed breeding success and losses of young birds. The first edition of ***Practical Solutions*** described promising research into conditioned taste aversion (CTA) strategies which it was hoped would result in an effective method of non-lethal control. Unfortunately, problems of practical deployment and effects on non-target species have led to an abandonment of this research in the UK. In this edition we review other methods of deterrence/control. Whichever method is considered most appropriate, our main recommendations remain valid: that fox predation problems are best addressed as part of a co-ordinated regional strategy and that control should be carefully targeted to areas where it will have a significant conservation benefit, e.g. near colonies of ground-nesting birds.

Advantages

- Reduced predation, which can aid the survival, breeding success and post-breeding success of protected bird species in some situations.

Limitations

- Requires close liaison between landowners in a given area.
- A successful strategy may require concerted use of several control methods over a period of years.

9.2 Fox Management...2

Methods of Deterrence/Control

1. **Electric Fencing**
   Can be used as a successful method of deterrence where concentrations of wildlife occur in a small area, e.g. colonies of nesting terns, although problems with earthing often occur on dry and sandy soils. Generally needs to be accompanied by lethal control methods.

2. **Live-capture Traps**
   Have the advantage of enabling release of non-target species. Can be successful in reducing numbers of urban foxes but rural animals are generally too cautious to enter and trapping success is often low.

3. **Snares**
   An effective method of control but considerable experience required to site correctly. Self-locking snares are banned in the UK but other mammals including hare, otter, badger and farm livestock can still be caught by this method; it must therefore be undertaken with extreme caution on wildlife sites and is not recommended if there is a chance that non-target species may be caught.

4. **Lamping**
   Involves night-time control using a powerful spot-lamp and rifle. Generally a successful method of control where vehicular access is possible but needs to be undertaken by skilled staff, is labour-intensive and involves working unsocial hours.

Further Information

REYNOLDS, J.C. 2000. *Fox Control in the Countryside.* The Game Conservancy Trust, Fordingbridge.
➤ 14.1 Handbooks

BASC. 1998. *Fox Snaring. A code of practice.* British Association for Shooting and Conservation, Wrexham.

BASC. 1998. *Lamping (Night Shooting).* A code of practice. British Association for Shooting and Conservation, Wrexham.
➤ 14.2 Leaflets

MUSGRAVE, M. 1993. Outfoxing the fox. *enact* **1 (1)**. 6-9.
➤ 14.3 Journals

CHADWICK, A.H., HODGE, S.J. & RATCLIFFE, P.R. 1997. *Foxes and Forestry. Forestry Commission Technical Paper 23.* Forestry Commission. Edinburgh.
➤ 15 References

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9.3 Grey Squirrel Control

Grey squirrel *English Nature*

Purpose

Grey squirrels can potentially cause a variety of problems on wildlife sites, including displacement of red squirrel populations, damage to trees and disturbance and predation of breeding birds.

Methods

Cage trapping provides an efficient solution which ensures that non-target species are not controlled. Both single-capture and multi-capture traps are available; the latter are generally considered to be the more efficient. Traps should normally be sited under a tree on ground clear of vegetation and the trap covered in black plastic and branches to provide protection from the elements.

Traps are normally baited with grain (yellow whole maize is particularly attractive) and must be inspected daily. Caught animals can be transferred to a hessian sack for humane despatch.

Advantages

- Live, humane traps enable the release of any non-target species.
- Multi-catch versions allow catching of several animals at one time.
- Enables balanced control of population numbers by periodic use, and selective control at critical times of year, i.e. before sap starts rising when beech trees are particularly susceptible.
- Control operations can be carried out efficiently and discreetly.

9.3 Grey Squirrel Control...2

Limitations

- Daily inspection essential (as with any control device) to remove squirrels and free any non-target species that may have entered the trap.
- Care required in location of trap to ensure it is suitably sited in areas which squirrels will regularly use to feed.
- Training is required in humane methods of despatch.
- Pre-baiting period required to allow squirrels to get used to using the trap.

Further Information

CURRIE, F. & PEPPER, H. 2000. *Controlling Grey Squirrel Damage to Woodlands. Practice Note 4.* Forestry Commission, Edinburgh.

➤ 14.2 Leaflets

Manufacturers

1. **Squirrel Cage Traps**
   Single- and multi-capture squirrel traps are widely available from agricultural merchants throughout the UK.

9.4 Mink Control

American mink *English Nature*

Purpose

The American mink became established in the British countryside in the late 1950s, with populations present in most parts of the UK by the 1960s. Mink can cause problems with predation of fish stocks and waterfowl but it is their impact on populations of water voles that is of greatest concern.

Methods

Mink can be caught relatively easily using a variety of traps; live-capture traps which enable the release of non-target species are recommended. Double-entry cage traps (with a door at each end) are particularly effective, generally baited with meat or fish. Effectiveness can be increased by placing traps in wooden sleeves which can be permanently positioned in suitable locations along water courses. Traps must be inspected at least daily and caught animals despatched with a high-powered air rifle or shotgun.

Advantages

- Live, humane traps enable the release of any non-target species.
- Operation and inspection of traps only requires semi-skilled labour.
- Control operations can be carried out discreetly.

9.4 Mink Control...2

Limitations

- ✿ Daily inspection essential (as with any control device) to remove mink and free any non-target species that may have entered the trap.
- ✿ Air rifle or shotgun required for despatch of caught animals.
- ✿ Some knowledge of mink habitat utilisation required for correct siting of traps.

Further Information

STRACHAN, R. 1998. *The Water Vole Conservation Handbook.* Oxford University Wildlife Conservation Research Unit, Oxford.

➤ 14.1 Handbooks

Manufacturers

1. **Live-catch Cage Traps**
   Double-entry live-catch cage traps are widely available from agricultural merchants throughout the UK.

9.5 Lightweight Deer Fencing

Fallow deer *P. Wakely, EN*

Purpose

Six species of deer are found in the British countryside where they alone fill the niche of large wild herbivores. They play an important role in grazing and browsing many wildlife habitats but as the population levels of most species are increasing, so are problems associated with deer grazing and browsing, particularly in woodland habitats. Damage includes browsing of coppice regrowth, grazing of tree seedlings and other herbaceous species and the stripping of bark on larger trees.

Methods

Ideally, a balanced deer population would be maintained via a co-ordinated regional strategy involving a culling of surplus animals but this has yet to be achieved in most parts of the UK; therefore other methods of deterrence often need to be employed. Chemical repellants can be effective for a short period of time but require regular re-application. Exclosure fencing is commonly used to protect young plantations and coppice plots; this is an effective method but relatively costly. However, in recent years, the Forestry Commission with funding from MAFF has been developing a new lightweight fencing system which overcomes many of the disadvantages of traditional deer fencing. Full details are provided in Forestry Commission *Practice Note 9* (see *Further Information*).

Advantages

- Lightweight system – easy and quick to transport and erect.
- Wire can be re-rolled and re-used: ideal for coppice plots where protection is only required for a few years.
- Reduced costs, compared with permanent fencing.

9.5 Lightweight Deer Fencing...2

Limitations

- Still a relatively expensive method of tree protection.

Further Information

ENGLISH NATURE. 1997. *Deer management and woodland conservation in England.* English Nature, Peterborough.

MAYLE, B. 1999. *Managing Deer in the Countryside. Practice Note 6.* Forestry Commission. Edinburgh.

PEPPER, H. 1999. *Recommendations for Fallow, Roe and Muntjac Deer Fencing: New Proposals for Temporary and Reusable Fencing. Practice Note 9.* Forestry Commission. Edinburgh.
Contains full details of specifications and suppliers of new patterns of wire netting, straining assemblies and intermediate posts.

➤ 14.2 Leaflets

PEPPER, H. 1992. *Forest Fencing. Bulletin 102.* Forestry Commission. Edinburgh.

➤ 15 References

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10 Problem Species – Alien Plants

Of the many hundreds of alien plants which have become established in Britain, relatively few have a significant impact on our countryside. There are however certain species which can cause major problems, in terms of their impact on semi-natural habitats, displacement effect on native species and their resistance to control. Some aliens, for example rhododendron and sycamore, are long established in Britain (to a degree that the latter features in the National Vegetation Classification) and well-known techniques exist for their control. Others, however, particularly some of the aquatics, are much more recent colonists and little published material exists. This section describes some of the species which are likely to be problematic to managers of wildlife sites and summarises current advice on their control.

1 Rhododendron	*Rhododendron ponticum*
2 Sea Buckthorn	*Hippophae rhamnoides*
3 Sycamore	*Acer pseudoplatanus*
4 Tree Lupin	*Lupinus arboreus*
5 Giant Hogweed	*Heracleum mantegazzianum*
6 Himalayan Balsam	*Impatiens glandulifera*
7 Hottentot Fig	*Carpobrotus edulis*
8 Japanese Knotweed	*Fallopia (Reynoutria) japonica*
9 Shallon	*Gaultheria shallon*
10 Canadian Pondweed	*Elodea canadensis*
11 Cord Grass	*Spartina spp.*
12 Floating Marsh Pennywort	*Hydrocotyle ranunculoides*
13 Australian Swamp Stonecrop	*Crassula helmsii*
14 Water Fern	*Azolla filiculoides*
15 Least Duckweed	*Lemna minuta (minuscula/minima)*

Tree lupin *C. Gibson*

Shallon *C. Gibson*

Cord grass *C. Gibson*

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10.1 Rhododendron Rhododendron ponticum

Rhododendron *C. Gibson*

Introduction

Rhododendron was present in much of Europe before the last glaciation but is now native in the Nepalese Himalayas, southern Spain and Portugal, parts of European Turkey and Bulgaria. Plants were brought to Kew in 1793 and in the nineteenth century it was introduced to estates/landscape parks as game cover and as an ornamental plant in gardens. It has become naturalised in woods and has also invaded areas of heath, upland acid grassland, scrub, peatland (particularly cut-over raised mire) and roadside verges. Considerable effort has already been put into its eradication in the UK, particularly in the New Forest, the Lake District and Snowdonia. Rhododendron creates dense shade and deep litter, often leading to the exclusion of other plant species, including bryophytes. Problems with the public perception of its worth or role in woods are frequently encountered so reasons for removal need to be effectively presented to the public.

Description

- Shrub growing to a height of 5 metres.
- Leaves evergreen, spirally arranged, large, leathery and elliptical.
- Flowers trumpet-shaped, pinkish/purple/white, spotted inside, in clusters of 8–15. Flowers from March to May.
- Spreads mainly by seed.
- Needs open or light canopies in which to flourish.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.1 Rhododendron...2

Control

Biological × **Chemical** ✓ **Physical** ✓

Generally controlled by hand or mechanical cutting, followed by chemical treatment of stumps with glyphosate, triclopyr or ammonium sulphumate. Foliar spraying of regrowth is also effective; glyphosate with a wetting agent is recommended.

Further Information

WILLOUGHBY, I. & DEWAR, J. 1995. *The Use of Herbicides in the Forest. Forestry Commission Field Book 8.* HMSO, London.

➤ 14.1 Handbooks

BURTON, D., CARPENTER, P. & SEARLE, S. 1999. Rhododendron: winning the battle. *enact* **7 (4)**. 10-16.

SMALL, R. 2000. Another method of control. *enact* **8 (2)**. 21.

➤ 14.3 Journals

CLAY, D.V., GOODALL, J.S. & NELSON, D.G. 1992. The effect of imazapyr on *Rhododendron ponticum. Aspects of Applied Biology* **29**. 287-294.

COMPTON, S.G., KEY, R.S., KEY, R.J.D. & PARKES, E. 1997. Control of *Rhododendron ponticum* on Lundy in relation to the conservation of the endemic plant Lundy cabbage *Coincya wrightii. English Nature Research Reports,* No. 263. English Nature, Peterborough.

TABBUSH, P.M. & WILLIAMSON, D.R. 1987. *Rhododendron ponticum* as a forest weed. *Forestry Commission Bulletin No. 73.* HMSO, London.

See also: CRONK, Q.C.B. & FULLER, J.L. 1995; GRITTEN, R. 1988; GRITTEN, R. 1995; LAWRIE, J. & CLAY, D.V. 1993.

➤ 15 References

10.2 Sea Buckthorn *Hippophae rhamnoides*

Sea buckthorn *C. Gibson*

Introduction

In the UK, sea buckthorn is native only on the sand dune systems of the east coast. However, it has been extensively planted elsewhere to stabilise dunes or simply as a physical barrier and has become a serious problem in some areas, often causing a loss of native flora through its shading effect. The shrub fixes nitrogen and can thus lead to a build-up of soil nutrients. On some sand dune systems, natterjack toad habitat has been lost to encroaching sea buckthorn. However, on some sites it can provide useful shelter and cover for birds, particularly migrant species.

Description

- Spiny, spreading and suckering shrub growing to 3 metres.
- Leaves shiny, deciduous, linear/lanceolate.
- Flowers very small, without petals, March/April.
- Fruit: an orange berry.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.2 Sea Buckthorn...2

Control

Biological × **Chemical ✓** **Physical ✓**

Generally controlled by hand cutting or pulling or mechanical mowing/uprooting. Cutting old plants (>25 years) generally results in poor regeneration but young stands regenerate vigorously from both cut stumps and suckers. Chemical control of regrowth is effective; either foliar or stump treatment with glyphosate or triclopyr based products are the general methods. The use of a wetting agent is recommended for foliar control from June onwards as the leaves develop a waxy cuticle as they mature.

