ENGLISH NATURE

HABITAT RESTORATION PROJECT

Fact sheet

6

Creation of linking habitats for wildlife

Linear features such as hedges and hedgebanks, lines of trees, grassland strips along field boundaries, stone walls, ditches and rivers act as linking habitats connecting some of the remaining wildlife-rich areas in the English countryside. They contain much of the wildlife found in the ordinary countryside and may also be used by species moving from one habitat patch to another. Creating new linking habitats is thus valuable, both because it increases the area available for wildlife, and because it reduces the isolation of other patches in the landscape.

This fact sheet provides guidance on the creation of new linking habitats in agricultural landscapes, focusing in particular on the planting of hedgerows and the creation of grass strips around the boundaries of fields. Linking habitats do not always need to be linear and continuous, small patches of new wildlife habitat can form valuable "stepping stones" which bridge the gap between isolated patches of a particular habitat.

Where to create linking habitats

- Between existing areas of semi-natural habitat, particularly areas of similar habitat type (e.g. linking woodland to woodland, or unimproved grassland to unimproved grassland).
- To fill gaps or breaks in existing linking habitats (e.g. replanting a missing section of hedgerow).
- To widen and increase the habitat diversity of existing linear habitats (e.g. creation of a grass strip adjacent to a hedgerow, or planting of a hedge next to a ditch dividing two arable fields).
- Along former field boundaries, which may retain some species, and in order to maintain the character of the landscape.

General design guidelines for linking habitats

- To act as wildlife corridors, linking habitats should be as continuous as possible, since some animals and plants are unable to cross even short stretches of unsuitable ground.
- Where possible, create a range of habitats running parallel to one another (e.g. a hedge with strips of tall herb vegetation and short grassland running alongside).
- Maximise the width of the linear habitat. This will increase the overall extent of habitat and the range of habitats that can be provided, as well as reducing the impact of external influences such as accidental contamination with pesticides and fertilisers.
- Where possible, incorporate some sinuosity into linear features, as this can be more attractive and increase habitat variation.
- Where complete continuity of habitat cannot be maintained, a series of "stepping stones" of habitat will still be of value to wildlife.

Hedges

Design and establishment

- Remove the existing vegetation from the planting site (unless a grass strip or other semi-natural vegetation is already present) by herbicide treatment or cultivation.
- Use only native trees and shrubs, selecting species which occur locally in hedges and woods. Plant stock which is of British provenance, preferably derived from seed obtained from local sources.
- Try to use a variety of species, e.g. five species of shrub and three species of tree, according to what is present locally (it may be appropriate to use fewer species, especially in the north).

- Plant whips (0.45-0.6m high) between October and March for best results. Plant the hedge as a double staggered row, with 0.25m between plants and 0.5m between rows.
- Plant groups of the same species together.

Initial aftercare

- Reduce competition from weeds during the first few years of establishment by the use of selective herbicides or low fertility mulch. Black plastic may also be used, but should be biodegradable.
- Erect protective fencing where there is a risk of grazing damage by farm livestock.
- Erect rabbit fencing or protect the plants with individual rabbit guards if needed.
- Trim the top of the hedge each autumn until the required height is reached.
- Allow some of the trees to grow on to become hedgerow trees. Mark these to prevent accidental pruning.

Long-term management

- Aim for a height of at least 1.4m (preferably 2m) and a width of 1.2m.
- Trim the hedge every second or third year, between November and February. Adopt a programme of trimming in which there is always a proportion of uncut hedge.
- If required, hedges can be laid or coppiced (according to regional style) to maintain good structure.
- On arable land, establish a perennial grass strip (at least 1m wide) either side of the hedge.
- In pastures, consider fencing-off a strip of grassland adjacent to the hedge to prevent grazing and allow the development of tall herbage.
- Prevent artificial fertilisers and pesticides getting into the hedge.

Grass strips

Perennial grass and wild flower strips can be established by sowing or by natural regeneration of vegetation. They will be particularly beneficial for wildlife where they form links between existing areas of semi-natural grassland, or where they are established adjacent to other linear features such as hedges, ditches or rivers. Grassland next to rivers may also act as a buffer strip, reducing the potential impacts of agriculture by intercepting run-off containing sediment, fertilisers and pesticides.

Natural regeneration

- This option is appropriate where there is semi-natural vegetation growing nearby to provide a seed source to establish the new vegetation, and on soils of low fertility where competition from agricultural weeds is likely to be less severe.

Sown strips

- This option is most suitable where there is no adjacent semi-natural vegetation to provide seed sources for vegetation establishment, and on fertile soils where competition from weeds is likely to be a problem.
- The wider the strip, the better it will be for wildlife.
- If required, remove the existing vegetation by herbicide treatment. Prepare a firm, fine seedbed and sow between late August and mid September. Grasses can be sown by shallow drilling followed by light rolling. Wild flowers should be broadcast followed by rolling.
- Plants selected for sowing should be native species and of British stock.
- Choose species which are common in local semi-natural grasslands, and which are suited to the soil conditions. Wherever possible, use seed derived from local sources.
- Include long-lived perennial species and avoid highly competitive species such as rye-grass.
- Choose three or four grasses and five to ten wild flower species.
- Only include wild flowers if future management will allow annual cutting of at least part of the strip.
- Sow 85% grass seed and 15% wild flower seed by weight. Sow at a rate of 30kg/hectare. If necessary, bulk the seed up with an inert carrier (sand or sawdust) to allow even distribution.

Initial aftercare

- Once the vegetation develops it should be cut to encourage tillering and the closing of the sward. Cutting will also reduce competition from annual weeds. Several cuts may be required during the first year of establishment.
- With natural regeneration, periodic topping will suppress annual weed species and encourage the development of a thick sward of perennial species.

Long-term management

- Strips comprising only grasses can be left unmanaged, though periodic cutting may be required to prevent encroachment by scrub.
- Strips containing wild flowers should be cut each year in the autumn to prevent the grasses becoming too dominant and swamping the growth of the other species. Removal of the cut material will (over a period of years) reduce nutrient levels and increase the competitiveness of the wild flowers.
- Where width allows, habitat diversity can be increased by leaving half the strip uncut with the remainder cut once a year.
- Care must be taken to avoid the use of fertilisers and pesticides on grass strips, though problems with perennial weeds can be dealt with by careful spot treatment with herbicide if necessary.

