

UK Biodiversity Group

Tranche 2 Action Plans

Terrestrial and Freshwater Habitats



THE RT HON JOHN PRESCOTT MP
DEPUTY PRIME MINISTER AND SECRETARY OF STATE FOR THE
ENVIRONMENT, TRANSPORT AND THE REGIONS

Dear Deputy Prime Minister,

BIODIVERSITY ACTION PLANS

I am writing to you in my capacity as Chairman of the United Kingdom Biodiversity Group (UKBG) about the latest group of 10 habitat action plans which UKBG have completed and published in the present volume.

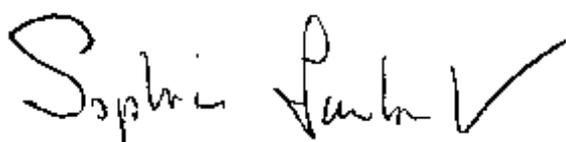
This is the third volume of action plans. The first was published in 1995 and the second in June this year. We expect to produce three further volumes early next year, including one dealing with coastal and marine species and habitats.

These actions plans represent a considerable body of work involving Government departments and agencies, voluntary conservation groups, land managers and academic institutions to set challenging but achievable targets to conserve and enhance these habitats. Like earlier tranches of action plans, these new ones each have a lead agency lined up to co-ordinate their implementation.

Each of the new action plans contains indicative costings so that those charged with implementation are clear about the scale of the financial consequences. As noted by my predecessor, UKBG is now focussing increasingly on the implementation of these action plans and this will inevitably highlight the changes of policy and practice which achievement of the plans require. These are changes which will have implications for Government but also for other key sectors.

Since my predecessor wrote to you in June, the Comprehensive Spending Review has provided additional resources for biodiversity. UKBG welcome this. Many UKBG members, however, would wish me to convey their belief that the level of resources devoted to our work, both from Government and other sources, still falls short of what is needed.

On behalf of UKBG, I commend to you and your ministerial colleagues the action plans set out in this volume.

A handwritten signature in black ink, reading "Sophia Lambert" followed by a checkmark.

SOPHIA LAMBERT

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1. Background

- 1.1 At the Earth Summit in Rio de Janeiro in 1992, Governments from across the world pledged to take urgent action to secure the future of the earth's resources. In the UK this commitment led to the development of a Sustainable Development Strategy and the publication, in 1994, of the UK Biodiversity Action Plan. The overall goal for biodiversity is captured in *Biodiversity: The UK Action Plan* as:

"To conserve and enhance biological diversity within the UK and to contribute to the conservation of global biodiversity through all appropriate mechanisms."

- 1.2 Within the UK it is widely recognised that if we are to conserve and enhance the populations and range of native species, and the quality and distribution of our most important natural and semi-natural habitats, we need to act quickly. One of the main thrusts of activity in the UK has therefore been the preparation of action plans for our most threatened species and wildlife habitats. Implementation requires support from all sectors of society who must continue to play their part in conserving biodiversity.
- 1.3 Whilst we have identified a suite of 'priority' habitats requiring action it is also important to understand how these are set within the context of the whole land surface and surrounding sea of the UK. A classification of broad habitat types has therefore been developed.
- 1.4 This report builds on the work published in *Biodiversity: The UK Steering Group Report* (DETR, 1995). It sets out the revised Broad Habitat Classification for terrestrial and freshwater habitats and contains 10 priority habitat action plans.

2. Biodiversity Broad Habitat Classification

- 2.1 The UK Biodiversity Action Plan set out a framework classification for 37 habitat types across the whole of the UK. Whilst this provided useful contextual information for the initial action planning process, gaps existed and the Biodiversity Steering Group recommended that these and some of the ambiguity in the habitat descriptions should be re-visited. The classification was therefore re-examined in October 1997 by a cross-sectoral group led by the Joint Nature Conservation Committee (JNCC). The findings for the terrestrial and freshwater elements of the classification are presented below and in Section 5 of this report.
- 2.2 Changes to the marine and coastal habitat types have been reviewed separately by the Marine Targets Sub-Group and will be published, along with the maritime priority habitat action plans, in a complementary volume in 1999.
- 2.3 In reviewing the broad habitats the group gave due regard to the original basis for the selection of the broad habitat types namely that:
- ! There should be a workable number of habitat types to ensure the process remained feasible.
 - ! The definitions should be simple and easily understood by a broad range of people.

In addition the working group concluded that the Broad Habitat Classification should aim to provide:

- ! a comprehensive framework for surveillance of the UK countryside and surrounding seas which is compatible with other widely used habitat and land cover classifications, particularly Phase 1 and Countryside Survey 2000;
- ! a means of setting priority habitats in context and a system for identifying gaps and emerging new priorities in the list of priority habitats;
- ! a means of characterising patterns and mosaics upon which wide ranging species are dependent.

2.4 The working group used the following six criteria to re-examine the Broad Habitat Classification:

- a. Comprehensive - All of the habitat types of the UK should be described within the classification.
- b. Exclusive - The habitat types should be discrete to ensure that there is a "once only fit" in the classification for each habitat encountered in the field.
- c. Structured - The classification should provide a framework for organising and presenting the priority habitats that are the focus of action plans.
- d. Nested - Priority habitats should fit into only one broad habitat type.
- e. Measurable - Broad habitats should be easily recognisable, have a measurable surface and physical or biological features that are clearly characterised and wherever possible can be selected from existing systems for data collection.
- f. Consistent - There should be consistency in the division of the broad habitats. The classification should not sub-divide some ecological units more finely than others.

2.5 The changes made to the terrestrial and freshwater elements of the Broad Habitat Classification are presented in Table 1 below. Brief descriptions of the revised types are outlined in Section 5 of this report. A more detailed interpretation manual, being prepared by the JNCC, will be published in spring 1999. The interpretation manual will provide further information on the relationships between the revised broad habitats and other standard classifications commonly used in the UK, such as the National Vegetation Classification (NVC).