Where there is a strong presumption against herbicide use, e.g. in dune slacks holding rare species, pulling or grubbing out by fork (of suckers up to 40 cm) can be effective in clearing an area but is labour intensive and needs to be repeated over several years.

Grubbing out with a large excavator with a purpose-built rake has been trialled on a number of nature reserves. This has proved to be an efficient and cost-effective way of eradicating large stands, but involves a lot of burning. This method has the added advantage of mixing in the soil horizons which should theoretically speed up nutrient leaching. Properly done, this method can result in zero regeneration.

All methods require 1–2 years' follow-up management to catch stray suckers that have not been killed. It is important that all cut material is removed, to prevent a build-up of soil nutrients; the use of forestry mulchers for this type of work (➤ 4.4 Mulching) is therefore likely to be undesirable, unless used in association with a cut-and-collect machine (➤ 5.2 Cut-and-Collect Machines).

Grazing can be a useful tool in controlling regrowth: rabbits will suppress young plants and Herdwick sheep used on the Sefton coast of Lancashire have helped prevent new regrowth (➤ 11 Grazing Management).

Further Information

ROONEY, P. 1998. A thorny problem. *enact* **6 (1)**. 12-13.

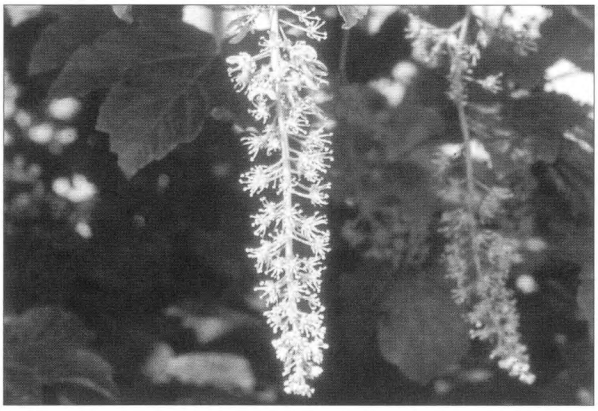
➤ 14.3 Journals

RANWELL, D.S. 1972. *The Management of Sea Buckthorn (Hippophae rhamnoides L.) on Selected Sites in Great Britain.* The Nature Conservancy, Norwich.

See also: BOWDEN, A. 1991.

➤ 15 References

10.3 Sycamore *Acer pseudoplatanus*



Sycamore *C. Gibson*

Introduction

Sycamore is native to central and southern Europe, mostly in mountain habitats. It was first recorded in Britain in Lyte's *Herball* of 1578 (claims of it being an ancient introduction seem to be unfounded) and has been extensively planted in the UK since the eighteenth century. Sycamore is a fast-growing tree, producing large quantities of seed from which it establishes itself readily. It has invaded both secondary and ancient semi-natural woods where it creates a dense, early-season shade that is unsuitable for many shrub and ground flora communities.

Description

- Deciduous tree, growing to some 30 metres.
- Smooth, grey bark, flaky on old trees.
- Palmate leaves with five broad, toothed lobes.
- Fruit: two-winged, wings at acute angle.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.3 Sycamore...2

Control

Biological × **Chemical ✓** **Physical ✓**

Seedlings and small saplings can be hand-pulled, but generally sycamore needs to be felled with hand saws, brushcutters or chainsaws. Regrowth from cut stumps is generally a problem; herbicide treatment is generally advised although alternative methods for removal of small stumps now exist.

➤ 2.4 Hand Tools

➤ 4.1 Stump Grinding

➤ 4.2 Root Cutting

➤ 4.3 Stump Lifting

➤ 4.4 Mulching

➤ 6 Timber Harvesting

Ring-barking is an alternative method but dying trees will produce a large seed crop for several years.

Further Information

WILLOUGHBY, I. & DEWAR, J. 1995. *The Use of Herbicides in the Forest. Forestry Commission Field Book 8.* HMSO, London.

➤ 14.1 Handbooks

CRONK, Q.C.B. & FULLER, J.L. 1995. *Plant Invaders: the threat to natural ecosystems.* Chapman & Hall, London.

See also: BRITISH ECOLOGICAL SOCIETY, Industrial Ecology Group, 1990.

➤ 15 References

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10.4 Tree Lupin *Lupinus arboreus*

Tree lupin *C. Gibson*

Introduction

Tree lupin is a native of California but has become naturalised in the UK in waste places and on coastal sand and shingle. It is considered to be a problem at Dawlish Warren in Devon; in other areas it is frequently affected by frost and generally does not persist.

Description

- Evergreen shrub growing to a height of 2.5 metres.
- Leaves are narrow and subdivided into 5–12 leaflets with stiff hairs on the underside.
- Flowers yellow to white and sometimes flushed blue or purple; scented.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

Control

Biological × **Chemical** × **Physical** ✓

Generally controlled by hand pulling; follow-up treatment to remove seedlings is generally required.

Further Information

NICHOLSON, P. 1985. Californian tree lupin, *Lupinus arboreus* at Dawlish Warren. *Nature in Devon* **6**. 25-29.

➤ 15 References

10.5 Giant Hogweed *Heracleum mantegazzianum*

Giant hogweed *C. Gibson*

Introduction

Giant hogweed is native to the Caucasus mountains of western Asia. It first appeared in the UK in Victorian shrubberies but became naturalised during the twentieth century in grassy and waste places, roadside verges and along river and stream margins, often dominating the vegetation where it does occur. Contact with the sap of giant hogweed can cause blistering of the skin; consequently it is often removed by local authorities and landowners. Under Schedule 9 of the Wildlife and Countryside Act, 1981, it is an offence to plant giant hogweed or otherwise cause it to grow in the wild.

Description

- Tall robust plant growing to a height of 5 metres.
- Stems ridged and red spotted, up to 10 cm in diameter.
- Leaves palmate, very large.
- Flowers white, in large umbels.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.5 Giant Hogweed...2

Control

Biological × **Chemical ✓** **Physical ✓**

Giant hogweed can be controlled by physical methods, including cutting at ground level with machete or scythe, removal of seedheads and grazing of young plants by cattle and sheep. Extreme care should be taken with all methods of hand cutting to avoid contact with the sap.

The plant can also be controlled with chemicals; glyphosate is generally recommended and is the only chemical approved for use near water. Spraying should commence in March/early April when leaf growth has occurred and the height is >15 cm. Experience in Ireland has shown that seedlings are less susceptible to glyphosate treatment. A dose rate of 5 l/ha is sufficient to kill treated vegetation. Sections treated in March/April should be re-treated in May. In July, any plants that have flowered or are likely to flower must be deheaded before seeds are produced. The cut umbels must be removed from the area and destroyed. The plant should be sprayed again with glyphosate or it will attempt to flower again and set seed. A further spraying of glyphosate in September will kill or suppress the growth of autumn-flowering or late-developing plants. Because of the plant's tendency to spread down the catchment of a watercourse, a strategic approach to control is required, starting in the upper reaches and working downstream.

Giant hogweed seed can remain viable for up to 7 years; monitoring is therefore required for several years to prevent re-infestation.

Further Information

ENVIRONMENT AGENCY. 1996a. *Guidance for the Control of Invasive Plants near Watercourses: Japanese knotweed, Himalayan balsam, giant hogweed*. Environment Agency, Bristol.

➤ 14.1 Handbooks

NEWMAN, J.R. 1999. Control of Giant Hogweed (*Heracleum mantegazzianum*). *Centre for Aquatic Plant Management Information Sheet* **6**. IACR-Centre for Aquatic Plant Management, Reading.

➤ 14.2 Leaflets

WAAL, L.C. de, CHILD, L.E. & WADE, P.M. 1995. The management of three alien invasive riparian plants: *Impatiens glandulifera*, *Heracleum mantegazzianum* and *Fallopia japonica*. In: Harper, D.M. & Ferguson, A.J.D. *The Ecological Basis for River Management*. Wiley, Chichester.

See also: BINGHAM, I.J. 1989, CAFFREY, J.M. 1998, ENVIRONMENT AGENCY. 1996b, HUMPHRIES, J. 1992, WAAL, L.C. de, and others, eds. 1993.

➤ 15 References

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10.6 Himalayan Balsam *Impatiens glandulifera*

Himalayan balsam *C. Gibson*

Introduction

Also called Indian balsam or policeman's helmets, Himalayan balsam is a native of the western Himalayas. It was introduced into British gardens in 1839 and was widely distributed by gardeners (Hans Krebs may have introduced it to the Derbyshire Derwent). The seeds are catapulted out explosively from the plant and disperse widely so that the plant spread quickly and had become naturalised by the end of the nineteenth century, especially in the south-west of England.

Stands of Himalayan balsam occur particularly along watercourses but the plant will also grow in drier sites such as woodland, urban waste land and roadsides, where dense stands can suppress the native flora.

Description

- Tall, annual plant, generally in wet places, growing to a height of 2 metres.
- Leaves alternate, pointed and oval in whorls of 3–5 with jagged edges. Each set lies at right angles to the previous set. Glands towards the base. The edges of the leaves and the vein in the middle may be reddish in colour.
- Stems hollow, often reddish in colour.
- Flowers slipper-shaped, purple/pink/white with spots and marks and a short incurved spur. June–August.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.6 Himalayan Balsam...2

Control

Biological × **Chemical ✓** **Physical ✓**

Can be controlled by grazing, pulling/cutting or chemical control. Hand pulling is relatively simple as the plant is shallow-rooted and is probably the best method for small infestations. Cutting should take place as close to the ground as possible – if the stem is cut above the first node it will regrow. Pulling or cutting should be carried out before the end of June, i.e. before the plants have flowered or set seed.

If mechanical control is not possible, Himalayan balsam can be controlled with glyphosate which should be applied to leaves or stems before the plants have flowered or set seed. Subsequently, annual monitoring should be undertaken and re-treatment where necessary for a 5–10 year period. Chemical control near watercourses requires Environment Agency approval.

Further Information

NEWMAN, J.R. 2000. Control of Himalayan Balsam (*Impatiens glandulifera*). *Centre for Aquatic Plant Management Information Sheet* **5**. IACR-Centre for Aquatic Plant Management, Reading.

➤ 14.2 Leaflets

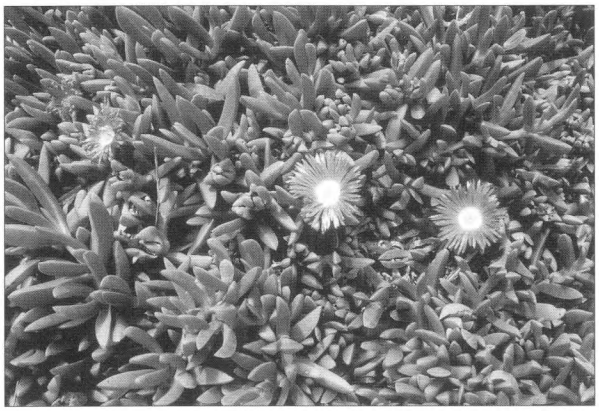
ENVIRONMENT AGENCY. 1996a. *Guidance for the Control of Invasive Plants near Watercourses: Japanese knotweed, Himalayan balsam, giant hogweed.* Environment Agency, Bristol.

WAAL, L.C. de, and others, eds. 1993. *Ecology and Management of Invasive Riverside Plants.* Wiley, Chichester.

See also: ENVIRONMENT AGENCY. 1996b, GUNN, I.D.M. 1986, PERRINS, J., FITTER, A. & WILLIAMSON, M. 1990.

➤ 15 References

10.7 Hottentot Fig *Carpobrotus edulis*



Hottentot fig *C. Gibson*

Introduction

Hottentot fig is a native of South Africa but has become naturalised in many warm, temperate regions. Like many other alien plants, it was brought into the UK for use in gardens from which it has become established in the wild, particularly in south and south-west England, notably Devon, Cornwall and south-east Ireland. It is found on rocks, cliffs and sand where it smothers the ground to the detriment of local native plants, e.g. on the southernmost part of the Lizard peninsula.

Description

- A low, spreading, perennial plant with woody stems.
- Triangular, succulent, fleshy leaves, in pairs.
- Flowers bright pink, mauve or acid yellow.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.7 Hottentot Fig...2

Control

Biological × **Chemical ✓** **Physical ✓**

Various techniques have been used to control Hottentot fig. The re-introduction of rough grazing by sheep or cattle on the cliff slopes in the Lizard district of Cornwall has helped control the plant, as has planting lengths of bracken rhizome within the mats of the fig.

Other eradication measures include physical uprooting, a method which is not recommended on steep slopes unless some system of stabilising the soil surface is applied, together with re-seeding. Hottentot fig can reproduce from small sections of stem so all plant material must be removed.

The only herbicide which has proved successful is the brushwood killer SBK in oil.