Other linking habitats

Ditches

- At least one bank should have a shallow gradient to encourage colonisation by marginal and aquatic vegetation. Maximising physical diversity within the ditch will increase the value for wildlife.
- For ditches which remain wet all year, a shelf should be constructed just below the summer water level. For ditches which tend to dry out, creation of one or more deeper pools may allow water to be retained throughout the year.

Scrub

- New areas of scrub can be created by direct planting or by allowing its natural development, for example by suckering from hedgerow shrubs or invasion of unmanaged grassland. (n.b. Scrub should not be allowed to invade grasslands with existing wildlife value).
- Linear features containing scrub will be of most benefit to wildlife where they comprise a mixture of scrub, tall herb vegetation and short grassland.
- Areas of scrub should be managed on a rotation (part of the area cleared each year) to give an uneven age structure.

Dry-stone walls

- Always use local stone for their construction.
- For arable land, create a grass strip adjacent to the wall. In pastures, consider erecting a fence parallel to the wall to allow tall grass and herb cover to develop.

Sources of further information on linking habitats

Andrews, J. and Rebane, M. 1994. Farming and Wildlife: A Practical Management Handbook. Royal Society for the Protection of Birds, Sandy. 358pp.

Brooks, A. 1984. Hedging. A Practical Conservation Handbook. British Trust For Conservation Volunteers, Wallingford. 120pp.

Dowdeswell, W.H. 1987. Hedgerows and Verges. Allen and Unwin, London. 190pp.

Environment Agency. (Undated). Understanding Buffer Strips: An Information Booklet. The Environment Agency, Bristol. 12pp.

Kirby, K. 1995. Rebuilding the English Countryside: Habitat Fragmentation and Wildlife Corridors as Issues in Practical Conservation. English Nature Science No. 10. English Nature, Peterborough. 39pp.

Pollard, E., Hooper, M.D. and Moore, N.W. 1974. Hedges. Collins New Naturalist No. 58. Collins, London. 256pp.

RSPB/NRA/RSNC. 1994. The New Rivers and Wildlife Handbook. Royal Society for the Protection of Birds, Sandy. 426pp.

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Bibliography

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Habitat creation bibliography: linking habitats

ADAS. 1994. *Management of Arable Field Margins.* 4pp (leaflet).

Leaflet detailing how cultivation, spraying and fertiliser application can contribute to arable field margin weed problems, and suggesting changes in agricultural practice which can reduce the problem at the same time as benefiting wildlife. Contains sections on perennial grass and herb boundary strips (covering ground preparation, choice of seed mixture, sowing methods and subsequent management), beetle banks, conservation headlands, and fallow strips for arable weed species. (*Useful leaflet suitable for direct distribution to farmers. More detailed information on species to plant would be required by farmers wishing to establish boundary strips*).

ADAS. 1994. *Hedgerow Establishment.* 4pp (leaflet).

Leaflet providing general advice to farmers on hedgerow establishment. The subject matter includes ground preparation, when to plant, choice of species, planting patterns and use of plastic mulching. There are useful illustrations showing the recommended spacing of plants and a specification for rabbit-proof fencing. There is also a section on hedgerow trees, including how to establish these in existing hedges. (*Useful leaflet suitable for direct distribution to farmers, although more detailed guidance on what species to plant in particular localities would be useful*).

Andrews, J. and Rebane, M. 1994. *Farming and Wildlife: A Practical Management Handbook.* R.S.P.B., Sandy. 358pp.

Handbook providing guidance on the management, restoration and creation of wildlife habitats on farmland in the UK. The first chapter deals with surveying the wildlife interest of farms and making wildlife management decisions, with the remaining chapters covering the major wildlife habitats found on farms (arable land, pastures and meadows, lowland heaths, hill and rough grazings, machair, farm woodlands, hedgerows, farm trees and scrub, waterbodies and other wetlands, farm buildings and walls). For each habitat there are sections on wildlife requirements and effects of farm management, options for conservation management, prescriptions for the management, enhancement and creation of the habitat, references and further reading, and case studies of the implementation of wildlife conservation on farms. Also included are key features on selected species and numerous tables summarizing aspects of wildlife assessment and conservation management. (*Although the sections on habitat creation are relatively brief, this is nonetheless an invaluable source of information for those undertaking or advising on habitat creation on farmland*).

Barr, C., Howard, D., Bunce, R., Gillespie, M. and Hallam, C. 1991. *Changes in Hedgerows in Britain Between 1984 and 1990.* ITE Report to Department of the Environment. Institute of Terrestrial Ecology, Grange-over-Sands. 14pp.

A technical report summarising the changes in hedgerows between 1984 and 1990, based on the analysis of data from "Countryside Survey 1990". The report provides estimates of the extent of hedge loss, hedge gain and changes in hedge management in England, Scotland and Wales over the six year period, and describes the methods used to derive these estimates. (*Too technical to be of general appeal - only useful for those interested in learning more about how estimates of hedge loss are arrived at*).

Boatman, N. (Ed). 1994. *Field Margins: Integrating Agriculture and Conservation.* Proceedings of symposium organised by the British Crop Protection Council in association with the British Ecological Society and Association of Applied Biologists, University of Warwick, April 1994. BCPC Monograph No. 58. BCPC, Farnham. 404pp.

Contains sections on the role of field margins in the landscape, field margins as wildlife habitats, management of field margins, and restoration and creation of field margins. (*Information is more readily accessible from other sources*).

British Crop Protection Council. (Undated). *The Management of Cereal Field Margins.* BCPC, Farnham. 6pp.

Leaflet detailing options for the management of field margins. The introduction explains the terminology of field margins, and is followed by separate sections on the boundary, boundary strip and crop margin. Contains information on hedge and ditch management, bare ground and sown boundary strips, conservation headlands and fertiliser/pesticide usage. (*Good general leaflet - though lacks detailed prescriptions for habitat creation/ enhancement*).

Brooks, A. 1988. *Hedging. A Practical Conservation Handbook.* British Trust for Conservation Volunteers, Wallingford. 120pp.

Contains sections on planting and early care of hedges, trimming, laying, banking and turfing. (*Good source of practical advice on establishment and management of hedges*).