Table 1 - Revisions to the Broad Habitat Classification

* Old broad habitat type		Change made	Revised broad habitat type	
1	Broadleaved and yew	Redefined to include mixed woodland	1	Broadleaved, mixed and yew woodland
2	Planted coniferous woodland	Redefined to include native and semi-natural coniferous woodland	2	Coniferous woodland
3	Native pine woodland	Priority habitat		
4	Lowland wood pastures and parkland	Priority habitat		
5	Boundary features	Redefined to include linear features	3	Boundary and linear features
6	Arable	Redefined to include horticulture and woody crops	4	Arable and horticulture
7	Improved grassland	Unchanged	5	Improved grassland
8	Unimproved neutral grassland	Redefined to include semi-improved neutral grassland	6	Neutral grassland
10	Calcareous grassland	Unchanged	7	Calcareous grassland
9	Acid grassland	Unchanged	8	Acid grassland
		Added	9	Bracken
11	Lowland heathland	Redefined to include upland heathland	10	Dwarf shrub heath
12	Grazing marsh	Priority habitat		
13	Fens, carr, marsh, swamp and reedbed	Redefined to remove carr and include flushes	11	Fen, marsh and swamp
14	Lowland raised bog	Redefined to include blanket bogs	12	Bogs
15	Standing open water	Redefined to include canals	13	Standing open water and canals
16	Rivers and streams	Unchanged	14	Rivers and streams
17	Canals	Deleted and incorporated into standing open water		
18	Montane	Restricted to include only habitats which occur exclusively in the montane zone	15	Montane habitats
19	Upland heathland	Deleted and incorporated into Dwarf shrub heath		
20	Blanket bog	Deleted and incorporated into Bogs		
36	Limestone pavements	Priority habitat		
		Added	16	Inland rock
37	Urban	Redefined to include all built up areas	17	Built up areas and gardens

* The numbers for the broad habitat types listed in column 1 are taken from the original Broad Habitat Classification published in *Biodiversity: the UK Steering Group Report* (DETR 1995).

3. Priority habitat action plan preparation

- 3.1 The process of action planning was initiated in 1995 with the publication of *Biodiversity: The UK Steering Group Report* (DETR 1995). Habitats for action planning were identified using the following criteria:
- ! habitats for which the UK has international obligations;
 - ! habitats at risk, such as those with a high rate of decline, especially over the last 20 years, or which are rare;
 - ! habitats which may be functionally critical (i.e. areas that are part of a wider ecosystem but provide reproductive or feeding areas for particular species); and
 - ! habitats which are important for priority species.
- 3.2 There are many competing claims on our landscape resources and natural heritage. The priority habitats form a select list of habitats identified as being of 'high conservation concern', on the basis of expert judgement.
- 3.3 Priority habitats have a narrower definition than the broad habitat types and are recognisable as distinctive management units within the wider landscape. Unlike the Broad Habitat Classification, the priority habitat list is not intended to be a comprehensive system for the description of all habitat types found in the UK. Habitats not currently identified as priority habitats are effectively 'invisible' in the classification at a level of division below the broad habitat types. These habitats may later be identified as priority habitats if conservation priorities change. The relationship between the priority habitats and the broad habitat types is set out in Section 5, Table 4.
- 3.4 The 1995 UK Biodiversity Steering Group Report contained 14 action plans for priority habitats and listed a number of other habitat types which should also be the focus of action planning. This report contains plans for a further 10 of these terrestrial and freshwater habitats. The remaining 4 terrestrial action plans (Upland heath, Upland calcareous grassland, Blanket bog and Lowland raised bog) will be published early in 1999. A complementary volume for maritime priority habitat action plans will also be published in 1999 (see Table 3).
- 3.5 Whilst the process of habitat action plan preparation has been led by the statutory conservation agencies it has benefited from constructive input from a range of sectors including Government Departments, voluntary conservation bodies, farming and land management groups and research institutes. Qualitative biological targets for "*maintenance, restoration or re-creation*" of the priority habitats have been established through a consultative and consensus building approach.
- 3.6 The format of the plans closely follows that used in the UK Biodiversity Steering Group Report. To provide clarity to the priority habitat definitions additional information on the correspondence with the NVC has been incorporated. Associations with priority species have also been introduced to ensure that their ecological requirements are given due consideration when implementing the specific management required for the habitat type.
- 3.7 The action plans document compelling cases for immediate conservation action, however, their value will only be realised with widespread co-operation from a range of sectors involved in land use and their continuing commitment to sustainable land management. To enable national work to commence immediately the UK Biodiversity Group has identified for each plan a Lead Agency to co-ordinate implementation (see Table 2 below).

Table 2 - Lead Agencies for the Priority Habitat Action Plans

Priority Habitat Action Plan	Lead Agency
Aquifer-fed naturally fluctuating water bodies	Environment Agency
Eutrophic standing waters	Environment Agency
Lowland meadows	CCW
Upland hay meadows	MAFF
Lowland dry acid grassland	English Nature
Lowland calcareous grassland	English Nature
Lowland wood pasture and parkland	English Nature
Wet woodland	Forestry Commission
Upland mixed ashwoods	Forestry Commission
Lowland beech and yew woodland	Forestry Commission

4. Timetable for future publications

- 4.1 This report represents another significant contribution towards completion of the action planning process. A further 4 terrestrial and 19 maritime priority habitat action plans are currently being prepared and will be published in early 1999 (see Table 3). These plans will be made available in a similar volume to this report and distributed through the DETR Biodiversity Secretariat in Bristol.
- 4.2 Action Plans and details of the biodiversity Broad Habitat Classification will also be available on the UK Biodiversity Group's website at <http://www.JNCC.gov.uk/ukbg>

Table 3 Habitat Action Plans scheduled for publication in 1999

<p>Terrestrial Habitat Action Plans</p> <p>Upland calcareous grasslands Upland heathland Blanket bog Lowland raised bog</p> <p>Maritime Priority Habitat Action Plans</p> <p><i>Ascophyllum nodosum mackii</i> beds Coastal sand dunes Coastal vegetated shingle Deep mud (Seapen and burrowing megafauna communities) Littoral and sublittoral chalk reefs Littoral and sublittoral seagrass beds <i>Lophelia pertusa</i> reefs Machair Maerl beds Maritime cliff and slopes <i>Modiolus modiolus</i> beds Mudflats Offshore sands and gravels <i>Sabellaria alveolata</i> reefs <i>Sabellaria spinulosa</i> reefs Saltmarsh <i>Serpula vermicularis</i> beds Sheltered muddy gravels Tidal rapids</p>

5. Descriptions of the biodiversity broad habitat types

5.1 The following descriptions provide a brief account of the characteristics of each of the terrestrial and freshwater broad habitat types. Changes to the marine and coastal habitat types have been reviewed separately by the Marine Targets Sub-Group and will be published, along with the maritime priority habitat action plans, in a complementary volume in 1999. A more detailed interpretation manual providing further information on the relationships between the revised broad habitats and other standard classifications commonly used in the UK, such as the NVC is currently being prepared by the JNCC and will be published in spring 1999.