Further Information

FROST, L.C. 1987. The alien Hottentot fig (*Carpobrotus edulis*) in Britain: a threat to the native flora and its conservation control. Bristol, *University of Bristol Lizard Project Report No. 22.*

➤ 15 References

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10.8 Japanese Knotweed *Fallopia (Reynoutria) japonica*

Japanese knotweed *C. Gibson*

Introduction

Japanese knotweed was introduced to Britain from Japan as an ornamental shrub sometime between 1825 and 1840. It was first seen in the wild in South Wales in 1886, was recorded in the London area by 1900 and by the 1950s had reached Northumberland. All British plants are female (possibly derived from clones of a single plant) and therefore produce no viable seed; spread in this country is vegetative, via rhizomes. Japanese knotweed has colonised many habitats, including river banks, woodlands, grassland, coastal areas and waste ground. It generally forms dense stands, suppressing semi-natural vegetation, and can cause damage to banks of watercourses, walls, and tarmac/concrete surfaces. The plant spreads rapidly via rhizomes and can also regenerate from pieces of cut or broken stem. Under Schedule 9 of the Wildlife and Countryside Act, 1981, it is an offence to plant Japanese knotweed or otherwise cause it to grow in the wild. Japanese knotweed is regarded as special waste and requires careful disposal.

Description

- A vigorously growing perennial, reaching a height of 2–3 metres.
- Leaves alternate, green, heart-shaped.
- Stems hollow, green in colour with red/purple specks. Brown, dead stems persist through the following winter.
- Flowers cream, in clusters.
- Spreads by rhizomes.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.8 Japanese Knotweed...2

Control

Biological × **Chemical ✓** **Physical ✓**

Sheep and goats will both graze young shoots of the plant but if stands are already established, cutting will be required before grazing is introduced.

Repeated cutting is often cited as a method of control but is very labour intensive and there are doubts over long-term effectiveness as the rhizomes are very long-lived. All cut material must be collected and burnt to prevent further spread.

Stands can also be dug out but every piece of rhizome needs to be removed to prevent regrowth. Care must also be taken to avoid contaminating new sites if soil is moved for disposal.

For chemical treatment, glyphosate applied at a rate of 5 l/ha is recommended, preferably with the addition of a wetting agent. Treatment can take place from May to September; two or three applications per season may be necessary over several years for effective control. Chemical control near watercourses requires Environment Agency approval.

Further Information

CHILD, L. & WADE, M. 2000. *The Japanese Knotweed Manual: the management and control of an invasive alien weed.* Packard, Chichester.

WELSH DEVELOPMENT AGENCY, 1991. *Guidelines for the Control of Japanese Knotweed (Reynoutria japonica).* Welsh Development Agency, Cardiff.

➤ 14.1 Handbooks

NEWMAN, J.R. 1999. Control of Japanese Knotweed (*Fallopia japonica*). *Centre for Aquatic Plant Management Information Sheet* **7**. IACR-Centre for Aquatic Plant Management.

➤ 14.2 Leaflets

FORD, S. & RENALS, T. 2001. Controlling Japanese knotweed in Cornwall. *enact* **9 (2)**. 8-9.

WADE, M. & CHILD, L. 2001. Getting to grips with Japanese knotweed. *enact* **9 (2)**. 4-7.

➤ 14.3 Journals

See also: ENVIRONMENT AGENCY. 1996a, ENVIRONMENT AGENCY. 1996b, GRITTEN, R. 1990, GUNN, I.D.M. 1986, HUMPHRIES, J. 1992, PALMER, J.P. 1990, WAAL, L.C. de, and others, eds. 1993, WAAL, L.C. de, 1995, WAAL, L.C. de, CHILD, L.E. & WADE, P.M. 1995.

➤ 15 References

10.9 Shallon *Gaultheria shallon*

Shallon *C. Gibson*

Introduction

Shallon is an ericaceous shrub native to western North America from Alaska to California and was originally planted in the UK as game cover. It has since become naturalised on heathland and in woods on sand and peat with resultant loss of native flora.

Description

- A suckering, thicket-forming, ericaceous shrub growing to 1.5 metres.
- Leaves rounded to cordate at base, minutely serrated.
- Flowers in terminal racemes, white to pink.
- Fruit purplish black, resembling a black berry.
- Needs open or light canopies in which to flourish.
- Spreads by seed and by stolons which run in litter layer rather than in the soil.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.9 Shallon...2

Control

Biological × **Chemical** ✓ **Physical** ✓

Published information on control techniques in the UK is centred on the New Forest, where shallon is naturalised in several areas. Herbicide has been successfully used to treat small areas (triclopyr or glyphosate plus a wetting agent); it has been noted that young leaves are more susceptible than older ones and repeat treatment is always required.

Growth of the plant is checked by pony and deer grazing and the Forestry Commission have successfully controlled dense stands by penning pigs into the thickets. Although the pigs do not eat shallon they uproot the majority of the plant, exposing it to rot and enabling surviving pieces to be hand-pulled or treated with herbicide.

Trials have also taken place with an excavator equipped with a root rake. This proved to be a successful method of removing the plant and subsequent growth was easily controlled by hand pulling or spot spraying; disposal of excavated plant material presented the greatest problem.

Further Information

SPENCER, J. 2000. A bleak future for *Gaultheria shallon* in the New Forest. *BSBI News* **No. 84**. 47-48.

➤ 14.3 Journals

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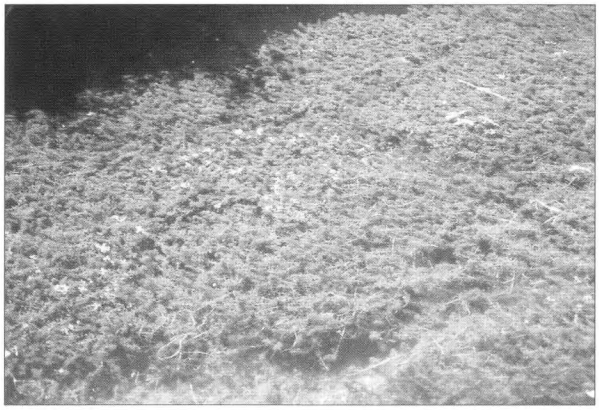
10.10 Canadian Pondweed *Elodea canadensis*



Canadian pondweed *C. Gibson*

Introduction

Canadian pondweed is a native of North America. It was first recorded in Ireland in 1836 and in Scotland in 1842 at Duns Castle, Berwickshire, but spread rapidly through the river and canal system attaining great abundance by the 1870s. Canadian pondweed can form dense stands, outgrowing other aquatic plants, with which it also competes for nutrients. Control of Canadian pondweed can result in invasion by even less desirable alien species; careful thought therefore needs to be given to control strategies.

Description

- Submerged herbaceous plants with vertical stems up to 3 metres in length.
- Flat leaves c.1 cm in length, in whorls of 2–4.
- Flowers greenish-purple, inconspicuous.
- Reproduces only by vegetative means in the UK.

See:
STACE, C. 1997. *New Flora of the British Isles*. Cambridge University Press, Cambridge.

10.10 Canadian Pondweed...2

Control

Biological ✓ Chemical ✓ Physical ✓

Control by cutting is recommended where the plant is growing alone or in mixtures with other vegetation and where spreading the plant by the release of fragments is not important. It can be done at any time of year but is usually done as late in the summer as possible to prevent the risk of regrowth by the autumn. Cutting should be done close to the watercourse bed, using a weed boat, weed bucket or hand-operated scythe or chain scythe. Cutting controls the plant for no more than one season and can result in spreading the plant unless all fragments are collected up.

Herbicides can be used for longer-lasting control where the control of other submerged weeds is required but recolonisation from upstream can be a problem in flowing water. Recommended herbicides include terbutryn (in waters flowing at less than 20 metres/hour), dichlobenil (in waters flowing at less than 90 metres/hour), and diquat alginate (in waters of greater velocity). As these chemicals will also control other species consideration of the implications on other aquatic and marginal plants is required before undertaking such control. Environment Agency approval is required for herbicide use in water.

Where acceptable, grass carp can be used as a method of biological control.

Further Information

NEWMAN, J.R. 2000. Control of Canadian Waterweed (*Elodea canadensis*). *Centre for Aquatic Plant Management Information Sheet* **9**. IACR-Centre for Aquatic Plant Management, Reading.

➤ 14.2 Leaflets

ENVIRONMENT AGENCY. 1996b. Biological control of weeds: a scoping study of the feasibility of biological control of aquatic and riparian weeds in the UK. *Environment Agency Research & Development Technical Report W105*. Environment Agency, Bristol.

ENVIRONMENT AGENCY. 2000. Aquatic weed control operation best practice guidelines. *Environment Agency Research & Development Technical Report W111*. Environment Agency, Bristol.

➤ 15 References

FACT
FORUM FOR THE APPLICATION OF CONSERVATION TECHNIQUES

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10.11 Cord Grass *Spartina spp.*

Cord grass *C. Gibson*

Introduction

Two species of cord grass have become established on mudflats around the UK coast. *Spartina x townsendii* apparently arose as a hybrid between the introduced and almost extinct *S. alternifolia* and the now rare native, *S. maritima*. It was first recorded in Southampton Water in 1870, since when it has spread from Dorset to W. Sussex and is scattered elsewhere. However, since the 1950s *S. x townsendii* has declined and in many areas the plant no longer forms a significant component of the saltmarsh flora.

The second species, *Spartina anglica*, is thought to have arisen from *S. x townsendii*, from which it differs in being fertile, as a result of a doubling in its chromosome number. This species was also first recorded from Southampton Water around 1890 but has been extensively planted elsewhere for the stabilisation of mudflats and is now dominant over large areas of saltmarsh and estuarine mudflats. Both species of cord grass are pioneer colonisers of saltmarsh and can potentially alter the course of succession in this habitat. They form dense stands which often lead to a reduction in botanical diversity and can result in a loss of wader and goose feeding areas.

Description

- A stout, perennial grass with thick, tough leaves, forming dominant stands on tidal mudflats.

  See:
  STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.11 Cord Grass...2

Control

Biological × **Chemical ✓** **Physical ✓**

Early attempts to control cord grass included hand-digging which is an effective method of controlling seedlings and young plants but is too labour-intensive to be considered on large stands. Successful control has been undertaken by English Nature at Lindisfarne NNR in Northumberland using a rotoburier to bury 'turves' (➤ 3.1 Rotoburying).

Herbicides can also be used; Dalapon was originally favoured but glyphosate is now more commonly used, applied with a boom sprayer in July/August at 5% mixture, 7 l/ha. An off-label licence is required from DEFRA for this use.

Further Information

DAVEY, P., VENTERS, M. & BACON, J. 1996. Spoiling *Spartina*: a muddy problem solved? *enact* **4 (4)**. 8-9.

DAVEY, P. 1993. *Spartina*: eliminating the root of the problem. *enact* **1 (3)**. 7.

➤ 14.3 Journals

DOODY, P. ed. 1984. *Spartina anglica* in Great Britain: a report of a meeting held at Liverpool University on 10th November 1982. *Nature Conservancy Council Focus on Nature Conservation*, No. 5.

➤ 15 References

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10.12 Floating Marsh Pennywort *Hydrocotyle ranunculoides*

Floating marsh pennywort *C. Gibson*

Introduction

A native of North America, floating marsh pennywort was first recorded in UK watercourses in 1990. The plant has spread rapidly since this time and in the Pevensey Levels alone over 12 miles of waterway have been affected.

This vigorous species completely dominates waterways, killing native plants, excluding light and lowering oxygen levels, resulting in the death of aquatic fauna. Channels blocked with the plant have also led to flooding. Control of this species has been hampered by its apparent resistance to many control methods.

Description

- Similar to the native marsh pennywort *H. vulgaris* in appearance but with stems often floating and larger leaves (<70 mm in diameter; cf. <35 mm).
- Leaves circular with shallow lobes.
- Very small, insignificant flowers.
- Spherical, slightly flattened fruit, 2–3 mm in diameter.

See:
STACE, C. 1997. *New Flora of the British Isles*. Cambridge University Press, Cambridge.

10.12 Floating Marsh Pennywort...2

Control

Biological × **Chemical ✓** **Physical ✓**

Small infestations can be controlled by hand or mechanical cutting or pulling although complete elimination is unlikely in one attempt, because of the plant's ability to reproduce from a single node. Extreme care must be taken to remove all cut material to prevent re-infestation: the netting of affected areas is recommended on flowing waters to prevent further infestation downstream.

Experiments on chemical methods of control have shown that the plant is most susceptible to herbicides containing 2,4-D amine or diquat. Diquat applied at a dilution of 1 to 4 at an off-label application rate of 50 l/ha is recommended by The Centre for Aquatic Plant Management (see Newman leaflet for more detailed information). Consideration of the implications on other aquatic and marginal plants is required before undertaking such control. Chemical control on or near watercourses requires Environment Agency approval.

Further Information

NEWMAN, J.R. 1999. Control of floating pennywort (*Hydrocotyle ranunculoides*). *Centre for Aquatic Plant Management Information Sheet* **20**. IACR-Centre for Aquatic Plant Management, Reading.