Clarke, J. (Ed). 1992. *Set-aside.* Proceedings of a symposium organised by the British Crop Protection Council. Cambridge University, September 1992. BCPC Monograph No. 50. BCPC, Farnham. 283pp.

(*Technical publication. Information on enhancing set-aside for wildlife is more readily accessible in other publications*).

Countryside Council for Wales. 1996. *Hedgerow Management and Renovation. A Guide for Land Managers in the Hedgerow Renovation Scheme.* CCW, Bangor. 8pp.

Booklet focusing mainly on hedgerow management (including laying, coppicing and trimming), but also containing useful sections on the planting and aftercare of new hedges. (*Although produced for distribution in Wales, much of the content will be equally useful to land managers in England*).

Devon Hedge Group. (Undated). *Hedge Cutting: How to Cut Costs and Benefit the Environment.* Devon Hedge Group.

Leaflet detailing recommended hedge cutting methods, and explaining the environmental benefits of the management prescriptions given. Deals solely with established hedgerows, and contains no information on the creation of new hedges. The leaflet also puts forward an economic argument for adopting less frequent hedge maintenance. (*Useful for farmers interested in implementing "wildlife-friendly" management of their hedges*).

Dodds, G.W., Appleby, M.J. and Evans, A.D. *A Management Guide to Birds of Lowland Farmland.* Royal Society for the Protection of Birds. Sandy. 64pp.

Contains details of the ecology of 12 farmland birds, and guidelines on how to encourage them. Contains sections on agricultural practices, set-aside, flower-rich margins, pesticides, grassland management, hedges, tree management, wetland management, weeds, scrub and buildings.

Dowdeswell, W.H. 1987. *Hedgerows and Verges.* Allen and Unwin, London. 190pp.

General text serving as a good introduction to these habitats. Topics covered include the origin and diversity of hedges as well as extensive sections on the ecology of hedgerow fauna and flora. The final three chapters (Hedgerows under Threat, Problems of Conservation and What Future?) have most relevance to habitat restoration, and include information on the rates of hedgerow loss and a consideration of the perceived benefits and disbenefits of hedges. (*Useful as an introductory text, although the date of this publication means that some of the more recent initiatives in agricultural practices and incentives are not included*).

Environment Agency. (Undated). *Understanding Buffer Strips: An Information Booklet.* The Environment Agency, Bristol. 12pp.

Booklet explaining the various terms used to describe buffers, before concentrating on riparian buffer strips and how they can be used to reduce diffuse pollution (e.g. sediment, pesticides and fertilisers) from agriculture. Topics covered include a review of research on how buffer strips work, and a consideration of factors to take into account to ensure that buffers are established in appropriate locations. The opportunity for buffer strips to have multiple functions (e.g. wildlife corridors, beetle banks, boundary strips etc) is also discussed. (*Useful for distribution to riparian landowners - though contains little practical advice on how to establish buffers*).

Farming and Wildlife Advisory Group. (Undated). *Hedges and Field Boundaries.* FWAG, Kenilworth. 12pp.

Booklet summarising the value of field boundaries for wildlife and providing recommendations on their management and establishment. Includes information on hedges, grass strips, fences, walls, ditches and other watercourses.

Farming and Wildlife Advisory Group. (Undated). *Guidelines for Environmentally Responsible Farming.* FWAG, Kenilworth. 12pp.

A series of guidelines aimed at achieving a whole-farm approach to conservation. Topics covered include fertiliser and pesticide use, and the management of typical farmland wildlife habitats (hedges, woodlands, watercourses, wetlands and grasslands).

Farming and Wildlife Advisory Group. (Undated). *Arable Farming and Set-aside.* FWAG, Kenilworth. 14pp.

Booklet outlining the opportunities for enhancing habitats on arable farmland for wildlife, with particular reference to set-aside land. Contains management recommendations for the full range of habitats found on arable farms, as well as suggestions on fertilisers, pesticides, spraying techniques etc. (*Good source of general information on improving the value of farmland habitats for wildlife*).

Farming and Wildlife Advisory Group. (Undated). *Farming and Field Margins.* FWAG, Kenilworth.

Booklet summarising the value of field margins for wildlife, and providing recommendations on how to manage them to maximise their benefit to wildlife. Subjects covered include natural regeneration of margins, sowing margins with grasses/wild flowers, protection of margins from pesticide and fertiliser contamination, and retention of an ungrazed strip in pastures.

Farming and Wildlife Advisory Group. (Undated). *Trees, Woodlands and Scrub.* FWAG, Kenilworth. (Booklet).

Farming and Wildlife Advisory Group. (Undated). *Ditches, Rivers and Streams.* FWAG, Kenilworth. (Booklet).

Farming and Wildlife Advisory Group. 1996. *Field Margin Management.* FWAG, Kenilworth.

Technical Information Sheet defining the various components of field margins (boundary, boundary strip and crop margin) and explaining how past agricultural intensification has decreased the value to wildlife of these habitats. Most of the leaflet deals with boundary strips, including the options for their establishment and a consideration of their benefits to farming and wildlife. (*Leaflet should be read in conjunction with other FWAG technical information sheets on boundary strips*).

Farming and Wildlife Advisory Group. 1996. *Natural Regeneration and Boundary Strips.* FWAG, Kenilworth.

Technical Information Sheet detailing the role of vegetated boundary strips in controlling weed growth, and explaining how they can be created through natural regeneration of fallow field margins. Topics covered include the advantages of using natural regeneration, consideration of situations when this method is appropriate, as well as management guidelines for the period following establishment and in subsequent years. (*Leaflet best read in conjunction with other FWAG technical information on boundary strips/expanded field margins*).

Farming and Wildlife Advisory Group. 1996. *Sown Boundary Strips.* FWAG, Kenilworth.

Technical Information Sheet explaining the rationale for sowing boundary strips in arable field margins to reduce weed problems, and providing practical guidelines on how best to establish and manage them. Identifies priority sites for boundary strips to benefit wildlife, and contains some general advice on which wild grasses and herbs are suitable for inclusion in seed mixtures. (*Suitable for distribution to farmers, but lacks information on when to sow and any specific mention of the benefits of boundary strips for wildlife. Should be read in conjunction with other FWAG technical information sheets on field boundaries*)

Farming and Wildlife Advisory Group. 1996. *Planting New Hedges.* FWAG, Kenilworth.