1. Broadleaved, mixed, and yew woodland

This type includes all broadleaved and yew stands and mixed broadleaved and coniferous stands which have more than 20% of the cover made up of broadleaved and yew trees. It also includes patches of scrub of above 0.25ha which form a continuous canopy. Areas of recently felled broadleaved woodland are also included in this type, along with other integral features of woodland such as glades and rides. It does not include dwarf gorse scrub which is included in the "*Dwarf shrub heath*" or "*Supralittoral rock*" broad habitat types.

2. *Coniferous woodland*

This type includes all coniferous stands where broadleaved trees make up less than 20% cover with the exception of yew woodlands. Areas of recently felled coniferous woodland are also included in this type, along with other integral features of woodland such as glades and rides.

3. *Boundary and linear features*

This type includes boundary features such as hedgerows, walls, and dry ditches. It also includes linear features such as roads and railways and associated narrow verges of semi-natural habitat. It does not include canal or river corridors. It also does not include ditches which are water filled for the majority of the year which should be included under the "*Standing open water and canals*" broad habitat type.

4. *Arable and horticulture*

This type includes arable cropland (including perennial, woody crops, and intensively managed orchards), commercial horticultural land (such as nurseries, vegetable plots and flower beds), freshly-ploughed land, annual leys, rotational set aside and fallow. It does not include domestic gardens and allotments which should be included in the "*Built up areas and gardens*" broad habitat type.

5. *Improved grassland*

This type includes species poor, grass dominated swards occurring on all soil types that have been either sown, or created by modification of unimproved grassland by fertilisers and selective herbicides, for agricultural or recreational purposes. It includes grassland that has been reseeded for more than one year.

6. *Neutral grassland*

This type includes all semi-improved and unimproved grassland occurring on circumneutral soils. It includes enclosed and managed grassland such as hay meadows and pastures, a range of grasslands which are inundated with water periodically, permanently moist or even waterlogged grassland, where the vegetation is dominated by grasses, and tall and unmanaged grassland.

7. *Calcareous grassland*

This type includes all semi-improved and unimproved grassland occurring on shallow lime-rich soils normally underlain by chalk or limestone rocks.

8. *Acid grassland*

This type includes all semi-improved and unimproved grassland occurring on acid soils. It also includes pioneer annual rich calcifuge communities on dry sandy soils as well as wet acidic grasslands typified by species such as heath rush, but it excludes saltmarsh and sand-dune communities.

9. *Bracken*

This type includes areas dominated by continuous bracken. It does not include areas with scattered patches of bracken or areas of bracken which are less than 0.25ha which should be included in the broad habitat type that they are associated with.

10. *Dwarf shrub heath*

This type includes vegetation dominated by species from the heath family or dwarf gorse species. It includes the moss and lichen dominated heaths of the East Anglian Breckland but not of mountain summits which should be included in the "*Montane habitats*" broad habitat type.

11. *Fen, marsh and swamp*

This type includes vegetation that is ground water fed; and permanently, seasonally or periodically waterlogged peat, peaty or mineral soils where grasses do not predominate. It also includes emergent vegetation or frequently inundated vegetation occurring over peat or mineral soils. This type includes neither areas of carr that are greater than 0.25ha which should be included in the "*Broadleaved, mixed and yew woodland*" broad habitat type nor include wet grassland (with the exception of purple moor grass, reed, or sweet-grass dominated vegetation) which should be included in the "*Neutral grassland*" broad habitat type.

12. *Bogs*

This type includes wetlands that support vegetation that is usually peat forming which receive nutrients only from precipitation (ombrotrophic). It includes blanket bog, raised mire and mixed (or intermediate) bog habitat types.

13. *Standing open water and canals*

This type includes natural systems such as lakes, meres and pools, as well as man-made waters such as reservoirs, canals, ponds and gravel pits. It includes the open water zone which may contain submerged, free floating or floating-leaved vegetation, and water fringe vegetation. It also includes adjacent wetland habitats with contiguous water levels that are less than 0.25ha. Ditches with open water for at least the majority of the year should also be included in this type. Small areas of open water in a predominately terrestrial habitat such as bog pools or temporary pools on heaths should be included in the appropriate terrestrial broad habitat type.

14. *Rivers and streams*

This type includes rivers and streams from bank top to bank top or where there are no distinctive banks or banks are never overtopped, it includes the extent of the mean annual flood. This includes the open water zone which may contain submerged, free floating or floating-leaved vegetation, water fringe vegetation and exposed sediments and shingle banks.

15. *Montane habitats*

This type includes montane heath and snow bed communities which are dominated by stiff sedge and three leaved rush, and dwarf forb communities of alpine lady's mantle, moss campion, *Sibbaldia* and saxifrage species. It also includes moss and lichen dominated heaths of mountain summits. It does not include montane dwarf shrub heaths, flushes, grasslands, and rock and scree communities that straddle the notional boundary of the former treeline with little change in floristics and these should be treated as components of other broad habitat types.

16. *Inland rock*

This type includes both natural and artificial exposed rock surfaces where these are almost entirely lacking in vegetation, as well as various forms of excavations and waste tips. It includes inland cliffs, ledges and caves, screes, limestone pavements, quarries and quarry waste. It also includes Calaminarian grassland.

17. *Built up areas and gardens*

This type includes urban and rural settlements, farm buildings, caravan parks and other man made built structures such as industrial estates, retail parks, waste and derelict ground, urban parkland and transport infrastructure. It also includes domestic gardens and allotments. This type does not include amenity grassland which should be included in the "*Improved grassland*" broad habitat type.