➤ 14.2 Leaflets

NEWMAN, J.R. & DAWSON, F.H. 1998. Ecology, distribution and chemical control of *Hydrocotyle ranunculoides* in the UK. In: A. Monteiro and others. *Management and ecology of aquatic plants: proceedings of the 10th EWRS International Symposium on Aquatic Weeds*. Lisbon, 1998.

NEWMAN, J.R. & DAWSON, F.H. 1999. Ecology, distribution and chemical control of *Hydrocotyle ranunculoides* in the UK. *Hydrobiologica* **415**. 295-298.

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FACT
FORUM FOR THE APPLICATION OF CONSERVATION TECHNIQUES

Practical Solutions

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10.13 Australian Swamp Stonecrop *Crassula helmsii*

Australian swamp stonecrop *C. Gibson*

Introduction

Also known as New Zealand pigmyweed, the Australian swamp stonecrop, as its names suggest, is native to Australia and New Zealand. It was introduced to the UK as an oxygenating plant for water gardens but in the last two decades has spread widely across the country, probably through being discarded into ponds and other watercourses and via subsequent transfer by wildlife. Australian swamp stonecrop now occurs in ponds, lakes and flowing watercourses, both as an aquatic plant in water depths <3 metres and also on the shores of water bodies <0.5 metres above the water level. Where it occurs it can quickly become dominant, often outcompeting native species and causing severe oxygen depletion in water bodies.

Description

- Aquatic forms are superficially similar to Starwort (*Callitriche* spp.); expert identification advice should be sought before commencing any control.
- Stems to 30 cm trailing in or ascending from water or trailing in mud.
- Leaves opposite, linear to lanceolate, without stalks.
- Flowers small, white, four petals, solitary in leaf axils.
- Terrestrial plants have succulent appearance.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.13 Australian Swamp Stonecrop...2

Control

Biological × **Chemical ✓** **Physical ✓**

Small areas of Australian swamp stonecrop can be controlled by covering with a weighted opaque sheet of black polythene or similar, for a period of 6–8 weeks.

Chemical control can be undertaken by glyphosate (for terrestrial growth) or diquat (aquatic growth). Terrestrial growth can generally be controlled with a single application of glyphosate, applied with a knapsack sprayer. Aquatic growth is best tackled with a gel formulation of diquat, sold under the brand name of Midstream. Two applications separated by an interval of about a month are generally required. Consideration of the implications on other aquatic and marginal plants is required before undertaking such control. Chemical control on or near watercourses requires Environment Agency approval.

Further Information

NEWMAN, J.R. 1999. Control of Australian Swamp Stonecrop (*Crassula helmsii*). *Centre for Aquatic Plant Management Information Sheet* **14**. IACR-Centre for Aquatic Plant Management, Reading.

➤ 14.2 Leaflets

LEACH, J. & DAWSON, H. 1999. *Crassula helmsii* in the British Isles: an unwelcome invader. *British Wildlife* **10 (4)**. 234-239.

SUTHERLAND, W.J. 1995. *Crassula helmsii*. *British Wildlife* **6**. 311.

WICKS, D. & STONE, I. 2001. War against *Crassula helmsii*. *enact* **9 (2)**. 11-13.

➤ 14.3 Journals

DAWSON, F.H. 1992. *Crassula helmsii*: focus on control. Institute of Freshwater Ecology, Wareham.

ENVIRONMENT AGENCY. 2000. Aquatic weed control operation best practice guidelines. *Environment Agency Research and Development Technical Report W111*. Environment Agency, Bristol.

See also: CHILD, L.E. & SPENCER-JONES, D. 1995, DAWSON, F.H. & HENVILLE, P. 1991, ENVIRONMENT AGENCY. 1996b, SWALES, S. 1991, WAAL, L.C. de, and others, eds. 1993.

➤ 15 References

FACT
FORUM FOR THE APPLICATION OF CONSERVATION TECHNIQUES

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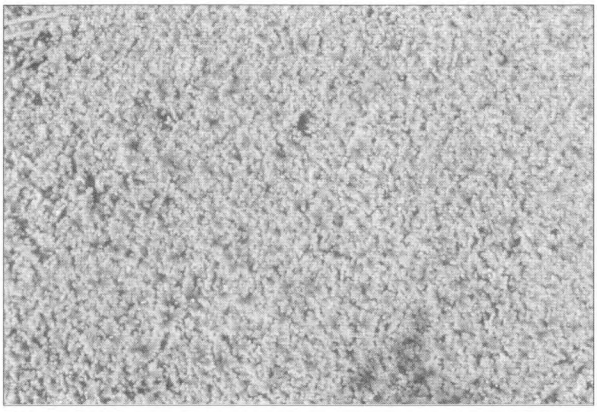
10.14 Water Fern *Azolla filiculoides*



Water fern *C. Gibson*

Introduction

Water fern, a native of tropical America, has become naturalised in ponds and slow-moving water bodies across southern Britain. It is the only floating species of fern which occurs in Britain and often covers the surface of a water body in similar fashion to a duckweed. Water fern reproduces both vegetatively and also by production of spores. It rapidly builds up a thick layer across the water surface, reducing light levels below the water surface causing dieback of submerged aquatic plants with a consequent reduction in oxygen levels. The dense mat formed by the plant gives the impression of dry land which can be dangerous to livestock (and humans).

Description

- Small, duckweed-like fern, floating on water surface. Bright green in summer months turning red in autumn and through the winter.
- Small, two-lobed leaves, up to 2.5 mm in diameter.
- Simple, hanging roots.

See:
STACE, C. 1997. *New Flora of the British Isles*. Cambridge University Press, Cambridge.

10.14 Water Fern...2

Control

Biological ✓ Chemical ✓ Physical ✓

Water fern can be controlled on small water bodies by raking or by the use of a floating rope or boom to drag it to the bank. Wind or a current can be of assistance. In situations where it is possible, raising the water level may assist in flushing water fern out from other emergent plants. Repeat treatment is almost always required. The formation of dense mats induces the plant to produce spores; control after this stage has been reached will therefore not prevent re-infestation the following year.

Chemical treatment can be undertaken with either glyphosate or diquat, sprayed on to the floating fronds. Both are effective on water fern but will also control other species. Consideration of the implications on other aquatic and marginal plants is therefore required before undertaking such control. Chemical control on or near watercourses requires Environment Agency approval.

Where acceptable, grass carp can be used as a method of biological control on small areas of infestation.

Further Information

NEWMAN, J.R. 2000. Control of Water Fern (*Azolla filiculoides*). *Centre for Aquatic Plant Management Information Sheet* **24**. IACR-Centre for Aquatic Plant Management, Reading.

➤ 14.2 Leaflets

ENVIRONMENT AGENCY. 1996b. Biological control of weeds: a scoping study of the feasibility of biological control of aquatic and riparian weeds in the UK. *Environment Agency Research & Technical Report W105*. Environment Agency, Bristol.

JANES, R. 1995. The biology and control of *Azolla filiculoides* and *Lemna minuta*. In: J.R. Newman, *The Robson meeting: 1995 proceedings*. Centre for Aquatic Plant Management, Reading.

➤ 15 References

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10.15 Least Duckweed *Lemna minuta (syn. L. minuscula/minima)*

Least duckweed *C. Gibson*

Introduction

Least duckweed, a native of the Americas, was first recorded in Britain in 1977 although it may previously have been overlooked. It is now naturalised across southern England in ponds, ditches, canals and slow-flowing rivers, where it can form dense mats across the surface of the water.

Description

- Superficially similar to other duckweed species. Expert identification advice should be sought before commencing any control.
- Leaves tiny, single, elliptical, 0.8–3.0 mm in diameter, flattened on both surfaces, with one vein.

See:
STACE, C. 1997. *New Flora of the British Isles.* Cambridge University Press, Cambridge.

10.15 Least Duckweed...2

Control

Biological × **Chemical ✓** **Physical ✓**

Least duckweed is probably best controlled by mechanical methods; on small ponds it can be raked off the surface, on larger water bodies a floating rope or boom can be used. As a plant of still water and open conditions it can be discouraged by increasing water flow or by bankside planting if these are compatible with other management objectives.

All duckweeds are susceptible to herbicides containing glyphosate, diquat or terbutryn. As these chemicals will also control other species, consideration of the implications on other aquatic and marginal plants is required before undertaking such control. Chemical control on or near watercourses requires Environment Agency approval.

None of the above control methods are likely to eliminate least duckweed; repeat treatment is therefore generally required.

Further Information

NEWMAN, J.R. 2000. Control of duckweeds. *Centre for Aquatic Plant Management Information Sheet* **25**. IACR-Centre for Aquatic Plant Management.

➤ 14.2 Leaflets

ENVIRONMENT AGENCY. 1996b. Biological control of weeds: a scoping study of the feasibility of biological control of aquatic and riparian weeds in the UK. *Environment Agency Research & Development Technical Report W105*. Environment Agency, Bristol.

JANES, R. 1995. The biology and control of *Azolla filiculoides* and *Lemna minuta*. In: J.R. Newman, *The Robson meeting: 1995 proceedings*. Centre for Aquatic Plant Management, Reading.

➤ 15 References

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11 Grazing Management

Grazing is now recognised as an essential tool for the management of many wildlife habitats. Initiating grazing on small, isolated sites presents a particular challenge, especially when animals are only required for a small part of the year. This section describes a selection of miscellaneous ideas which may assist managers in achieving effective grazing on such sites.
See also: The Grazing Animals Project ➤ 14.4 Advisory Services/Organisations

1 Mobile Stock Pens

Temporary facilities for the penning of stock, to enable the carrying out of stock tasks on sites where permanent holding facilities are not available.

2 Mobile Cattle Grids

Permanent cattle grids to stop stock straying are expensive to install. Alternative designs are now available which eliminate the need for excavation work or which provide a temporary facility.

3 Electric Fencing Systems

Alternatives to traditional fencing systems and of particular benefit for temporary grazing enclosures.

Mobile penning system *J. Bacon*

Gunhill mobile cattle grid *Gunhill*

Electric flexinet *J. Bacon*

11.1 Mobile Stock Pens

Prattley mobile penning system *J. Bacon*

Purpose

The efficient handling of stock is an essential part of the management of any conservation grazing scheme, irrespective of who owns the livestock. Permanent pens or crushes are always to be preferred but if this is not possible, considerable time can be spent driving animals to the nearest holding yard. Temporary erectable pens are currently an alternative for sheep and goats. These are constructed out of lightweight alloy sections which can be carried on a trailer towed behind a 4x4 vehicle and set up on the chosen site in a matter of minutes. A range of accessories are available which enable sorting of stock and other stock tasks to be carried out.

Advantages

- Allows containment and handling of stock on the grazing site with consequent savings in labour and cost of permanent handling pen.
- Light weight enables easy transportation and erection by one person.
- A versatile system which enables erection to any desired formation.
- Transportability enables sharing of capital outlay between many sites.
- Material allows easy cleaning for improved hygiene.

11.1 Mobile Stock Pens...2

Limitations

- ✿ Not as robust as permanently fixed systems.
- ✿ May need modification/strengthening for some animals, e.g. ponies.

Manufacturers

1. **Prattley Livestock Systems**
   A New Zealand sheep and goat penning system which can be transported on a purpose-built trailer either behind a 4x4 vehicle or via a three-point linkage to a tractor.
   Imported by Rappa Fencing Ltd, Steepleton Hill, Stockbridge, Hampshire SO20 6JE.
   Tel: 01264 810665. **Fax:** 01264 810079.
   Email: sales@rappa.co.uk **Website:** www.rappa.co.uk

2. **Mobile Livestock Pens**
   Modular system as above.
   Manufactured by IAE (Industrial and Agricultural Engineers), Riverside Works, Macclesfield Road, Leek, Staffordshire ST13 8LB who can advise on local dealers/agents.
   Tel: 01538 399200. **Fax:** 01538 373005.

11.2 Mobile Cattle Grids

Gunhill mobile cattle grid *Gunhill*

Purpose

Many grazing schemes require cattle grids instead of gates to stop grazing animals from straying along tracks and roadways. Permanent grids can be very expensive to install, requiring major excavations which may be difficult on rocky ground. In situations where the use of a grid may only be required temporarily or where surface installation is acceptable portable grids may provide a versatile and convenient option.

NB: Please note that highways authority approval may be necessary.

Advantages

- Installation is possible even on rocky ground by use of made-up hard-core ramps.
- Surface installation is quick and easy.
- Temporary installation is possible, if required, with integral ramps.
- There may be considerable cost savings over conventional grids.
- Connections easily made to adjoining fence lines.

11.2 Mobile Cattle Grids...2

Limitations

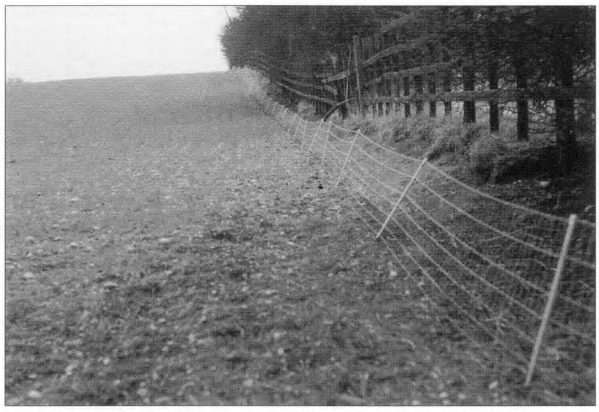
- ✿ Approach ramps may need frequent maintenance.
- ✿ Need to obtain highways authority approval, as required.