Technical Information Sheet giving concise, practical guidance on the establishment of new hedgerows using native species. Topics covered include species selection, planting methods (timing, spacing, mulching etc), weed control and protective fencing. (*Useful for direct distribution to farmers*).

Farming and Wildlife Advisory Group. 1996. *Creating Wildflower Swards.* FWAG, Kenilworth.

Technical Information Sheet concentrating on the practical aspects of establishing wild flower swards. Covers where to create swards, species choice, establishment methods (timing, choice of bare seedbed or sowing/ planting into existing swards) and aftercare in the first season of establishment and in subsequent years. (*Good basic leaflet, though lacks specific information on suitable species to plant - instead concentrates on which species to avoid*).

Farming and Wildlife Advisory Group. 1996. *Hedgerow Trees.* FWAG, Kenilworth.

Technical Information Leaflet explaining the importance of hedgerow trees for wildlife, and providing guidance on the planting of new trees. Includes sections on where to plant, which species to plant, and management (pruning/pollarding).

Firbank, L.G., Arnold, H.R., Eversham, B.C., Mountford, J.O., Radford, G.L., Telfer, M.G., Treweek, J.R., Webb, N.R.C. and Wells, T.C.E. 1993. *Managing Set-aside Land for Wildlife.* ITE Research Publication No. 7. HMSO, London. 146pp.

Report detailing management recommendations for set-aside land which will benefit wildlife. Introductory sections consider the conservation priorities on set-aside farmland as well as the potential for wildlife enhancement. These are followed by a series of management options for rotational set-aside (e.g. management for arable weeds and birds), non-rotational set-aside (e.g. enhanced field margins, natural regeneration) and longer-term restoration on set-aside land (e.g. creation of calcareous grassland and heathland). (*Good appraisal of the various options for set-aside, though partly out of date due to changes in the set-aside regulations*).

Game Conservancy Trust. 1995. *Guidelines for the Management of Field Margins.* Farmland Ecology Unit Factsheet No. 2. The Game Conservancy Trust, Fordingbridge. 16pp.

Document detailing the Game Conservancy Trust's recommendations for the management of field margins (boundary, boundary strip and crop margin). Topics covered include conservation headlands, hedgerows, grass

strips and beetle banks. Contains detailed information on the types of pesticides permitted on conservation headlands and grass strips. *(Concise summary document. Although aimed primarily at gamebirds, many of the recommendations will benefit other wildlife groups).*

Game Conservancy Trust. 1996. *Game, Set-aside and Match. Your Guide to Set-aside for Game in 1996.* Farmland Ecology Factsheet No. 3. The Game Conservancy, Fordingbridge. 12pp.

Factsheet summarising the Game Conservancy's recommendations for managing set-aside for gamebirds. The recommendations are divided into those for rotational set-aside, flexible/guaranteed set-aside, woodland and other options. Topics covered include natural regeneration, winter cover crops, brood-rearing cover and sown cereal mixtures. *(Good summary of the main options available to improve set-aside for game and, indirectly, other wildlife. Some of the information is likely to become rapidly out of date due to changing set-aside regulations).*

Game Conservancy Trust. (Undated). *The Management of Field Margins and Conservation Headlands.* The Game Conservancy Trust, Fordingbridge.

A concise leaflet, aimed at farmers, explaining the wildlife value of conservation headlands and field boundaries and giving clear recommendations on how best to manage these areas for wildlife. Recommendations for pesticide use on cereal headlands are also included. *(Suitable for direct distribution to farmers).*

Lack, P. 1992. *Birds on Lowland Farms.* HMSO, London. 140pp.

Publication arising from a collaboration between the BTO, JNCC and MAFF, and using the Common Birds Census as the main data source. The book aims to describe the ecological requirements of birds on farms, to indicate the factors influencing their distribution and abundance, to explain the effects of different management practices on birds and to demonstrate how management can be modified to improve the habitat for birds. Whilst the emphasis is on the management of existing habitats, there are also recommendations for the creation of areas of new habitat specifically to benefit birds. There are separate chapters for each of the main farmland habitats (e.g. hedges, woodlands, field margins, fields and crops etc). *(The information on habitat creation is concise but probably lacks sufficient detail to plan a project without reference to other sources. The management recommendations will be of value in assessing the future management requirements of newly-established habitat creation schemes).*

Nature Conservancy Council. 1989. *Management Options for Expanded Field Margins.* NCC, Peterborough. (Leaflet).

Introductory leaflet covering the four main options for expanded field margins - conservation headlands, fallow margins, grass boundary strips and hedgerows. The benefits to wildlife (and farming) of each option are explained, and brief guidance is given on how to establish and manage each of these features. *(Concise, clear guide to the available options).*

Peterken, G.F. and Allison, H. 1989. *Woods, Trees and Hedges: A Review of Changes in the British Countryside.* Focus on Nature Conservation No. 22. Nature Conservancy Council, Peterborough. 65pp.

Report providing detailed information on the losses of woodland and hedges in different regions of Britain. *(Excellent source of background information on habitat loss).*

Pollard, E., Hooper, M.D. and Moore, N.W. 1974. *Hedges.* Collins New Naturalist No. 58. Collins, London. 256pp.

Rackham, O. 1976 (revised 1990). *Trees and Woodlands in the British Landscape.* J.M.Dent, London. 234pp.

Treatise detailing the historical ecology of Britain's woodland and hedgerows (as well as the trees of meadows, commons and parks) from pre-history to the present day. The final chapter reviews recent developments in the conservation of ancient woodland and considers prospects for the future. *(Excellent account of the historical, landscape and wildlife importance of our woodland resource).*

Rackham, O. 1986. *The History of the Countryside.* J.M.Dent and Sons Ltd., London. 445pp.

Detailed historical ecology of the British countryside. The emphasis is on woodland and trees, though a number of other habitats are also covered, including heaths, moors, grassland, ponds, marshes, fens and rivers. *(Excellent introduction to wildlife habitats in a historical context).*

Royal Society for the Protection of Birds. 1995. *Farmland Bird Information.* RSPB, Sandy.