Table 4 Relationship between the revised Broad Habitat Classification and the Priority habitats

	Revised broad habitat types	Priority habitats
1	Broadleaved, mixed and yew woodland	Upland oak woodland Lowland beech Upland mixed ashwoods Wet woodlands Lowland wood pastures and parkland *
2	Coniferous woodland	Native pine wood
3	Boundary and linear features	Ancient and/or species rich hedgerows
4	Arable and horticulture	Cereal field margins
5	Improved grassland	Coastal and floodplain grazing marsh *
6	Neutral grassland	Lowland meadows Upland hay meadows
7	Calcareous grassland	Lowland calcareous grassland Upland calcareous grassland
8	Acid grassland	Lowland dry acid grassland
9	Bracken	
10	Dwarf shrub heath	Lowland heathland Upland heathland
11	Fen, marsh and swamp	Purple moor grass and rush pastures Fens Reedbeds
12	Bogs	Lowland raised bog Blanket bog
13	Standing open water and canals	Mesotrophic standing waters Eutrophic standing waters Aquifer fed naturally fluctuating water bodies
14	Rivers and streams	Chalk rivers
15	Montane habitats	
16	Inland rock	Limestone pavements
17	Built up areas and gardens.	

* Priority habitats which are habitat complexes (eg grazing marsh or lowland wood pastures and parkland) represent distinctive and biologically important land use systems which have given rise to characteristic habitat mosaics. Elements of these mosaics are drawn from a range of broad habitat types and therefore they cannot be assigned to a single type within the Broad Habitat Classification.

6. Methodology of the costings process

Data gathering and sources

- 6.1 Costing the habitat action plans (HAPs) has involved gathering data, advice, opinion and estimates from a wide range of sources including public bodies, non-government organisations, individuals, government departments, private companies and the statutory conservation bodies. Data were gathered by use of questionnaires and through telephone interviews and meetings with key personnel.
- 6.2 Requests for data were also made for the major grant schemes operating in the UK, for example, Environmentally Sensitive Areas, Countryside Stewardship Scheme, Woodland Grant Scheme, Tir Cymen, Reserve Enhancement Scheme and Wildlife Enhancement Scheme. Further data were requested for public sector costs additional to grant schemes.
- 6.3 Cost data was sought for each habitat on a range of actions included in the HAPs, for example, habitat maintenance, restoration and creation, survey, research and production of publicity material and the provision of advice. These data were used to develop indicative costs for the proposed actions within the plans.
- 6.4 To estimate costs it proved necessary to seek additional information and opinion to clarify the targets set in the HAPs and to determine the appropriate level of activity for each of the actions. The type of additional information required included the extent and condition of the overall habitat resource, the extent of appropriate management and extent of research requirements.

Costing proposed actions and targets

- 6.5 Costing the HAPs has been based on a 'bottom up' approach with cost estimates being prepared for the specific actions within the plans. The objectives and targets of the HAPs have been used to determine the time scales and the extent of particular actions (see Box 1).
- 6.6 This approach to costing the HAPs is in line with the costing of Species Action Plans (SAPs) which also focussed on actions as well as targets. Costing specific actions and identifying those actions that should not or cannot be costed will enable future reviews of the HAPs to compare actual costs with those forecast and identify where future costs may need to be reviewed.

Box 1:**Costing actions to meet targets for upland hay meadows.**

Target (c) of this HAP is as follows:

'Refine guidelines for appropriate methods and approaches to establish new stands of upland hay meadow of wildlife value by 2005 and attempt to re-establish 50 ha of upland hay meadow of wildlife value at carefully targeted sites by 2010'

This target has been costed through the following action:

Action 5.1.2

'Develop and implement strategies to restore and expand the cover of upland hay meadow, taking into account the need to ameliorate the negative effects of isolation, fragmentation and small patch size.'

This action has been costed on the basis of an indicative cost of £265/ha for hay meadow re-creation in the uplands of northern England and the scale of the action is determined by the target of 50 ha.

Determining which actions have been included in the costing

- 6.7 In each HAP a number of the actions have not been included in the costing. These include those actions that would be incurred as part of the normal duties of the lead agencies (e.g. notification of SSSI/ASSIs) and those that would be implemented because they are a statutory requirement (e.g. enforcement of water quality standards under drinking water legislation aimed at protecting public health).
- 6.8 A number of the actions have a shared cost with another action within the plan or another closely related HAP. These costs cannot always be separated between the actions and have been allocated to just one particular action.
- 6.9 Some of the actions have been particularly difficult to cost as they propose a potential future work requirement that is conditional on the outcome of another proposed action. These conditional future actions are difficult to cost because of the unknown nature of any potential future work. These actions have been costed, however, based on a number of assumptions and opinions derived from consultations with organisations and individuals. These costings are therefore general and could potentially change if the assumptions made have under estimated or over estimated the need for, and the extent of, a conditional future action. Conditional future actions are often comprised of separate actions (see Box 2).

Box 2:**Conditional future actions**

Action 5.5.5 of the lowland calcareous grassland HAP states:

'Evaluate the need for impact assessment of the effect of atmospheric nutrient deposition on community composition, and commission research as appropriate'

In this case the evaluation of the need is a definite action for which an indicative cost can be prepared. The commissioning of research, however, is uncertain as the evaluation may conclude that there is no need for further research. Alternatively if the evaluation does conclude there is a need for further work, until the evaluation is complete the type of research required is unknown. To cost this conditional future action therefore a number of assumptions have to be made. Unless there is a clear opinion to the contrary the costing assumes in such circumstances that the conditional future action will be required.

Indicative and opportunity costs

- 6.10 The cost of implementing the actions is based on a range of indicative costs. These costs have been calculated from the data gathering stage of the costing process. The costs have been prepared as far as possible to reflect any variation throughout the UK.
- 6.11 The HAPs for agricultural habitats generally seek to meet their targets through the further use of agri-environment scheme payments or positive management agreements. The payment rates within these schemes are based on detailed assessments by Government agricultural departments of the cost to a landowner for managing a habitat in a manner sympathetic to its nature conservation value and not to its maximum productive potential. Consequently, the payment rates represent opportunity costs in the form of foregone revenue from not converting to a more productive agricultural or forestry land-use. In some circumstances the foregone revenue calculations are also 'topped' up as an incentive for landowners to enter the scheme. In other circumstances, e.g. for capital works, the payments are based on the costs of the works.
- 6.12 For state owned forestry land, opportunity costs are presented in terms of the lost revenue associated with felling timber before its optimum harvesting date. The full opportunity costs associated with longer-term changes in land use (e.g. from exotic to native species) have not been estimated, because of the difficulty of estimating these costs and of identifying to what extent they would be attributable to the HAP.