Manufacturers

1. **Beaver Cattle Grid**
   Pre-fabricated steel construction, surface or cavity-installed grids, made to measure in widths of 3–6 metres.
   R S Beaver & Son, Old Mill Farm, Walkmills, Church Stretton, Shropshire SY6 6NJ.
   Tel: 01694 751265.

2. **The Gunhill Grid**
   A portable grid, hot-dipped galvanised square section with side rails and ramps adjustable for 4x4 vehicles or quad bikes.
   Ritchie Equipment, Carseview Road, Suttieside, Forfar DD8 3EE.
   Tel: 01307 462271. **Fax:** 01307 464081.

11.3 Electric Fencing Systems



Rabbit flexinet *J. Bacon*

Purpose

If a wildlife site is to be grazed, some method of stock containment is generally required. Temporary fencing may be considered as an alternative to permanent fencing, particularly where stock are only grazed for a short period, or where rotational grazing is undertaken. It may also be desirable simply on cost grounds. Electric fencing systems on wildlife sites are generally powered by a 12 volt battery which gives animals which contact the fence a short, sharp electric shock which is sufficiently memorable that after a couple of days, animals avoid the fence altogether. Solar-powered and wind-powered options are available.

Advantages

- Low purchase and installation cost.
- Flexibility: fenced area can easily be adjusted and moved.
- Can be removed outside grazing period, therefore minimising impact on the landscape and restriction of access.

Limitations

- Fences need regular inspection to check battery/energiser operation and to ensure that there is no energy loss due to poor insulation or vegetation touching line wires.
- Fence elements (battery, energiser, posts) can be prone to theft in some areas.

11.3 Electric Fencing Systems...2

Further Information

AGATE, E. 1996. *Fencing: A Practical Handbook*, British Trust for Conservation Volunteers.

➤ 14.1 Handbooks

Manufacturers

1. **Gallagher Fencing Systems**
   A large range of line wire systems which include solar-powered energisers.
   Gallagher Power Fence UK Ltd, Curriers Close, Canley, Coventry CV4 8AW.
   Tel: 0870 201 0101. **Fax:** 0800 515536.
   Email: info@gallagher.co.uk **Website:** www.gallagher.co.nz

2. **The Ridley Rappa System**
   An ingenious lining out system which comprises a 'wheelbarrow' which runs out or retrieves several reels of wire simultaneously. ATV versions also available.
   Rappa Fencing Ltd, Steepleton Hill, Stockbridge, Hampshire SO20 6JE.
   Tel: 01264 810665. **Fax:** 01264 810079.
   Email: sales@rappa.co.uk **Website:** www.rappa.co.uk

3. **Flexible Electric Netting**
   'Flexinet' electric netting, designed for enclosing or exclosing a range of animals, including sheep (may not be suitable for horned breeds) and rabbits.
   Bramley and Wellesley, Unit C, Chancel Close Trading Estate, Eastern Avenue, Gloucester GL4 7SN.
   Tel: 01452 300450. **Fax:** 01452 308776.
   Email: bramley@wildnet.co.uk **Website:** www.bramley.co.uk

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12 Seed Harvesting

The last two decades have seen a proliferation in projects of habitat restoration and re-creation. Early schemes often used proprietary seed mixes containing seed of continental origin, quite unsuitable for use on semi-natural habitats. The need for locally sourced seed is now recognised and demand for UK harvested seed is high. There are many techniques for harvesting including the collection and spreading of green hay or heather litter. This section describes a number of specialist harvesting machines that have been adapted/developed for the collection of heather and wild flower seed.

1 Heather

A collection of agricultural brushing machines which can be tractor-mounted or towed behind an ATV for the collection of heather seed.

2 Wild Flowers

A selection of purpose-built machines specially designed for the harvesting of wild flower seed.

Heather seed harvesting *T. Wall*

Emorsgate seed harvester *T. Robinson*

12.1 Heather

Suton bucket brush *T. Wall*

Purpose

The collection, extraction and spreading of heather seed is a key part of most heathland and moorland restoration or re-creation schemes. Heather seed has generally ripened by late October and may remain within the seed capsule for much of the winter; in order to maximise returns it is generally advisable, however, to complete harvesting by the end of November. The harvested material then requires riddling to remove unwanted litter before sending the capsules to a seed merchant to extract the seed. Alternatively, capsules can be spread without the seed having been first extracted. A range of harvesting equipment is available for seed collection, including both purpose-built machines and equipment adapted from other industries.

Advantages

- Less material to handle compared with the spreading of brashings and known quantity of seed is spread.
- Machines can be bought at reasonable cost.
- Seed can be spread by helicopter on sites with difficult terrain.

12.1 Heather ...2

Limitations

- Narrow harvesting window – late October to late November is recommended to harvest maximum quantity of seed.
- Seed needs to be harvested in relatively dry conditions, otherwise it will need to be dried artificially.

Manufacturers

1. **The Heather Trust Heather Seed Harvester**
   A heavy-duty brush harvester with manual emptying. Fits a tractor three-point linkage: requires tractor of 80 hp.
   Available on hire from: The Heather Trust, The Cross, Kippen, Stirlingshire FK8 3DS. Tel: 01786 870808. **Fax:** 01786 870890.
   Email: info@heathertrust.co.uk **Website:** www.heathertrust.co.uk
   A scarifier/sower is also available for hire.

2. **Logic Brush Collector**
   A specially-adapted version of a self-powered yard sweeper with nylon brush and collecting bag, suitable for towing behind quad bike. Versions also available for harvesting wild flower seed.
   Marketed by: G Eyre, William Eyre & Sons, Brough Corn Mill, Brough, Bradwell, Derbyshire S30 2HG. Tel: 01433 620353. **Fax:** 01433 620430.
   Also available on contract hire from: **Alaska Environmental Contracting, Stokeford Farm, East Stoke, Wareham, Dorset BH20 6AL.**
   Tel: 01929 463301. **Fax:** 01929 463889. **Email:** will@alaska.ltd.uk

3. **Suton Bucket Brush**
   Sweeper collector with range of brushes (polypropylene recommended for heather seed harvesting). Fits front hydraulic arms of tractor and is therefore fully height adjustable which may be an advantage in rocky or otherwise difficult terrain. Auto-emptying.
   Suton Agricultural Machinery Division, Gurney Reeve and Co Ltd, Suton, Nottingham NR18 9SR.
   Tel: 01953 603303. **Fax:** 01953 601331.

12.2 Wild Flowers

Emorsgate seed harvester *T. Robinson*

Purpose

The importance of using native wild flower seed in habitat enrichment, restoration and re-creation schemes is now fully recognised and there is now a considerable demand in the UK for locally harvested sources of seed.

Methods

Early harvesting projects in the 1980s generally involved the use of combine harvesters (with cleaning fans switched off to reduce loss of small seed) or machines based on industrial vacuums. Nowadays most harvesters collect seed with a system of rotating brushes which knock seed off the plants and into a hopper. Because seeds of different species ripen at different times, two harvestings are generally recommended.

Advantages (Brush Harvester)

- Less chaff than seed harvested with a combine harvester.
- Meadows can still be mown for hay, even after two harvestings.
- Brush harvesters are thought to be less damaging to invertebrate populations than vacuum harvesters.

12.2 Wild Flowers...2

Limitations

- The seeds of different plants ripen at different periods; even with two harvestings it is likely that a biased sample will be collected.
- A large proportion of the seeds of some species may be harvested. It is therefore important that any one area is harvested only once every three, or preferably five, years.

Further Information

ANDERSON, P. 1994. Flower-rich grassland creation. *enact* **2 (3)**. 21-22.

➤ 14.3 Journals

GILBERT, O. & ANDERSON, P. 1998. *Habitat Creation and Repair.* Oxford University Press, Oxford.

➤ 15 References

The *Flora Locale* website provides extensive information on seed collection, propagation and ecological restoration. The site includes an excellent Code of Practice for Collectors, Growers and Suppliers.
Website: www.naturebureau.co.uk/pages/florloc

Manufacturers

1. **The Emorsgate Brush Harvester**
   A dedicated seed harvester, developed by Emorsgate Seeds for harvesting wild flower meadows. Utilises rotating brushes to collect seed, which is then blown into collecting hopper. Fits a tractor three-point linkage: requires tractor of 40 hp. Can also be used for harvesting heather seed.
   Available for purchase or hire from: Emorsgate Seeds, Limes Farm, Tilney All Saints, Kings Lynn PE34 4RT.
   Tel: 01553 829028. **Fax:** 01553 829803.

2. **Logic Brush Collector**
   A specially-adapted version of a self-powered yard sweeper with nylon brush and collecting bag, suitable for towing behind quad bike. Based on heather seed harvester described in previous section (➤ 12.1 Heather).
   Marketed by: G Eyre, William Eyre & Sons, Brough Corn Mill, Brough, Bradwell, Derbyshire S30 2HG. Tel: 01433 620353. Fax: 01433 620430.
   Also available on contract hire from: **Alaska Environmental Contracting, Stokeford Farm, East Stoke, Wareham, Dorset BH20 6AL.**
   Tel: 01929 463301. **Fax:** 01929 463889. **Email:** will@alaska.ltd.uk

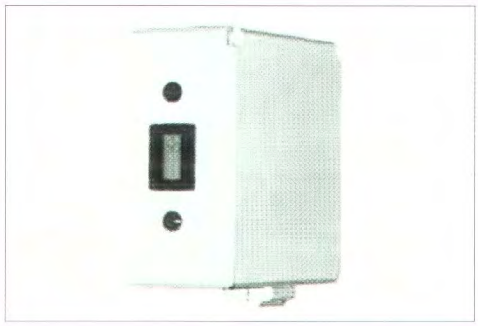
13 Visitor Management

Management of visitors is an integral part of the management of many wildlife sites. Often this involves providing a quality visitor experience whilst minimising the impact of visitors on both the physical environment and wildlife populations.

1 People and Vehicle Loggers

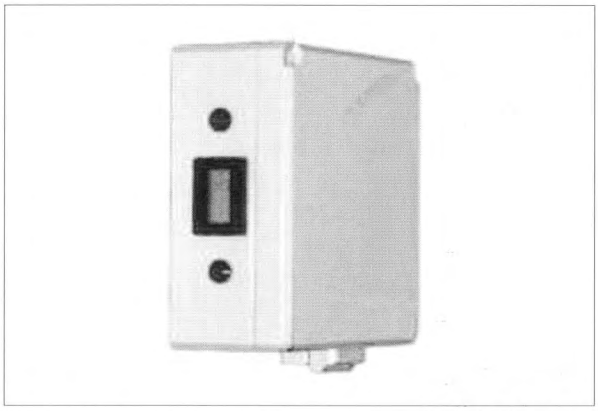
Hi-tech equipment for measuring pedestrian and vehicle movement.

This section will be expanded in future editions to include items on environmentally friendly timber treatment and footpath surfacing amongst other ideas on visitor-related issues.



Radio beam people counter A. & P. Chambers

13.1 People and Vehicle Loggers



Radio beam people counter *A. & P. Chambers*

Purpose

Measuring vehicle and visitor numbers has historically been either notoriously time-consuming (using observers) or notoriously inaccurate (stile tally counters, etc.). A range of electronic counters are now on the market, specifically designed for counting pedestrians, horses, bicycles or motorised vehicles.

Advantages

- Low running costs – run for several months on one battery.
- Minimal maintenance, once installed.
- Simple installation on paths, tracks, stiles, etc.
- Can be linked to data logger for analysis of results.

Limitations

- Expensive initial cost.

Manufacturers

1. **Chambers Counters**
   A range of electronic counters, utilising radio beam, pressure and magnetic field sensors. Models for counting people, horses, bicycles and motor vehicles.
   A & P Chambers Ltd, Kaluna House, Nairnside, Inverness IV2 5BU.
   Tel: 01463 790400. **Fax:** 0870 1617442.
   Email: sales@chambers-electronics.com
   Website: www.chambers-electronics.com

14 Other Sources of Information

*One of the aims of **Practical Solutions** is to guide land managers to other sources of information and advice. In this section and the next we list a selection of recommended further reading much of which is readily available, either in the form of current handbooks and leaflets, or in articles in commonly-read journals. Information on other conservation initiatives and organisations is also presented for situations where advice needs to be sought from a specialist.*

1 Handbooks	Full references for all management handbooks listed in the text, including details of cost and availability.
2 Leaflets	Full references for all leaflets listed in the text, including details of availability.
3 Journals	Descriptions and subscription information of journals mentioned in the text.
4 Advisory Services/ Organisations	Information on other initiatives, services and organisations including web addresses of all FACT organisations.

14.1 Handbooks

The handbooks listed in this section all give good practical management advice for their particular subject. Where possible we have included purchase price and contact information for the publishing organisation. To our knowledge all are currently available (as at June 2001), unless otherwise indicated.