Information pack published by the RSPB, sponsored by MAFF, and supported by the GCT, BTO and FWAG. The pack comprises management guidelines for skylark, grey partridge, corn bunting, reed bunting, linnet and tree sparrow (one A4 sheet for each species). Basic factual information is given for each species (including the extent of population decline), as well as recommendations for management practices to encourage their presence on farms. *(These sheets would be very useful to distribute to farmers).*

Royal Society for the Protection of Birds. 1994. *Farming and Wildlife: Arable Land.* RSPB, Sandy. (Leaflet).

Leaflet summarising chapter 2 of Farming and Wildlife: A Practical Management Handbook. Topics covered include the importance of arable land for wildlife, the effects of fertiliser and pesticide use on wildlife, and recommended management practices (e.g. best practice for pesticide and fertiliser use) to benefit wildlife on arable land. There are additional sections on how to manage field margins, conservation headlands and rotational set-aside for wildlife, and details of the various incentive schemes available. (*Good, concise document which gets the main points across effectively - suitable for direct distribution to farmers*).

Royal Society for the Protection of Birds. 1994. *Farming and Wildlife: Hedgerows, Farm Trees and Scrub.* RSPB, Sandy. (Leaflet).

Leaflet summarising chapter 4 of Farming and Wildlife: A Practical Management Handbook. Mainly deals with the management of existing trees, hedges and scrub, but contains a useful resume of the wildlife value of these features. Outlines a few key points to consider when planting new hedges and hedgerow trees. (*Good general document suitable for direct distribution to farmers, but contains little information on creation of new areas of habitat*).

Smith, H., Feber, R.E., Johnson, P.J., McCallum, K., Plesner Jensen, S., Younes, M. and Macdonald, D.W. 1993. *The Conservation of Arable Field Margins.* English Nature Science No. 18. English Nature, Peterborough. 455pp.

Detailed research report describing the results of experiments on the management of arable field margins. The objectives of the experiments were to determine practical ways of restoring the wildlife conservation interest of field boundaries whilst addressing the problem of weed control. One experiment involved the establishment of 2m wide margins, and the other the establishment of wider margins. Vegetation on the margins was established by natural regeneration or sowing with grasses/wild flowers, and a variety of cutting regimes were introduced. Monitoring was carried out to determine the effects of the different treatments on vegetation, butterflies, other invertebrate groups and small mammals. The results of the study provide a basis for designing field margin management strategies which can increase the species richness of plant and animal communities whilst allowing adequate weed control. (*Contains a wealth of valuable information, but likely to be too detailed and inaccessible to be of use to those actively involved in habitat creation schemes*).

Wilson, R. 1979. *The Hedgerow Book.* David and Charles, Newton Abbot. 204pp.

A general account which includes sections on the origin and dating of hedges, but which concentrates mainly on individual animal and plant species characteristic of the habitat. (*Good general introduction to hedges and hedgerow wildlife).*

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Fact sheet

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Enhancing arable land for wildlife

Technological advances in arable farming over the past fifty years have resulted in large increases in crop yields, but have also led to the loss of much of our native wildlife which depends on farmland. Factors which have contributed to this include the decline of mixed farming, the change from spring to autumn-sown cereals (and consequent loss of winter stubbles), and the increased usage of pesticides and fertilisers. Characteristic wildlife known to have declined in recent decades includes birds (e.g. corn bunting, skylark and linnet), insects (including bees and other beneficial insects) and the specialised wild flowers of arable fields.

This fact sheet provides guidance on ways in which, within the constraints of current farming systems, the effects of these agricultural changes can be mitigated. It sets out a number of options for increasing habitat and species diversity on arable farmland. Brief recommendations are given on how to establish and manage each option, and which wildlife is likely to benefit. Financial incentives for some of the options may be available through Government schemes such as Countryside Stewardship, Environmentally Sensitive Areas and Set-aside. General guidelines on minimising the effects of pesticides and herbicides on the wildlife of arable land are also given.

Grass margins

Grass margins created alongside hedgerows and other field boundaries will increase the habitat available for a range of wildlife including invertebrates, small mammals and birds. Grassland provides feeding and nesting areas for grey partridge, and overwintering sites for predatory insects and spiders. In spring the predators disperse into the crop where they can reduce significantly the numbers of pest species.

- Prepare a seed bed 2m wide and drill or broadcast a mixture of tussock-forming, native perennial grasses such as cock's-foot, timothy and Yorkshire fog. A small proportion of other grasses such as bents, fescues and meadow grasses can be included in the mix to increase variety.
- Sow (normally in the autumn) at a rate of 30 Kg per hectare.
- Cut frequently during the first year to control weed growth and encourage the development of a thick sward.
- Once established, cut once every few years to prevent encroachment by scrub.
- The wildlife value can further be enhanced by including wild flower species in the seed mix. Only select relatively robust species which can withstand competition from the grasses. Wild flowers should be suited to the soil conditions and comprise native species local to the area (see Fact Sheet 6 - linking habitats). Wild flower seed should be sown by broadcasting followed by rolling.

- Areas sown with wild flowers will benefit from cutting each autumn (and the cuttings removed) to prevent the grasses becoming too dominant. A proportion of the area should be left uncut.

Beetle banks

Beetle banks are grass ridges constructed within arable fields where they provide similar habitats to grass margins.

- Beetle banks are especially valuable when created in large fields where the centre is more than 200m from the edge (and so difficult to reach by predators of crop pests).
- Construct a ridge at least 0.4m high and 2m wide across the field by careful ploughing. Leave a gap at each end to allow machinery access.
- Sow with perennial, tussocky grass species. Manage in the same way as grass margins.

Conservation headlands

Conservation headlands are created by managing the edges of arable crops less intensively than the main part of the field, primarily through reductions in pesticide use. They encourage the wildlife of the field margin, including hedges, ditches and grass strips, as well as the fringe of the crop. Groups which will particularly benefit include bird species such as grey partridge, rare wild flowers of arable fields, and invertebrates such as beetles and butterflies.

- Create conservation headlands on the outer 6m or 12m of the crop.
- Avoid selecting sites with high populations of aggressive weeds which may be difficult to control.
- Do not apply insecticides after mid-March.
- Only apply selective pesticides which allow control of grass weeds, cleavers and crop diseases, but which enable most broad-leaved weeds and beneficial insects to survive. Specific guidelines are available from the Game Conservancy Trust.
- For sites with rare arable wild flowers, consider reducing or ceasing fertiliser inputs to the headland.