Assumptions and the basis of calculations used in the costing process

- 6.13 Costing the implementation of the HAPs relies to varying degrees on assumptions based on the opinions and estimates of key consultees. The need to make assumptions in the costing process often arises because of conditional future actions (see Box 2) or because there is insufficient data on which to base a calculation.

6.14 The assumptions made in the costing process often relate to the amount of habitat or number of sites to be included or the number of staff posts or research contracts required to achieve the proposed targets. This introduces the potential for an over or underestimate of the cost of meeting the targets and objectives of the HAPs. The assumptions used to calculate the cost of some of the actions have been clearly stated in the costings reports prepared for each HAP¹.

Summary

6.15 In summary the HAP costs:

- ! are indicative only and are based on generic costs of habitat management and other work required to implement the actions of the HAPs and the estimations and assumptions provided by the authors of the HAPs or habitat specialists;
- ! almost always relate to the public sector although some costs (e.g. for research and habitat management) will be met by the private sector/non-governmental organisations. The costs do not take account of savings in 'mainstream' Common Agricultural Policy subsidies, because of the difficulty of assessing these;
- ! include the additional financial commitments needed to implement the actions proposed for the lead agencies in the HAP;
- ! are broken down into the four countries of the UK and where this is not possible the cost is presented for the UK as a whole;
- ! avoid duplication of costs between HAPs and with species action plans;
- ! exclude administrative costs.

6.16 Current expenditure relates to the 1997/98 financial year. The 03/04 figures in the cost tables are the average annual additional costs during the five years from 1999/00 financial year to 03/04 relative to 97/98. 2013/14 is the average annual additional costs for the ten years 04/05 to 13/14, relative to 197/98. All figures are in 97/98 prices and do not take account of inflation.

¹ Baker Shepherd Gillespie (1998). *Costing UK Biodiversity Habitat Action Plans. Contract Report to English Nature.*



Priority Habitat Action Plans

Aquifer fed naturally fluctuating water bodies

A Habitat Action Plan

1. Current status

1.1 Physical and chemical status

- 1.1.1 This habitat category consists of natural water bodies which have an intrinsic regime of extreme fluctuation in water level, with periods of complete or almost complete drying out as part of the natural cycle. They have no inflow or outflow streams at the surface, except at times of very high water level, when temporary outflows may develop. Instead, they are directly connected to the underlying groundwater system and periodically empty and are recharged via swallow holes or smaller openings in their beds.
- 1.1.2 There are two known variants of the habitat in the UK: turloughs, found over Carboniferous Limestone in Northern Ireland and Wales, and fluctuating meres, which occur over Chalk in the Norfolk Breckland. Turloughs are distinguished by winter flooding and a dry floor, apart from small residual pools, in summer. Under one definition, a water body qualifies as a turlough only if winter flooding exceeds a depth of 0.5m. There may be underground connections between neighbouring turloughs. The fluctuating meres of Norfolk do not have a regular annual rhythm of emptying and recharge. Instead, there is a complex pattern of drying out and refilling, sometimes with a stretch of several years during which a mere may remain dry, followed by a prolonged period when water is constantly present, although its depth may vary from a few centimetres to 6 metres. The water level in both turloughs and meres reflects the height of the water table, which periodically rises above the surface of the bed. The response to groundwater fluctuations in turloughs is rapid, whereas that in the meres is highly lagged, with each mere having an individual periodicity.
- 1.1.3 This is naturally a very rare habitat, both in the UK and internationally, although the Republic of Ireland has at least 60 unmodified turloughs 10 ha or more in extent. Three intact turloughs have so far been found in Co. Fermanagh, Northern Ireland, possibly the most northerly water bodies of this kind in Europe, and a single example (Pant-y-lyn) has been recognised in South Wales. Six fluctuating meres have been identified in the Norfolk Breckland, but some of the smaller pools nearby may also be fluctuating meres. There have been suggestions that aquifer fed naturally fluctuating water bodies may occur elsewhere in the UK, including Scotland, but none has yet been positively identified. Conversely, there are probably a number of aquifer fed water bodies which were once naturally fluctuating but have been deliberately modified and so have lost most of their biological interest.
- 1.1.4 Taking the area of maximum inundation, the total extent of the nine UK waters at present known to fit the definition of aquifer fed naturally fluctuating water bodies is approximately 10 ha in Northern Ireland, 1ha in Wales and 20 ha in England.
- 1.1.5 The nutrient status of these lakes varies from area to area and the water quality reflects that of the groundwater. The water of turloughs and fluctuating meres is hard because the underlying rock is calcareous. The Irish and Welsh turloughs lie naturally in the middle

of the trophic range for the UK (mesotrophic) and the Breckland meres are somewhat richer (mildly eutrophic).