- ***The Birch Woodland Management Handbook.*** WORRAL, R. 1999. Highland Birchwoods, Munlochy. Describes all aspects of management of native birch woodland. Available, price £11.50, from Highland Birchwoods, Littleburn, Munlochy, Ross-shire IV8 8NN. **Tel:** 01463 811606.

- ***Bracken Management Handbook: integrated bracken management.*** *A guide to best practice.* BROWN, R. & ROBINSON, R. 1997. Rhone-Poulenc. Considers the safe and responsible use of herbicides in bracken control. Available, free, from Aventis Crop Science Ltd, Fyfield Road, Ongar, Essex CM5 0HW. **Tel:** 01277 301125.

- ***Chalk Rivers – nature conservation and management.*** ENGLISH NATURE. 1999. English Nature, Peterborough. Contains information on characteristic wildlife communities, their habitat requirement and the ecological impact of activities that are relevant to the chalk river environment. Available, price £10, from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ***Conserving Bogs: the management handbook.*** STONEMAN, R. & BROOKS, S. 1997. Scottish Natural Heritage. Edinburgh. Describes classification and distribution of bogs and provides guidelines for management. Available from Scottish Natural Heritage, Publications Section, Battleby, Redgorton, Perth PH1 3EW. **Tel:** 01738 444177. **Fax:** 01738 827411. **Email:** pubs@redgore.demon.co.uk **Website:** www.snh.org.uk

- ***The Dormouse Conservation Handbook.*** BRIGHT, P., MORRIS, P. & MITCHELL-JONES, T. 1996. English Nature, Peterborough. Provides advice on ecology, survey, nest-boxes and reintroductions. Available, price £4.50, from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX.
  Tel: 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ***Drystone Walling: a practical handbook.*** BROOKS, A. & ADCOCK, S. 1999. British Trust for Conservation Volunteers, Wallingford. Describes regional styles, construction, health and safety and legal aspects. Available, price £13.95, from BTCV Enterprises, Balby Road, Doncaster DN4 0RH. **Tel:** 01302 572200. **Fax:** 01302 310167.

- ***A Farmer's Guide to Hedgerow and Field Margin Management.*** SOTHERTON, N. & PAGE, R. 1998. Game Conservancy Trust, Fordingbridge. Provides advice on management of hedgerows and field margins. Available from The Game Conservancy Trust, Fordingbridge, Hants SP6 1EF. **Tel:** 01425 652381. **Fax:** 01425 651026. **Email:** info@gct.org.uk **Website:** www.gct.org.uk

- ***Farming and Watercourse Management: a good practice handbook.*** SCOTTISH NATURAL HERITAGE. 2000. WWF Scotland, Scottish Natural Heritage, Scottish Environmental Protection Agency, Scottish Agricultural College. Available, price £10.00, from Scottish Natural Heritage, Publications Section, Battleby, Redgorton, Perth PH1 3EW. **Tel:** 01738 444177. **Fax:** 01738 827411. **Email:** pubs@redgore.demon.co.uk **Website:** www.snh.org.uk

14.1 Handbooks...2

- ***Farming & Wildlife: a practical handbook for the management, restoration and creation of wildlife habitats on farmland.*** ANDREWS, J. & REBANE, M. 1994. RSPB, Sandy, Beds. Provides practical management advice on all major wildlife habitats found on farmland. Available, price £21.95 + p&p, from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk

- ***Fencing: A Practical Handbook.*** AGATE, E. 1986. British Trust for Conservation Volunteers, Wallingford. Provides practical advice on design and construction of strained wire, wooden and electric fencing. Available, price £9.95, from BTCV Enterprises, Balby Road, Doncaster DN4 0RH. **Tel:** 01302 572200. **Fax:** 01302 310167.

- ***Fox Control in the Countryside.*** REYNOLDS, J.C. 2000. The Game Conservancy Trust, Fordingbridge. Discusses need and aims for fox control and reviews different methods. Available, price £6.00, from The Game Conservancy Trust, Fordingbridge, Hampshire SP6 1EF. **Tel:** 01425 652381. **Fax:** 01425 651026. **Email:** info@gct.org.uk **Website:** www.gct.org.uk

- ***Freshwater Fisheries and Wildlife Conservation – a good practice guide.*** ENVIRONMENT AGENCY. 1998. Environment Agency, Bristol. Describes principles of management for game and coarse fisheries. Available, free, from Environment Agency offices.

- ***The Good Hedge Guide: your pocket guide to hedgerow management.*** FWAG. 1999. FWAG, Bury St Edmunds. Provides advice on management of hedgerows and their wildlife interest. Available, price £5.00, from FWAG, National Agricultural Centre, Stoneleigh, Kenilworth, Warwickshire, CV8 2RX.

- ***Good Practice for Grouse Moor Management.*** SCOTTISH NATURAL HERITAGE et al. 1998. Scottish Natural Heritage, Edinburgh. Describes principles of moorland management for grouse. Available, free, from Scottish Natural Heritage, Publications Section, Battleby, Redgorton, Perth PH1 3EW. **Tel:** 01738 444177. **Fax:** 01738 827411. **Email:** pubs@redgore.demon.co.uk **Website:** www.snh.org.uk

- ***Gravel Pit Restoration for Wildlife: site managers' guide.*** ANDREWS, J. & KINSMAN, D. 1991. RSPB/Tarmac Quarry Products Ltd, Sandy, Beds. Describes opportunities for reclamation of land following sand and gravel extraction. Available, price £12.00, from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk

- ***Guidance for the Control of Invasive Plants near Watercourses: Japanese knotweed, Himalayan balsam, giant hogweed.*** ENVIRONMENT AGENCY. 1996. Environment Agency, Bristol. Describes control techniques. Available from Environment Agency offices.

- ***Guidelines for the Control of Japanese Knotweed (Reynoutria japonica).*** WELSH DEVELOPMENT AGENCY, 1991. Welsh Development Agency, Cardiff. Provides guidelines for herbicidal and non-herbicidal control.

- ***Habitat Management for Invertebrates: a practical handbook.*** KIRBY, P. 2001. RSPB, Sandy, Beds. Provides practical management advice for invertebrate conservation in a wide range of habitats. Recently reprinted. Available, price £17.45 + £2.75, p&p from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk

- ***Hedging: a practical handbook.*** BROOKS, A. & AGATE, E. 1998. British Trust for Conservation Volunteers, Wallingford. Provides practical advice on all aspects of planting, laying and trimming of hedges. Available, price £13.95, from BTCV Enterprises, Balby Road, Doncaster DN4 0RH. **Tel:** 01302 572200. **Fax:** 01302 310167.

14.1 Handbooks...3

- ***The IPCC Peatland Conservation and Management Handbook.*** FOSS, P. & O'CONNEL, C. 1998. Irish Peat Conservation Council, Dublin. Describes Irish peatlands and their conservation. Available from the Irish Peat Conservation Council, 119 Capel Street, Dublin 1. **Tel/Fax:** +353 01 8722397.

- ***The Japanese Knotweed Manual: the management and control of an invasive alien weed.*** CHILD, L. & WADE, M. 2000. Packard, Chichester. Provides information on biology of Japanese knotweed and provides guidelines for control.

- ***The Lowland Grassland Management Handbook.*** CROFTS, A. & JEFFERSON, R.J. eds. 1994. English Nature and Royal Society for Nature Conservation, Lincoln. Provides practical advice on all aspects of lowland grassland management. Currently out of print.

- ***The Lowland Heathland Management Handbook.*** GIMINGHAM, G.H. 1993. English Nature, Peterborough. Describes the different types of heathland and the management requirements of heathland animals and plants. Available, price £16.50, from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ***A Management Guide to Birds of Lowland Farmland.*** DODDS, G.W., APPLEBY, M.J. & EVANS, A.D. 1995. RSPB, Sandy, Beds. Provides information on declining species of farmland birds and suggests management practices which could help maintain populations. Available, price £5.00, from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk

- ***The Management of Semi-natural Woodlands.*** FORESTRY AUTHORITY. 1994. ***Forestry Practice Guides.*** Forestry Commission, Edinburgh. A series of guides on the management of various types of native woodland. Available from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire LS23 7EW. **Tel:** 0870 121 4180. **Fax:** 0870 121 4181. **Email:** forestry@twoten.press.net

- ***Managing Rides, Roadsides and Edge Habitats in Lowland Forests.*** FERRIS, R. 2000. Forestry Commission, Edinburgh. Provides information on the ecological value and management of forest rides and roads. Available, price £16.00, from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire LS23 7EW. **Tel:** 0870 121 4180. **Fax:** 0870 121 4181. **Email:** forestry@twoten.press.net

- ***Manual of River Restoration Techniques.*** RIVER RESTORATION CENTRE. Undated. Describes restoration projects on the Rivers Cole and Skerne, UK. Available, price £16, from River Restoration Centre, Silsoe Campus, Silsoe, Beds. MK45 4DT. **Tel:** 01525 86334. **Email:** rrc@cranfield.ac.uk

- ***Nature Conservation and the Management of Drainage Channels.*** NEWBOLD, C., HONNOR, J. & BUCKLEY, K. 1989. Nature Conservancy Council, Peterborough. Provides engineering and ecological advice for managers of lowland watercourses. Out of print but photocopies available from English Nature Enquiry Service, **Tel:** 01733 455101.

- ***The New Rivers and Wildlife Handbook.*** RSPB. 1994. RSPB, NRA, & RSNC. Provides practical management advice on most aspects of river management. Available, price £19.95 + p&p, from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk

14.1 Handbooks...4

- ***Otters and River Habitat Management.*** ENVIRONMENT AGENCY. 1999. Environment Agency, Bristol. Provides information on natural history and distribution of otters and practical advice on habitat management. Available, free, from Environment Agency offices.

- ***The Pond Book: a guide to the management and creation of ponds.*** WILLIAMS, P.D. et al. 1999. Ponds Conservation Trust, Oxford. Provides practical advice on pond creation and management for wildlife. Available, price £12.50, from the Ponds Conservation Trust, c/o Oxford Brookes University, Gipsy Lane, Headington, Oxford, OX3 0BP. **Tel:** 01865 483199.

- ***Ponds, Pools and Lochans: guidance on good practice in the management of small waterbodies in Scotland.*** SCOTTISH ENVIRONMENT PROTECTION AGENCY. 2000. SEPA, Stirling. Provides best practice advice on the management of ponds, pools and lochans in Scotland. Available, free, from Habitat Enhancement Initiative, SEPA, Clearwater House, Heriot-Watt Research Park, Avenue North, Riccarton, Edinburgh EH14 4AP. **Tel:** 0131 449 7296. **Email:** hei@sepa.org.uk

- ***Reedbed Management for Commercial and Wildlife Interests.*** HAWKE, C.J. & JOSE, P.V. 1996. RSPB, Sandy, Beds. Describes practical techniques on management, rehabilitation and wildlife interest. Available, price £14.95, from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk

- ***Repairing Upland Path Erosion: a best practice guide.*** DAVIES, P., LOXHAM, J. & HUGGON, G. 1996. Lake District National Park, National Trust & English Nature. Practical management advice on repair and maintenance of eroded upland paths.

- ***Restoring and Managing Riparian Woodlands.*** PARROTT, J. & MACKENZIE, N. 2000. Scottish Native Woods, Aberfeldy. Provides guidance on the management and restoration of native riparian woodland. Available, price £4 inc p&p, from Scottish Native Woodlands, The Old School, Errogie, Inverness-shire, IV2 6UH. **Tel:** 01456 486426. **Email:** nhnw-snw@btinternet.com

- ***The Sand Lizard Conservation Handbook.*** ENGLISH NATURE. 1999. English Nature, Peterborough. Provides information on ecology, distribution and habitat management. Available, price £5.00, from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ***The Scrub Management Handbook*** – in preparation.

- ***A Technical Guide to the Design and Construction of Lowland Recreation Routes.*** SCOTTISH NATURAL HERITAGE. 2000. Scottish Natural Heritage, Edinburgh. Practical advice on the engineering elements of how to construct routes for walkers, cyclists and horse-riders on low ground in the countryside. Includes information on assessing the site and approaching construction. Available, price £7.99, from Scottish Natural Heritage, Publications Section, Battleby, Redgorton, Perth PH1 3EW. **Tel:** 01738 444177. **Fax:** 01738 827411. **Email:** pubs@redgore.demon.co.uk **Website:**www.snh.org.uk

- ***The TIBRE Handbook: new options for arable farming.*** SCOTTISH NATURAL HERITAGE. 1997. Scottish Natural Heritage, Edinburgh. Targeted Inputs for a Better Rural Environment is an initiative by SNH to show how technology can be used in farming for the benefit of the environment. This handbook explains how. Available, free, from Scottish Natural Heritage, Publications Section, Battleby, Redgorton, Perth PH1 3EW.
Tel: 01738 444177. **Fax:** 01738 827411. **Email:** pubs@redgore.demon.co.uk
Website: www.snh.org.uk

14.1 Handbooks...5

- ***Tree Planting & Aftercare: a practical handbook.*** BROOKS, A. 1988. British Trust for Conservation Volunteers, Wallingford. Describes practical techniques of tree selection, planting and aftercare. Available, price £13.95, from BTCV Enterprises, Balby Road, Doncaster DN4 0RH. **Tel:** 01302 572200. **Fax:** 01302 310167.