Retention of cereal stubble

Winter stubble provides feeding areas for bird species characteristic of arable land such as the corn bunting, grey partridge and skylark, and will also provide suitable nesting sites if retained over the spring and summer period, for example as set-aside. Untreated stubbles will allow the natural regeneration of vegetation, providing food and habitat for a range of native wildlife.

- Leave the stubble untouched after harvest. To encourage nesting by birds such as skylark and corn bunting, delay cultivation until after mid-July in the year after harvest.
- Birds which require open ground conditions for nesting, such as lapwing and stone curlew, and rare arable wild flowers which rely on spring germination, can be encouraged by cultivating all or part of the field in early March.
- Cultivation of the field (after mid-March) and the sowing of a spring crop will provide nesting sites for skylark and lapwing.

Spring-sown cereals with undersown grass

Adoption of this cropping regime will result in insect-rich habitats attractive to farmland birds, such as the skylark and corn bunting, as well as other wildlife.

- Undersow with grass and legumes at the same time as the cereal is sown.
- Only apply herbicides which are grass and legume safe.
- Retention of the resulting grass ley until mid-July will provide suitable nesting sites for birds, and increase habitat diversity for a wide range of wildlife.
- The grass can be grazed or cut for silage once the nesting season is over (after mid-July).

Wildlife cover crops

Cover crops such as cereals, linseed and legumes provide an important seed food source as well as nesting sites for birds. They also support a wealth of other wildlife including butterflies, bees and small mammals.

- To encourage insects and the birds which feed on them, sow small-grained cereals and brassicas in the autumn or early spring. Retain the crop until March of the following year.
- To produce winter seed crops, sow two or more crops, at least one of which produces seed in the first year.

Minimising the effects of pesticides and fertilisers on wildlife of arable land

- Follow established codes of practice on fertiliser and pesticide use.
- Only use pesticides when pest populations reach threshold levels.
- Where possible, use target-specific pesticides rather than broad-spectrum formulations.
- Apply insecticides early or late in the day to reduce the effects on non-target species.
- Avoid spray-drift affecting sensitive habitats such as ponds, woodland, hedges and semi-natural grasslands.
- Do not apply fertilisers to hedge bases, grass strips, beetle banks, buffer zones beside ponds, ditches and rivers or other wildlife habitats. Fit deflectors to spinner applicators to minimise the risk of accidental applications.

Sources of further information on arable farming practices which benefit wildlife

Andrews, J. and Rebane, M. 1994. Farming and Wildlife: A Practical Management Handbook. Royal Society for the Protection of Birds, Sandy. 358pp.

Dodds, G.W., Appleby, M.J. and Evans, A.D. 1995. A Management Guide to Birds of Lowland Farmland. Royal Society for the Protection of Birds, Sandy. 64pp.

Firbank, L.G., Arnold, H.R., Eversham, B.C., Mountford, J.O., Radford, G.L., Telfer, M.G., Treweek, J.R., Webb, N.R.C. and Wells, T.C.E. 1993. Managing Set-aside Land for Wildlife. ITE Research Publication No.7. HMSO, London. 146pp.

Lack, P. 1992. Birds on Lowland Farms. HMSO, London. 140pp.

Osborne, P. 1989. The Management of Set-aside Land for Birds: A Practical Guide. Royal Society for the Protection of Birds, Sandy. 34pp.

A variety of leaflets on grass margins, beetle banks, conservation headlands and other aspects of wildlife on arable land are available from The Royal Society for the Protection of Birds, The Game Conservancy Trust, The Farming and Wildlife Advisory Group and The Ministry of Agriculture, Fisheries and Food.

ENGLISH NATURE

HABITAT RESTORATION PROJECT

Bibliography 7

Habitat creation bibliography: arable

ADAS. 1994. *Management of Arable Field Margins.* 4pp (leaflet).

Leaflet detailing how cultivation, spraying and fertiliser application can contribute to arable field margin weed problems, and suggesting changes in agricultural practice which can reduce the problem at the same time as benefiting wildlife. Contains sections on perennial grass and herb boundary strips (covering ground preparation, choice of seed mixture, sowing methods and subsequent management), beetle banks, conservation headlands, and fallow strips for arable weed species. (*Useful leaflet suitable for direct distribution to farmers. More detailed information on species to plant would be required by farmers wishing to establish boundary strips*).

Andrews, J. and Rebane, M. 1994. *Farming and Wildlife: A Practical Management Handbook.* R.S.P.B., Sandy. 358pp.

Handbook providing guidance on the management, restoration and creation of wildlife habitats on farmland in the UK. The first chapter deals with surveying the wildlife interest of farms and making wildlife management decisions. The remaining chapters cover the major wildlife habitats found on farms (arable land, pasture and meadow, lowland heath, hill and rough grazing, machair, farm woodland, hedgerows, farm trees and scrub, waterbodies and other wetlands, farm buildings and walls). For each habitat there are sections on wildlife requirements and effects of farm management, options for conservation management, prescriptions for the management, enhancement and creation of the habitat, references and further reading, and case studies of the implementation of wildlife conservation on farms. Also included are key features on selected species and numerous tables summarizing aspects of wildlife assessment and conservation management. (*Although the sections on habitat creation are relatively brief, this is nonetheless an invaluable source of information for those undertaking or advising on habitat creation on farmland*).

Boatman, N. (Ed). 1994. *Field Margins: Integrating Agriculture and Conservation.* Proceedings of symposium organised by the British Crop Protection Council in association with the British Ecological Society and Association of Applied Biologists, University of Warwick, April 1994. BCPC Monograph No. 58. BCPC, Farnham. 404pp.

Contains sections on the role of field margins in the landscape, field margins as wildlife habitats, management of field margins, and restoration and creation of field margins. (*Information is more readily accessible from other sources*).

British Crop Protection Council. (Undated). *The Management of Cereal Field Margins.* BCPC, Farnham. 6pp.

Leaflet detailing options for the management of field margins. The introduction explains the terminology of field margins, and is followed by separate sections on the boundary, boundary strip and crop margin. Contains information on hedge and ditch management, bare ground and sown boundary strips, conservation headlands and fertiliser/pesticide usage. (*Good general leaflet - though lacks detailed prescriptions for habitat creation/ enhancement*).