1.2 Biological status

- 1.2.1 The concentric zonation of vegetation in these lakes is strikingly obvious, especially when they are in their dry phase. Then their basins are partly or completely occupied by grassland, often with silverweed *Potentilla anserina* abundant, although turloughs in Northern Ireland retain some permanent swampy pools. Water chickweed *Myosoton aquaticum* and stinging nettle *Urtica dioica* are typical of the damp centre of Breckland mere basins, with a broad band of reed canary grass *Phalaris arundinacea* at a slightly higher level. Woodland and scrub - mainly willow, birch, alder, ash or hazel - grows around the margins of most of the meres and turloughs.
- 1.2.2 As a result of the fluctuating water levels, aquatic vegetation is absent (or, in Northern Ireland, restricted to residual pools) at some periods in the cycle of these lakes and abundant at others. An element common to both turloughs and meres is the prevalence of aquatic and semi-aquatic mosses such as *Fontinalis antipyretica* and *Cinclidotus fontinaloides*, which are more resistant to desiccation than higher (vascular) aquatic plants. Rare plants of the inundation zone include the moss *Physcomitrium erystomum* in the meres and the rare fen violet *Viola persicifolia* in the turloughs of Northern Ireland. Although some permanent pools in the Northern Irish turloughs support white water lily *Nymphaea alba* and other water plants, in the Breckland meres, where deep flooding can occur for long periods, aquatic vegetation becomes better established and more diverse than in most turloughs. Water plants typical of the meres are shining pondweed *Potamogeton lucens* and various-leaved pondweed *Potamogeton gramineus*, sometimes accompanied by their hybrid, long-leaved pondweed *Potamogeton x zizii*, which is scarce nationally.
- 1.2.3 The aquatic fauna of these fluctuating water bodies is adapted to intermittent desiccation. Fish are generally absent, but a range of amphibians can be found, including the protected great crested newt *Triturus cristatus* in the Breckland. Invertebrates include many insect species such as dragonflies, water boatmen and diving beetles, which are highly mobile and are therefore able colonisers. Typically, there is also a rich assemblage of micro-crustaceans such as water fleas, which have resting stages that can remain viable in the soil during dry phases. Snails such as the marsh snail *Lymnaea palustris*, which breathe air and can persist during periods of drought under stones and in damp vegetation, are common in both turloughs and meres. Numerous rare invertebrates have been recorded, including the large mussel-shrimp (ostracod) *Cypris bispinosa*, the small diving beetle *Bidessus unistriatus* and the scarce emerald damselfly *Lestes dryas* from the Breckland meres. During their wet phase the meres support breeding coot *Fulica atra*, tufted duck *Aythya fuligula*, mallard *Anas platyrhynchos*, shelduck *Tadorna tadorna*, pochard *Aythya ferina* and gadwall *Anas strepera*.

1.3 Links with species action plans

- 1.3.1 Aquifer-fed naturally fluctuating water bodies are an important habitat for the water beetle *Bidessus unistriatus* and the ribbon leaved water plantain *Alisma gramineum*.

The requirements of these species should be taken into account in the implementation of the plan.

2. Current factors affecting the habitat

- 2.1 A potential threat which may over-ride all the following factors, especially for the Breckland meres, is climate change. A long term decrease in rainfall could alter groundwater regimes and may ultimately depress levels in the underlying aquifers to such an extent that these water bodies cease to fill with water. All efforts to remedy the situation may then be ineffective.
 - 2.1.1 Because the delicate hydrological balance of these lakes is intimately related to the groundwater table, water abstraction from the aquifers for public supply or irrigation of crops is potentially very damaging to their characteristic flora and fauna.
 - 2.1.2 Heavy use of artificial fertilisers on arable land and pollution from livestock rearing, sewage effluent or road drainage, may result in over-enrichment of the lake water with plant nutrients (eutrophication), leading to algal blooms and loss of biodiversity.
 - 2.1.3 There are long-standing rights for limestone quarrying near Pant-y-llyn. If a quarry were to be opened up it could lead to significant drawdown of water in the catchment which supplies the turlough.
 - 2.1.4 An appropriate level of grazing is important to maintain the open condition of aquifer fed naturally fluctuating waters. High stocking levels can result in over-grazing and poaching within the drawdown zone, but complete cessation of grazing could result in the invasion of rank vegetation.
 - 2.1.5 Extensive conifer plantations in the vicinity of these water bodies may exacerbate drawdown by drying up nearby wells. Natural encroachment of woodland may create excessive shading and enrichment through the input of leaf litter.
 - 2.1.6 The presence of fish is a threat to amphibian populations and can adversely affect the characteristic invertebrate assemblages of this habitat.

3. Current action

3.1 Legal status

- 3.1.1 The five Breckland meres lie within a Site of Special Scientific Interest (SSSI) and are included in a proposed Special Area of Conservation (SAC) under the EC Habitats Directive, as examples of natural eutrophic lakes. The Breckland has been designated an Environmentally Sensitive Area (ESA) under the EC Common Agricultural Policy (CAP). The turloughs in Northern Ireland are designated as an Area of Special Scientific Interest (ASSI) and Pant-y-llyn forms part of an SSSI. Turloughs were listed as priority habitat in the EC Habitats Directive for the Republic of Ireland only, but in 1997 the Council of Ministers approved changes which extended this category to all other countries in the EC. This will allow the UK to consider proposing as SACs known turloughs in Northern Ireland and Wales.
- 3.1.2 Under the Conservation (Natural Habitats, etc.) Regulations, 1994, all public bodies and Government departments are required, when carrying out their

functions, to ensure that the integrity of SACs is maintained. The Environment Agency, under the Environment Act, 1995, has a duty generally to promote the conservation of aquatic flora and fauna and to consult the statutory nature conservation agencies over any work likely to affect an SSSI. Water companies, local authorities and the Office of Water Services also have statutory duties towards conservation. The pollution control arms of the Environment Agency and the Environment and Heritage Service (Northern Ireland), must take into account the desirability of conserving and enhancing features of special interest. The Water Resources Act, 1991 requires the monitoring of water pollution in England and Wales, allows the introduction of statutory water quality objectives and provides powers to designate Water Protection Zones to safeguard sensitive water bodies.

3.2 Management, research and guidance

- 3.2.1 There has been deliberate manipulation of the water levels in some water bodies which were originally turloughs, which has destroyed their defining characteristic. The intact turloughs in Northern Ireland lie in rough pasture land, so they are grazed during dry phases. Four of the Breckland meres lie in sheep pasture, so they also are grazed when their beds are exposed. Two of the meres are in a nature reserve managed by the Norfolk Wildlife Trust, with help from English Nature's (EN's) Reserve Enhancement Scheme. Two others lie within a Ministry of Defence training area.
- 3.2.2 A hydrological investigation of the Breckland meres, commissioned in connection with a groundwater abstraction proposal in the 1970s, suggested a model to explain the fluctuations in water level. Ecological surveys of the meres have indicated great biological interest. Recent biological surveys of Pant-y-llyn and the turloughs in Northern Ireland have been undertaken by the Countryside Council for Wales and the Environment and Heritage Service (Northern Ireland).
- 3.2.3 Any attempt to safeguard the water quality and hydrological regime of these water bodies is complicated by the difficulty of defining the catchments of the aquifers feeding them. The National Rivers Authority's *Ely Ouse catchment management plan* takes account of the importance of the Breckland meres and an abstraction policy exists to protect them. Modelling shows that abstraction could have an impact on water levels, but such an impact has never been observed from recorded water levels in the meres or in boreholes in the surrounding aquifer. However, as a precaution, a cessation level of 27.5m AOD is at present in operation. If the water falls to this level in one of the meres, abstractions are reduced or prohibited until the water regains the stipulated level. This regulation, which comes into force during dry or drought periods, renders abstraction for spray irrigation unreliable, so some local abstractors are developing schemes to convert from groundwater abstraction to winter surface water abstraction. Part of the drawdown in the aquifer should thereby be prevented.