- ***The Upland Management Handbook.*** BACKSHALL, J., MANLEY, J. & REBANE, M. eds. 2001. English Nature, Peterborough. Describes best management practice in upland habitats. Available, price £25.00, from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ***Upland Pathwork: construction standards for Scotland.*** HAMILTON, A. 2000. Scottish Natural Heritage, Edinburgh. Available, price £15.00, from Scottish Natural Heritage, Publications Section, Battleby, Redgorton, Perth PH1 3EW. **Tel:** 01738 444177. **Fax:** 01738 827411. **Email:** pubs@redgore.demon.co.uk **Website:** www.snh.org.uk

- ***The Use of Herbicides in the Forest.*** WILLOUGHBY, I. & DEWAR, J. 1995. *Forestry Commission Field Book 8*. HMSO, London. Gives various product rates for foliar application of the following herbicides: glyphosate, tryclopyr, 2,4-D/dicamba/tryclopyr, fossamine ammonium, imazapyr. Available, price £9.95, from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire LS23 7EW. **Tel:** 0870 121 4180. **Fax:** 0870 121 4181. **Email:** forestry@twoten.press.net

- ***Veteran Trees: a guide to good management.*** READ, H. 2000. Describes current understanding of best practice in veteran tree management. Available, price £15.00, from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ***The Water Vole Conservation Handbook.*** STRACHAN, R. 1999. Oxford University Wildlife Conservation Research Unit, Oxford. Outlines biology of water voles and advises on habitat and species management.

- ***Waterways and Wetlands: a practical handbook.*** AGATE, E. 1997. British Trust for Conservation Volunteers, Wallingford. Provides practical management advice on vegetation clearance, bank stabilisation, and dam, weir and sluice construction. Available, price £13.95, from BTCV Enterprises, Balby Road, Doncaster DN4 0RH. **Tel:** 01302 572200. **Fax:** 01302 310167.

- ***The Wet Grassland Guide: managing floodplain and coastal wet grasslands for wildlife.*** BENSTEAD, P. et al. 1997. RSPB, Institute of Terrestrial Ecology & English Nature. Describes techniques for the practical management of wet grassland for wildlife. Available, price £17.95, from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Email:** www.rspb.org.uk

- ***Wetland Restoration Manual.*** THE WILDLIFE TRUSTS. 2001. Wildlife Trusts Partnership, Newark. Practical and innovative advice on wetland restoration, creation, and management. Topics covered include legal and planning constraints, water level management, restoration of post-industrial land, and reedbed restoration. The manual also includes fact sheets on species conservation and Sustainable Drainage Schemes. Purchasers of the manual will be entitled to free inserts which are planned to cover techniques for restoring still and running open waters, fens, bogs, wet heaths, and wet grasslands. Available, price £45, from The Wildlife Trusts, The Kiln, Waterside, Mather Road, Newark, Nottinghamshire NG24 1WT. **Tel:** 01636 677711.

- ***Woodlands: a practical handbook.*** BROOKS, A. 1988. British Trust for Conservation Volunteers, Wallingford. Covers all aspects of practical woodland management. Available, price £9.95, from BTCV Enterprises, Balby Road, Doncaster DN4 0RH. **Tel:** 01302 572200. **Fax:** 01302 310167.

14.2 Leaflets

The leaflets listed all give good management advice for their particular subject. All are free and to our knowledge are available from the quoted sources at the time of publication (June 2001).

- BACON, J. 1996. Weed Wipe Notes (Technique Overview, Operator's Guide and Choosing the Herbicide). Guidance Notes, available from John Bacon, English Nature. **Tel/Fax:** 01694 723101. **Email:** jbacon7586@aol.com

- BASC. 1998. *Fox Snaring. A code of practice.* British Association for Shooting and Conservation. Wrexham. Available from the British Association for Shooting and Conservation, Marford Mill, Rossett, Wrexham LL12 0HL. **Tel:** 01244 573000. **Fax:** 01244 573001. **Email:** enq@ basc.demon.co.uk **Website:** www.basc.org.uk

- BASC. 1998. *Lamping (Night Shooting). A code of practice.* British Association for Shooting and Conservation. Wrexham. Available from the British Association for Shooting and Conservation, Marford Mill, Rossett, Wrexham LL12 0HL. **Tel:** 01244 573000. **Fax:** 01244 573001. **Email:** enq@basc.demon.co.uk. **Website:** www.basc.org.uk

- BUTTERFLY CONSERVATION. 1996. *Hedgerows for hairstreaks.* Butterfly Conservation, Wareham. Available from: Butterfly Conservation, Manor Yard East, Lulworth, near Wareham, Dorset BH20 5QP. **Tel:** 01929 400209. **Fax:** 01929 400210. **Email:** info@butterfly-conservation **Website:** www.butterfly-conservation.org.uk

- BUTTERFLY CONSERVATION. 1998. *Bracken for butterflies*. Butterfly Conservation, Wareham. Available from: Butterfly Conservation, Manor Yard East, Lulworth, near Wareham, Dorset BH20 5QP. **Tel:** 01929 400209. **Fax:** 01929 400210. **Email:** info@butterfly-conservation **Website:** www.butterfly-conservation.org.uk

- BUTTERFLY CONSERVATION. 2000. *The marsh fritillary – a guide to managing chalk grassland*. Butterfly Conservation, Wareham. Available from: Butterfly Conservation, Manor Yard East, Lulworth, near Wareham, Dorset BH20 5QP. **Tel:** 01929 400209. **Fax:** 01929 400210. **Email:** info@butterfly-conservation **Website:** www.butterfly-conservation.org.uk

- BUTTERFLY CONSERVATION. 2000. *The marsh fritillary – a guide to managing damp grassland*. Butterfly Conservation, Wareham. Available from: Butterfly Conservation, Manor Yard East, Lulworth, near Wareham, Dorset BH20 5QP. **Tel:** 01929 400209. **Fax:** 01929 400210. **Email:** info@butterfly-conservation **Website:** www.butterfly-conservation.org.uk

- COUNTRYSIDE COUNCIL FOR WALES. 1996. *Hedgerow management and renovation: a guide for land managers.* CCW, Bangor. Available from Countryside Council for Wales, Plas Penrhos, Fford Penrhos, Bangor, Gwynedd LL57 2LQ. **Tel:** 01248 385500. **Fax:** 01248 372342. **Email:** www.ccw.gov.uk

14.2 Leaflets...2

- CURRIE, F. & PEPPER, H. 2000. *Controlling Grey Squirrel Damage to Woodlands. Practice Note 4.* Forestry Commission, Edinburgh. Available from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire LS23 7EW. **Tel:** 0870 121 4180. **Fax:** 0870 121 4181. **Email:** forestry@twoten.press.net

- DETR. 1999. *The Management of Problems Caused by Canada Geese – a guide to best practice.* DETR, Bristol. Available from DETR. Wildlife Division, 1st Floor, Temple Quay House, 2 The Square, Temple Quay, Bristol BS1 6EB. **Tel:** 0117 987 8903. **Fax:** 0117 987 8182. **Email:** species@detr.gov.uk

- ENGLISH NATURE. 1996. *Grazing in upland woods: managing the impacts.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 1996. *Guide to the care of ancient trees.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 1996. *Land management for upland birds.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 1996. *Managing ponds for wildlife.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 1997. *Deer management and woodland conservation in England.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 1997. *Horses, grasslands & nature conservation.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 1998. *Management choices for ancient woodland: getting it right.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 1998. *Management of bare ground on dry grasslands and heathlands.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 2000. *Veteran trees: a guide to grants.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 2000. *Veteran trees: a guide to risk and responsibility.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

- ENGLISH NATURE. 2001. *Bracken management in the uplands.* English Nature, Peterborough. Available from English Nature, PO Box 1995, Wetherby, West Yorkshire LS23 7XX. **Tel:** 0870 121 4177. **Fax:** 0870 121 4178. **Email:** english-nature@twoten.press.net

14.2 Leaflets...3

- ENVIRONMENT AGENCY. 1996. *Understanding buffer strips.* Environment Agency, Bristol. Available from Environment Agency offices.

- ENVIRONMENT AGENCY. 1998. *Understanding riverbank erosion.* Environment Agency, Bristol. Available from Environment Agency offices.

- ENVIRONMENT AGENCY. 2000. *River rehabilitation – practical aspects from 16 case studies.* Environment Agency, Bristol. Available from Environment Agency offices.

- FORESTRY COMMISSION. 1998. Forest Research Technical Development Branch. *Phase 1 Technical Note No. 24/98: Smallwood Extraction Sledge.* Forestry Commission, Edinburgh. Available from Forestry Commission, Technical Development Branch, Ae Village, Dumfries DG1 1QB. **Tel:** 01387 860264. **Fax:** 01387 860386. **Email:** tdb@forestry.gov.uk

- FORESTRY COMMISSION. 1999. *Domestic stock grazing to enhance woodland biodiversity.* Information Note 28. Forestry Commission, Edinburgh. Available from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire LS23 7EW. **Tel:** 0870 121 4180. **Fax:** 0870 121 4181. **Email:** forestry@twoten.press.net

- FORESTRY COMMISSION. 2000. Guideline Note 1. *Forests and peatland habitats.* Forestry Commission, Edinburgh. Available from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire LS23 7EW. **Tel:** 0870 121 4180. **Fax:** 0870 121 4181 **Email:** forestry@twoten.press.net

- GAME CONSERVANCY TRUST. 1993. *Game set-aside and match.* Game Conservancy Trust, Fordingbridge. Available from the Game Conservancy Trust, Fordingbridge, Hampshire SP6 1EF. **Tel:** 01425 652381. **Fax:** 01425 651026. **Email:** info@gct.org.uk **Website:** www.gct.org.uk

- GAME CONSERVANCY TRUST. 1998. *Beetle banks – helping nature to control pests.* Game Conservancy Trust, Fordingbridge. Available from the Game Conservancy Trust, Fordingbridge, Hampshire SP6 1EF. **Tel:** 01425 652381. **Fax:** 01425 651026. **Email:** info@gct.org.uk **Website:** www.gct.org.uk

- GAME CONSERVANCY TRUST. 1998. *Guidelines for the management of field margins.* Game Conservancy Trust, Fordingbridge. Available from the Game Conservancy Trust, Fordingbridge, Hampshire SP6 1EF. **Tel:** 01425 652381. **Fax:** 01425 651026. **Email:** info@gct.org.uk **Website:** www.gct.org.uk

- HAMPSHIRE COUNTY COUNCIL. Undated. *Grazing for conservation in Hampshire.* Hampshire County Council and English Nature. Available from Hampshire Grazing Project, Planning Department, Hampshire County Council, The Castle, Winchester, Hampshire, SO23 8UE.

- LIFE PEATLANDS PROJECT (North of Scotland). Undated. *A land manager's guide to best practice in the peatlands of Caithness and Sutherland.*

- MAYLE, B. 1999. *Managing Deer in the Countryside. Practice Note 6.* Forestry Commission, Edinburgh. Available from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire LS23 7EW. **Tel:** 0870 121 4180. **Fax:** 0870 121 4181. **Email:** forestry@twoten.press.net

- NEWMAN, J.R. 1999. Control of Australian Swamp Stonecrop (*Crassula helmsii*). *Centre for Aquatic Plant Management Information Sheet* **14**. IACR-Centre for Aquatic Plant Management, Reading. Available from Centre for Aquatic Plant Management, Broadmoor Lane, Sonning, Reading RG4 6TH. **Tel:** 0118 969 0072. **Fax:** 0118 944 1730. **Email:** capm@freeuk.com