Clarke, J. (Ed). 1992. *Set-aside.* Proceedings of a symposium organised by the British Crop Protection Council. Cambridge University, September 1992. BCPC Monograph No. 50. BCPC, Farnham. 283pp.

(*Technical publication. Information on enhancing set-aside for wildlife is more readily accessible in other publications*).

Dodds, G.W., Appleby, M.J. and Evans, A.D. 1995. *A Management Guide to Birds of Lowland Farmland.* Royal Society for the Protection of Birds. Sandy. 64pp.

Contains details of the ecology of 12 farmland birds, and guidelines on how to encourage them. Contains sections on agricultural practices, set-aside, flower-rich margins, pesticides, grassland management, hedges, tree management, wetland management, weeds, scrub and buildings.

Farming and Wildlife Advisory Group. (Undated). *Hedges and Field Boundaries.* FWAG, Kenilworth. 12pp.

Booklet summarising the value of field boundaries for wildlife and providing recommendations on their management and establishment. Includes information on hedges, grass strips, fences, walls, ditches and other watercourses.

Farming and Wildlife Advisory Group. (Undated). *Guidelines for Environmentally Responsible Farming.* FWAG, Kenilworth. 12pp.

A series of guidelines aimed at achieving a whole-farm approach to conservation. Topics covered include fertiliser and pesticide use, and the management of typical farmland wildlife habitats (*hedges, woodlands, watercourses, wetlands and grasslands*).

Farming and Wildlife Advisory Group. (Undated). *Arable Farming and Set-aside.* FWAG, Kenilworth. 14pp.

Booklet outlining the opportunities for enhancing habitats on arable farmland for wildlife, with particular reference to set-aside land. Contains management recommendations for the full range of habitats found on arable farms, as well as suggestions on fertilisers, pesticides, spraying techniques etc. (*Good source of general information on improving the value of farmland habitats for wildlife*).

Farming and Wildlife Advisory Group. (Undated). *Farming and Pesticides.* FWAG, Kenilworth. 16pp.

Booklet providing guidance on how the responsible use of pesticides can minimise the damaging effects on wildlife. Topics covered include pesticides and the environment, how to minimise the use of sprays, spraying techniques and choice of product.

Farming and Wildlife Advisory Group. (Undated). *Fertilisers and the Environment.* FWAG, Kenilworth. 12pp.

Booklet providing guidance on how to help prevent damage to the environment and wildlife from the use of artificial fertilisers and manures. Contains sections on vulnerable farmland habitats, and methods of minimising nutrient losses.

Farming and Wildlife Advisory Group. (Undated). *Farming and Field Margins.* FWAG, Kenilworth.

Booklet summarising the value of field margins for wildlife, and providing recommendations on how to manage them to maximise their benefit to wildlife. Subjects covered include natural regeneration of margins, sowing margins with grasses/wild flowers, protection of margins from pesticide and fertiliser contamination, and retention of an ungrazed strip in pastures.

Farming and Wildlife Advisory Group. 1996. *Field Margin Management.* FWAG, Kenilworth.

Technical Information Sheet defining the various components of field margins (boundary, boundary strip and crop margin) and explaining how past agricultural intensification has decreased the value to wildlife of these habitats. Most of the leaflet deals with boundary strips, including the options for their establishment and a consideration of their benefits to farming and wildlife. (*Leaflet should be read in conjunction with other FWAG technical information sheets on boundary strips*).

Farming and Wildlife Advisory Group. 1996. *Natural Regeneration and Boundary Strips.* FWAG, Kenilworth.

Technical Information Sheet detailing the role of vegetated boundary strips in controlling weed growth, and explaining how they can be created through natural regeneration of fallow field margins. Topics covered include the advantages of using natural regeneration, consideration of situations when this method is appropriate, as well as management guidelines for the period following establishment and in subsequent years. (*Leaflet best read in conjunction with other FWAG technical information on boundary strips/expanded field margins*).

Farming and Wildlife Advisory Group. 1996. *Sown Boundary Strips.* FWAG, Kenilworth.

Technical Information Sheet explaining the rationale for sowing boundary strips in arable field margins to reduce weed problems, and providing practical guidelines on how best to establish and manage them. Identifies priority sites for boundary strips to benefit wildlife, and contains some general advice on which wild grasses and herbs are suitable for inclusion in seed mixtures. (*Suitable for distribution to farmers, but lacks information on when to sow and any specific mention of the benefits of boundary strips for wildlife. Should be read in conjunction with other FWAG technical information sheets on field boundaries*)

Farming and Wildlife Advisory Group. 1996. *Creating Wildflower Swards.* FWAG, Kenilworth.

Technical Information Sheet concentrating on the practical aspects of establishing wild flower swards. Covers where to create swards, species choice, establishment methods (timing, choice of bare seedbed or sowing/ planting into existing swards) and aftercare in the first season of establishment and in subsequent years. (*Good basic leaflet, though lacks specific information on suitable species to plant - instead concentrates on which species to avoid*).

Firbank, L.G., Arnold, H.R., Eversham, B.C., Mountford, J.O., Radford, G.L., Telfer, M.G., Treweek, J.R., Webb, N.R.C. and Wells, T.C.E. 1993. *Managing Set-aside Land for Wildlife.* ITE Research Publication No. 7. HMSO, London. 146pp.

Report detailing management recommendations for set-aside land which will benefit wildlife. Introductory

sections consider the conservation priorities on set-aside farmland as well as the potential for wildlife enhancement. These are followed by a series of management options for rotational set-aside (e.g. management for arable weeds and birds), non-rotational set-aside (e.g. enhanced field margins, natural regeneration) and longer-term restoration on set-aside land (e.g. creation of calcareous grassland and heathland). (*Good appraisal of the various options for set-aside, though partly out of date due to changes in the set-aside regulations*).

Game Conservancy Trust. 1995. *Guidelines for the Management of Field Margins.* Farmland Ecology Unit Factsheet No. 2. The Game Conservancy Trust, Fordingbridge. 16pp.

Document detailing the Game Conservancy Trust's recommendations for the management of field margins (boundary, boundary strip and crop margin). Topics covered include conservation headlands, hedgerows, grass strips and beetle banks. Contains detailed information on the types of pesticides permitted on conservation headlands and grass strips. (*Concise summary document. Although aimed primarily at gamebirds, many of the recommendations will benefit other wildlife groups*).