4. Action plan objectives and proposed targets

- 4.1 Conserve the characteristic hydrological regimes, plant and animal communities of all known aquifer fed naturally fluctuating water bodies in the UK.

- 4.2 Implement remedial action to restore, by 2010 to favourable condition those aquifer fed naturally fluctuating water bodies which have been damaged by human activity.

5. Proposed action with lead agencies

5.1 Policy and legislation

- 5.1.1 Ensure that water abstraction and groundwater protection policies take into account the specific requirements of aquifer fed naturally fluctuating water bodies and where necessary introduce new controls. (Action: DANI, DETR, EA, EHS WOAD, Water Service (NI))
- 5.1.2 Ensure that fishery policy recognises the need to prevent introductions of fish to these water bodies. (Action: DANI, EA)
- 5.1.3 Consider the designation of a Water Protection Zone to safeguard water quality in the Breckland Meres. (Action: EA)

5.2 Site safeguard and management

- 5.2.1 Bearing in mind the possible effects of climate change, continue to review the use of water resources in the area affecting the hydrological balance of the Breckland meres. In the light of the monitoring programme (see 3.2) set consent levels and regimes for abstraction which are compatible with maintaining the maximum nature conservation interest of the meres. (Action: EA, EN)
- 5.2.2 Establish water quality objectives and associated nutrient standards for turloughs and Breckland meres by 2002 and aim to meet these targets by 2010. (Action: CCW, DETR, EA, EHS, EN)
- 5.2.3 Designate as SSSI/ASSI all good examples of aquifer fed naturally fluctuating water bodies which are newly discovered and which lack such protection. (Action: CCW, EHS, EN, SNH)
- 5.2.4 Ensure that all SSSI/ASSI water bodies in this category have site management plans implemented by 2004, bearing in mind that activities well outside the SSSI/ASSI boundaries may affect the water bodies. Where necessary, offer long-term management agreements to protect these sites. (Action: CCW, EHS, EN, EA, FC, MAFF, MoD)
- 5.2.5 Consider proposing the presently recognised UK turloughs as SACs. (Action: CCW, DETR, EHS, JNCC, WO)
- 5.2.6 Consider designating by 2002 as Ramsar sites all good examples of aquifer fed naturally fluctuating water bodies. (Action: CCW, DETR, EHS, EN, JNCC, WO)
- 5.2.7 In order to achieve favourable condition, ensure that the special requirements of aquifer fed naturally fluctuating water bodies are recognised in management statements for SACs which contain them. (Action: CCW, DETR, EHS, EN, SNH)
- 5.2.8 Contribute to the implementation of relevant species action plans for rare and declining species associated with aquifer fed naturally fluctuating water bodies in conjunction with the relevant species steering group. (Action: CCW, EA, EN, DANI, EHS)

5.3 Advisory

- 5.3.1 Continue to advise Government and landowners on measures to safeguard this fragile habitat. (Action: CCW, DANI, EA, EHS, EN)

5.4 International

- 5.4.1 Contribute to knowledge of the status and importance of naturally fluctuating water bodies and of their effective management, by exchanging information gained in the UK with colleagues in other countries which contain similar sites. (Action: CCW, EA, EHS, EN, JNCC)

5.5 Monitoring and research

- 5.5.1 Carry out research to clarify the impacts of water abstraction, forestry and climate change on the hydrological regime of the Breckland meres. In particular, undertake groundwater modelling to increase understanding of the hydrological mechanisms in the aquifer and meres. Report on this by 2003. (Action: EA, FC)
- 5.5.2 By 2000 characterise the quality of the groundwater supplying turloughs and the Breckland Meres. (Action: EA, EHS)
- 5.5.3 By 2002 determine the likely impacts of any changes in hydrological regime and water quality on the biodiversity of these water bodies. (Action: CCW, EHS, EN)
- 5.5.4 Devise and initiate methods of biological and hydrological monitoring for all known aquifer fed naturally fluctuating water bodies by 2000. By 2015 consider whether, in the face of climate change, these sites are viable in the long term. (Action: CCW, EA, EHS, EN)
- 5.5.5 Undertake a systematic programme of hydrological and biological survey of seasonal water bodies throughout the UK, in order to identify those which are aquifer fed. By 2005 carry out conservation evaluations of any sites which are found to meet the criteria for aquifer fed naturally fluctuating water bodies. (Action: CCW, EHS, EN, SNH)
- 5.5.6 Develop and implement appropriate surveillance and monitoring programmes to assess progress towards action plan targets. (Action: CCW, EHS, EN, JNCC, SNH)
- 5.5.7 Contribute information to a World Wide Web based catalogue of survey information as a means of improving access to information on aquifer fed naturally fluctuating water bodies. (Action: CCW, EA, EHS, EN, SNH)

5.6 Communications and publicity

- 5.6.1 By 2000 formulate and implement a publicity strategy to promote at local and national levels an appreciation of the importance for biodiversity of aquifer fed naturally fluctuating water bodies. (Action: CCW, EHS, EN)
- 5.6.2 By 2002, produce a guide to the identification of this habitat and publish advice on protection of its hydrological characteristics and conservation of its animals and plants. (Action: CCW, EHS, EN)

6. Costings

- 6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the habitat, primarily through agri-environment schemes and

grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.