14.2 Leaflets...4

- NEWMAN, J.R. 1999. Control of Floating Pennywort (*Hydrocotyle ranunculoides*). *Centre for Aquatic Plant Management Information Sheet* **20**. IACR-Centre for Aquatic Plant Management, Reading. Available from Centre for Aquatic Plant Management, Broadmoor Lane, Sonning, Reading RG4 6TH. **Tel:** 0118 969 0072. **Fax:** 0118 944 1730. **Email:** capm@freeuk.com
- NEWMAN, J.R. 1999. Control of Giant Hogweed (*Heracleum mantegazzianum*). *Centre for Aquatic Plant Management Information Sheet* **6**. IACR-Centre for Aquatic Plant Management, Reading. Available from Centre for Aquatic Plant Management, Broadmoor Lane, Sonning, Reading RG4 6TH. **Tel:** 0118 969 0072. **Fax:** 0118 944 1730. **Email:** capm@freeuk.com
- NEWMAN, J.R. 1999. Control of Japanese Knotweed (*Fallopia japonica*). *Centre for Aquatic Plant Management Information Sheet* **7**. IACR-Centre for Aquatic Plant Management, Reading. Available from Centre for Aquatic Plant Management, Broadmoor Lane, Sonning, Reading RG4 6TH. **Tel:** 0118 969 0072. **Fax:** 0118 944 1730. **Email:** capm@freeuk.com
- NEWMAN, J.R. 2000. Control of Canadian Waterweed (*Elodea canadensis*). *Centre for Aquatic Plant Management Information Sheet* **9**. IACR-Centre for Aquatic Plant Management, Reading. Available from Centre for Aquatic Plant Management, Broadmoor Lane, Sonning, Reading RG4 6TH. **Tel:** 0118 969 0072. **Fax:** 0118 944 1730. **Email:** capm@freeuk.com
- NEWMAN, J.R. 2000. Control of Duckweeds. *Centre for Aquatic Plant Management Information Sheet* **25**. IACR-Centre for Aquatic Plant Management, Reading. Available from Centre for Aquatic Plant Management, Broadmoor Lane, Sonning, Reading RG4 6TH. **Tel:** 0118 969 0072. **Fax:** 0118 944 1730. **Email:** capm@freeuk.com
- NEWMAN, J.R. 2000. Control of Himalayan Balsam (*Impatiens glandulifera*). *Centre for Aquatic Plant Management Information Sheet* **5**. IACR-Centre for Aquatic Plant Management, Reading. Available from Centre for Aquatic Plant Management, Broadmoor Lane, Sonning, Reading RG4 6TH **Tel:** 0118 969 0072. **Fax:** 0118 944 1730. **Email:** capm@freeuk.com
- NEWMAN, J.R. 2000. Control of Water Fern (*Azolla filiculoides*). *Centre for Aquatic Plant Management Information Sheet* **24**. IACR-Centre for Aquatic Plant Management, Reading. Available from Centre for Aquatic Plant Management, Broadmoor Lane, Sonning, Reading RG4 6TH. **Tel:** 0118 969 0072. **Fax:** 0118 944 1730. **Email:** capm@freeuk.com
- PEPPER, H. 1999. *Recommendations for Fallow, Roe and Muntjac Deer Fencing: New Proposals for Temporary and Reusable Fencing. Practice Note 9.* Forestry Commission, Edinburgh. Available from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire LS23 7EW. **Tel:** 0870 121 4180. **Fax:** 0870 121 4181. **Email:** forestry@twoten.press.net
- RSPB. 1994. *Reedbed management for bitterns.* RSPB, Sandy, Beds. Available from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk
- RSPB. 1996. *Farm hedges and their management.* RSPB, Sandy, Beds. Available from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk
- RSPB. Undated. *Farmland bird management guidelines: grey partridge, linnet, tree sparrow, skylark, corn bunting, lapwing, reed bunting.* RSPB, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk
- RSPB. Undated. *Managing set-aside for birds. RSPB*, Sandy, Beds. Available from RSPB, The Lodge, Sandy, Beds. SG19 2DL. **Tel:** 01767 680551 **Fax:** 01767 692365. **Website:** www.rspb.org.uk

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- SCOTTISH NATURAL HERITAGE. 1996. Information and Advisory Note 59. *Fencing and upland conservation management.* Scottish Natural Heritage, Edinburgh. Available from Scottish Natural Heritage, Publications Section, Battleby, Redgorton, Perth PH1 3EW. **Tel:** 01738 444177. **Fax:** 01738 827411. **Email:** pubs@redgore.demon.co.uk **Website:** www.snh.org.uk

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14.3 Journals

This section provides descriptions and subscription information of journals referred to in the preceding sections. Journal references are listed in full in section 15.

British Wildlife

British Wildlife magazine is an independent bi-monthly journal covering all aspects of British natural history and conservation. The magazine features regular articles on practical habitat management and the management of individual species. A conservation news section includes the regular feature, Habitat Management News. Available by subscription (individual £19.95 p.a.) from: Subscriptions Dept, British Wildlife Publishing, Lower Barn, Rooks Farm, Rotherwick, Hook, Hampshire RG27 9BG.
Tel: 01256 760663. **Fax:** 01256 760501. **Email:** subs@britishwildlife.com
Website: www.britishwildlife.com

BSBI News

The journal of the Botanical Society of the British Isles, issued free to members. Includes regular articles on alien plants in Britain. For membership information see: **Website:** rbge.org.uk/BSBI

Enact

Enact magazine, published by English Nature, is aimed specifically at conservation land managers. Its four issues per year feature a wide range of articles about matters affecting the management of land for wildlife. Additional information, including costings, is presented in easy-to-follow fact boxes and diagrams with full colour illustrations. Each issue also carries a range of regular features including product reviews, book reviews and news items. Available by subscription (£12.00 p.a.) from: Enact Subscriptions Dept, British Wildlife Publishing, Lower Barn, Rooks Farm, Rotherwick, Hook, Hampshire RG27 9BG.
Tel: 01256 760663. **Fax:** 01256 760501. **Email:** subs@britishwildlife.com
Website: www.britishwildlife.com

FCA News

Newsletter of the Forestry Contracting Association which contains regular features on horse logging in the UK. Available by subscription to the FCA (Associate membership £20). Contact Forestry Contracting Association Ltd, Dalfling, Blairdaff, Inverurie, Aberdeenshire AB51 5LA.
Tel: 01467 651368. **Fax:** 01467 651595. **Email:** members@fcauk.com.

Heavy Horse World

A heavy horse magazine which contains regular features on use of heavy horses in conservation work. Available by subscription (£15, UK) from: Diane Zeuner, Park Cottage, West Dean, Chichester, West Sussex PO18 0RX. **Tel/Fax:** 01243 811364. **Email:** heavyhorse@mistrel.co.uk

14.4 Advisory Services/Organisations

This section provides an introduction to FACT and describes other initiatives and sources of advice from the group and its participating organisations.

✿ FACT

FACT, the Forum for the Application of Conservation Techniques, is a partnership group comprising representatives from over 20 conservation organisations which was formed to identify and address practical habitat management problems across Britain and Ireland. Since its formation in 1996, FACT has initiated a number of projects and products, including GAP, the Regional Grazing Schemes Initiative and Ecolots, all described in this section. For further information or suggestions on practical land management problems or technical developments contact:
John Bacon, FACT Co-ordinator, English Nature, PO Box 25, Church Stretton, Shropshire SY6 7WL. Tel/Fax: 01694 723101.
Email: jbacon7586@aol.com

or **Tony Robinson, Land Management Officer, English Nature, Bishops Hull, Roughmoor, Taunton, Somerset TA1 5AA. Tel:** 01823 283211.
Fax: 01823 272978. **Email:** tony.robinson@english-nature.org.uk

✿ Grazing Animals Project (GAP)

The Grazing Animals Project was formed in 1997, under the umbrella of FACT, to aid the development of sustainable conservation grazing in the UK. The project is managed by a steering group comprising representatives from both conservation organisations and the livestock industry and is currently staffed by three part-time contractors. GAP has initiated the development of a number of projects including the promotion of Regional Grazing Schemes (see separate entry) and the production of 'Breed Profiles', a reference collection listing profiles of breeds of grazing animals. GAP produces a quarterly newsletter, *GAP News*, which is currently circulated to over 750 members, and organises training courses and site visits and meetings around the country. For further details contact:
The Grazing Animals Project Office, 7A Friars Quay, Norwich NR3 1ES.
Tel: 01603 756070. **Fax:** 01603 756065.
Email: grazinganimalsproject@dialpipex.com

14.4 Advisory Services/Organisations...2

✿ *Ecolots*

A free web-based service aimed at managers involved in the environmentally sensitive and sustainable management of land. Ecolots is a successor to the bi-monthly magazines *Eco-ads* and *Woodlots*, and advertises a range of services and commodities, both for sale and wanted. Log on to **www.ecolots.co.uk** or, for a paper copy, contact:
Beacon Forestry, 2A Rutland Square, Edinburgh EH1 2AS.
Tel: 0131 229 4176.

✿ *The Regional Grazing Schemes Initiative*

A nationwide initiative to assist the sustainability of site grazing by encouraging the grazing of wildlife sites with local stock and developing local markets for grazing products. Regional Grazing Schemes also encourage and assist with the networking and joint working of all grazing managers in a given geographical area. Its aim is to address the requirements of the conservation grazing industry from 'grass blade to meat joint'. For information on progress, details of workshops and meetings contact:
The GAP Office (address above).

✿ *Machinery Rings*

The network of machinery rings which has developed in the last few years across the UK within the agricultural industry has allowed farmers to share machinery in a controlled way and thereby reduce capital expenditure, especially on very large and expensive machines. Rings also act as suppliers of commodities which they can bulk purchase, and of specialist labour such as stockmen. Machinery ring managers are now looking to extend their business to other land management operations especially within the wildlife and conservation management sectors. An Information Pack has been produced which sets out how business might be developed to the advantage of both wildlife managers and the rings. The Pack lists all the rings in the UK and their contact addresses and numbers. Involvement can either be as 'demanders' for equipment, or as 'suppliers' of equipment into a ring. If the rings receive sufficient demand for equipment they will try to supply the services of well-trained and qualified contractors with the required specialist equipment. The use of rings by wildlife managers should either increase the availability of 'green' machines or alternatively enable wildlife organisations who already have machines to make them more widely available and obtain a financial return on their investment. Copies of the Machinery Ring Information Pack are available from:
English Nature Enquiry Service, Northminster House, Peterborough PE1 1UA. Tel: 01733 455101. **Fax:** 01733 455103.

14.4 Advisory Services/Organisations...3

✿ Forestry Commission Research Division Reports Index

The Forestry Commission Research Division's Technical Development Branch carry out a wide range of research into forestry operations. The research is written up in various reports, technical notes and information notes under headings which include nursery, weeding, manual harvesting, mechanised harvesting, extraction and fire fighting. The reports are relevant to managers of all types of woodland.

The Index lists by subject area over 250 reports that have been completed since 1990. Available from: **Forestry Commission, Technical Development Branch, Ae Village, Dumfries DG1 1QB**. **Tel:** 01387 860264.
Fax: 01387 860386. **E-mail:** tdb@forestry.gov.uk

Many other Forestry Commission publications are viewable on-line and/or can be downloaded from the Forestry Commission website at: **www.forestry.gov.uk**

✿ Other Conservation Organisations

All the UK and Irish conservation organisations represented in FACT provide advice on differing aspects of practical land management. Respective websites provide information on the role of each organisation and provide contact details.

Association of National Park Authorities	**www.anpa.gov.uk**
British Trust for Conservation Volunteers	**www.btcv.org**
Butterfly Conservation	**www.butterfly-conservation.org.uk**
Countryside Agency	**www.countryside.gov.uk**
Countryside Council for Wales	**www.ccw.gov.uk**
DEFRA	**www.defra.gov.uk**
Duchas, National Park and Wildlife Service	**www.heritageireland.ie**
English Heritage	**www.english-heritage.org.uk**
English Nature	**www.english-nature.org.uk**
Environment Agency	**www.environment-agency.gov.uk**
Environment and Heritage Service	**www.doeni.gov.uk**
Farming and Wildlife Advisory Group	**www.fwag.org.uk**
Forestry Commission	**www.forestry.gov.uk**
Game Conservancy Trust	**www.gct.org.uk**
Ministry of Defence	**www.mod.uk**
National Trust	**www.nationaltrust.org.uk**
Royal Agricultural College	**www.royalagcol.ac.uk**
Royal Society for the Protection of Birds	**www.rspb.org.uk**
Scottish Natural Heritage	**www.snh.org.uk**
Wildlife Trusts Partnership	**www.wildlifetrust.org.uk**
Woodland Trust	**www.woodland-trust.org.uk**

15 References

This section lists all references cited in ***Practical Solutions****, with the exception of management handbooks and leaflets which are listed separately (➤ 14.1 Handbooks, ➤ 14.2 Leaflets). Wherever possible, a brief description of the content of each reference is given as an aid to judgement of relevance.*

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ALEXANDER, K. & GREEN, T. 1993. Deadwood: eyesore or ecosystem? *enact* **1 (1)**. 11-14. Discusses the importance of deadwood for invertebrates.

ANDERSON, P. 1994. Flower-rich grassland creation. *enact* **2 (3)**. 21-22. Describes a wild flower seeding project at Stansted airport.

ANDERSON, P. 1996. The wrong trees. *enact* **4 (4)**. 20-22. Recommends the adoption of better ecological principles for woodland planting schemes.

ANDERSON, R. 2001. *Deforesting and restoring peat bogs: a review.* Technical Paper 32, Forestry Commission, Edinburgh.

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ANDREWS, J. & WARD, D. 1991. The management and creation of reedbeds – especially for rare birds. *British Wildlife* **3 (20)**. 81-91.

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AUSDEN, M. & TREWEEK, J. 1995. Grasslands. In: *Managing Habitats for Conservation*, ed. SUTHERLAND, W.J. & HILL, D.A. 197-229. Cambridge University Press, Cambridge. Provides advice on principles of management.

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Describes development of a new weed-wiping machine.

BACON, J. 1995. Removing the prickles. *enact* **3 (2)**. 10-11.
An update on methods of controlling creeping thistle.

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BACON, J. 1999. A new turf lifter. *enact* **7 (3)**. 20-21.
Describes a turf-cutting machine that can be used to create bare ground.

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Describes a new hand tool for weed extraction.

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Describes a horse-drawn scarifier, developed for heathland rehabilitation work.

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Describes a major wetland restoration project in East Anglia.

BARRETT, J. 1997. Moor gripping in the uplands. *enact* **5 (1)**. 16-17.
Discusses the damming of drainage grips on moorland.

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