Game Conservancy Trust. 1996. *Game, Set-aside and Match. Your Guide to Set-aside for Game in 1996.* Farmland Ecology Factsheet No. 3. The Game Conservancy, Fordingbridge. 12pp.

Factsheet summarising the Game Conservancy's recommendations for managing set-aside for gamebirds. The recommendations are divided into those for rotational set-aside, flexible/guaranteed set-aside, woodland and other options. Topics covered include natural regeneration, winter cover crops, brood-rearing cover and sown cereal mixtures. (*Good summary of the main options available to improve set-aside for game and, indirectly, other wildlife. Some of the information is likely to become rapidly out of date due to changing set-aside regulations*).

Game Conservancy Trust. (Undated). *Beetle Banks - Helping Nature to Control Pests.* The Game Conservancy Trust, Fordingbridge.

A leaflet, aimed at farmers, explaining the rationale for mid-field refuges and giving clear instructions on how to construct them and establish a grass sward. Guidelines for their on-going management are also given. (*Suitable for direct distribution to farmers*).

Game Conservancy Trust. (Undated). *The Management of Field Margins and Conservation Headlands.* The Game Conservancy Trust, Fordingbridge.

A concise leaflet, aimed at farmers, explaining the wildlife value of conservation headlands and field boundaries and giving clear recommendations on how best to manage these areas for wildlife. Recommendations for pesticide use on cereal headlands are also included. (*Suitable for direct distribution to farmers*).

Game Conservancy Trust, Royal Society for the *Protection of Birds and English Nature. 1996.* Proposal for an Arable Incentive Scheme. Unpublished report to MAFF. 23pp.

A series of recommendations for management prescriptions which could be implemented as an "Arable Incentive Scheme" to increase the biodiversity of arable land. Contains introductory sections documenting the decline in the flora and fauna of arable land, as well as the likely reasons for this decline, followed by summaries of the prescriptions. These are divided into extensive cereal options (spring cereal undersown with grass/legume mix, stubble left over winter, conservation headlands) and unharvested crop options (cover crops, grass margins, beetle banks).

Lack, P. 1992. *Birds on Lowland Farms.* HMSO, London. 140pp.

Publication arising from a collaboration between the BTO, JNCC and MAFF, and using the Common Birds Census as the main data source. The book aims to describe the ecological requirements of birds on farms, to indicate the factors influencing their distribution and abundance, to explain the effects of different management practices on birds and to demonstrate how management can be modified to improve the habitat for birds. Whilst the emphasis is on the management of existing habitats, there are also recommendations for the creation of areas of new habitat specifically to benefit birds. There are separate chapters for each of the main farmland habitats (e.g. hedges, woodlands, field margins, fields and crops etc). (*The information on habitat creation is concise but probably lacks sufficient detail to plan a project without reference to other sources. The management recommendations will be of value in assessing the future management requirements of newly-established habitat creation schemes*).

Nature Conservancy Council. 1989. *Management Options for Expanded Field Margins.* NCC, Peterborough. (Leaflet).

Introductory leaflet covering the four main options for expanded field margins - conservation headlands, fallow margins, grass boundary strips and hedgerows. The benefits to wildlife (and farming) of each option are explained, and brief guidance is given on how to establish and manage each of these features. (*Concise, clear guide to the available options*).

Nature Conservancy Council. 1989. *The Conservation of Cornfield Flowers.* Nature Conservancy Council, Peterborough. 16pp.

Booklet documenting how changes in agricultural practice have led to the decline in cornfield flowers, and outlining management practices (e.g. creation of conservation headlands) which can be adopted to help conserve this group of plants. Contains lists of rare and declining species of wild flower characteristic of cultivated land. (*Excellent background information on cornfield plants. Details of the creation and management of conservation headlands are dealt with better in more recent publications*).

Osborne, P. 1989. *The Management of Set-aside Land for Birds: A Practical Guide.* Royal Society for the Protection of Birds, Sandy. 34pp.

Royal Society for the Protection of Birds. 1995. *Farmland Bird Information.* RSPB, Sandy.

Information pack published by the RSPB, sponsored by MAFF, and supported by the GCT, BTO and FWAG. The pack comprises management guidelines for skylark, grey partridge, corn bunting, reed bunting, linnet and tree sparrow (one A4 sheet for each species). Basic factual information is given for each species (including the extent of population decline), as well as recommendations for management practices to encourage their presence on farms. (*These sheets would be very useful to distribute to farmers*).

Royal Society for the Protection of Birds. 1994. *Farming and Wildlife: Arable Land.* RSPB, Sandy. (Leaflet).

Leaflet summarising chapter 2 of Farming and Wildlife: A Practical Management Handbook. Topics covered include the importance of arable land for wildlife, the effects of fertiliser and pesticide use on wildlife, and recommended management practices (e.g. best practice for pesticide and fertiliser use) to benefit wildlife on arable land. There are additional sections on how to manage field margins, conservation headlands and rotational set-aside for wildlife, and details of the various incentive schemes available. (*Good, concise document which gets the main points across effectively - suitable for direct distribution to farmers*).

Smith, H., Feber, R.E., Johnson, P.J., McCallum, K., Plesner Jensen, S., Younes, M. and Macdonald, D.W. 1993. *The Conservation of Arable Field Margins.* English Nature Science No. 18. English Nature, Peterborough. 455pp.

Detailed research report describing the results of experiments on the management of arable field margins. The objectives of the experiments were to determine practical ways of restoring the wildlife conservation interest of field boundaries whilst addressing the problem of weed control. One experiment involved the establishment of 2m wide margins, and the other the establishment of wider margins. Vegetation on the margins was established by natural regeneration or sowing with grasses/wild flowers, and a variety of cutting regimes were introduced. Monitoring was carried out to determine the effects of the different treatments on vegetation, butterflies, other invertebrate groups and small mammals. The results of the study provide a basis for designing field margin management strategies which can increase the species richness of plant and animal communities whilst allowing adequate weed control. (*Contains a wealth of valuable information, but likely to be too detailed and inaccessible to be of use to those actively involved in habitat creation schemes*).