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Costings for aquifer fed naturally fluctuating water bodies

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	0		
Total average annual cost / £000/Yr		49.5	7.5
Total expenditure to 2004/ £000		247.5	
Total expenditure 2004 to 2014 £/000			75.0

Eutrophic standing waters

A Habitat Action Plan

1. Current status

1.1 Physical and chemical status

1.1.1 Eutrophic standing waters are highly productive because plant nutrients are plentiful, either naturally or as a result of artificial enrichment. These water bodies are characterised by having dense, long-term populations of algae in mid-summer, often making the water green. Their beds are covered by dark anaerobic mud, rich in organic matter. The water column typically contains at least 0.035 mg L⁻¹ total phosphorus (which includes phosphorus bound up in plankton and 0.5 mg L⁻¹ or more total inorganic nitrogen (mainly in the form of dissolved nitrates). Many lowland water bodies in the UK are now heavily polluted, with nutrient concentrations far in excess of these levels although there is some geographical variation in the extent of the enrichment. This action plan covers natural and man made still waters such as lakes, reservoirs and gravel pits but it excludes small pools, field ponds and brackish waters. It includes some waters, such as Lough Neagh, Northern Ireland, which have been enriched as a result of human activity and so have been forced along the trophic continuum from a mesotrophic to a eutrophic state. The biodiversity action plans for mesotrophic and eutrophic waters are therefore complementary and their implementation should be co-ordinated. Eutrophic waters are most typical of hard water areas of the lowlands of southern and eastern Britain, but they also occur in the north and west, especially near the coast.

1.1.2 There are no accurate estimates of the amount of eutrophic standing water in Great Britain. The total area of still inland water is estimated as 675 km² in England, 125 km² in Wales and 1604 km² in Scotland. Current work suggests that over 80% of this resource in England, some 40% in Wales and approximately 15% in Scotland is eutrophic. On this assumption, the area of eutrophic standing water in Great Britain would be about 845 km². Measurements made by the Environment and Heritage Service put the area of eutrophic standing water in Northern Ireland at approximately 940 km². The total UK area for eutrophic standing waters is therefore likely to be around 1785 km².

1.2 Biological status

1.2.1 In their natural state eutrophic waters have high biodiversity. Planktonic algae and zooplankton are abundant in the water column, submerged vegetation is diverse and numerous species of invertebrate and fish are present. Plant assemblages differ according to geographical area and nutrient concentration but fennel-leaved pondweed *Potamogeton pectinatus* and spiked water-milfoil *Myriophyllum spicatum* are characteristic throughout the UK. Common floating-leaved plants include yellow water lily *Nuphar lutea* and there is often a marginal fringe of reedswamp, which is an important component of the aquatic ecosystems. A rare plant found in a few eutrophic waters is ribbon-leaved waterplantain *Alisma gramineum*. Bottom-dwelling invertebrates such as snails, dragonflies and water beetles are abundant and calcareous sites may support large populations of the native freshwater crayfish *Austropotamobius pallipes*. Coarse fish such as roach

Rutilus rutilus, tench *Tinca tinca* and pike *Esox lucius* are typical of eutrophic standing waters, but salmonids also occur naturally in some. Amphibians, including the protected great crested newt *Triturus cristatus*, are often present and the abundance of food can support internationally important bird populations. Loch Leven and Lough Neagh, for example, each support over 20,000 waterfowl, including large numbers of wintering whooper swan *Cygnus cygnus*. Loch Leven is nationally important for breeding ducks such as wigeon *Anas penelope*, gadwall *Anas strepera* and shoveler *Anas clypeata*, and Lough Neagh is of national importance for breeding great crested grebe *Podiceps cristatus*.

1.2.2 For centuries, periodic 'blooms' of blue green algae, which may be natural phenomena, have been documented in Llyn Syfaddan (Llangorse Lake), south Wales, and in the meres of the west Midlands. Lakes change naturally over time, slowly filling in with silt and vegetation and usually, in the absence of human impact, gradually becoming less fertile. In water bodies which are heavily enriched as a result of human activity, biodiversity is depressed because planktonic and filamentous algae (blanket-weed) increase rapidly at the expense of other aquatic organisms. Sensitive organisms, such as many of the pondweed *Potamogeton* and stonewort *Chara* species, then disappear and water bodies may reach a relatively stable but biologically impoverished state.

1.3 Links with species action plans

1.3.1 Eutrophic standing waters is an important habitat for a number of priority species, and their requirements should be taken into account in the implementation of the plan. They include ribbon leaved water plantain *Alisma gramineum*, convergent stonewort *Chara connivens*, starry stonewort *Nitellopsis obtusa*, tadpole shrimp *Triops cancriformis*, medicinal leech *Hirudo medicinalis*, pollan *Coregonus autumnalis* and freshwater white clawed crayfish *Austropotamobius pallipes*.

2. Current factors affecting the habitat

2.1 One or more of the following factors may cause a reduction in biodiversity in a eutrophic standing water. The response of any given water body is unique, as some lakes are relatively resistant to change where others are more sensitive. A potential threat which may over-ride all the others is climate change. A substantial change in water supply and throughput would alter the character of water bodies and a rise in temperature would produce wide-ranging effects such as acceleration of plant growth.

2.1.1 Pollutants find their way into these waters not only from point sources, but also from diffuse sources. Organic and inorganic fertilisers and nitrogen-rich gases cause nutrient enrichment (eutrophication) of the water, with consequent damage to plant and animal communities. Diffuse-source pollution generally exceeds that from point-sources.

2.1.2 Changes in land cover can release nutrients from the soil and these may enter water bodies, causing enrichment. The long-term effect of such land-use changes is an increase in the risk of pollution and of siltation, which

can smother fish spawning sites and damage aquatic vegetation. These problems are exacerbated by the removal of waterside vegetation and reedswamp, which are effective barriers to particulate matter and act as sinks for nutrients.

- 2.1.3 Water abstraction for potable supply, industry or irrigation, either directly from a standing water body or from surface feeders or aquifers, can depress water levels and increase water retention time and reduced flushing rate. This may exacerbate nutrient enrichment, cause deterioration of marginal vegetation through drawdown and cause shallow lakes to dry out. For coastal sites, a reduction in the throughput of fresh water could increase the salinity of a water body.
- 2.1.4 The introduction of fish, the removal of predators, and the manipulation of existing fish stocks for recreational fishing leads to the loss of natural fish populations and may affect plant and invertebrate communities.
- 2.1.5 Heavy stocking of bottom-feeding fish such as carp *Cyprinus carpio* can cause turbidity and accelerate the release of nutrients from sediments. This has caused major problems of enrichment in some eutrophic water bodies.
- 2.1.6 Use of standing waters for recreational and sporting purposes may create disturbance which affects bird populations. Marginal vegetation may suffer from trampling and the action of boat hulls and propellers destroys aquatic plants and stirs up sediment, contributing to enrichment and encouraging the growth of algae. The construction of marinas and other leisure facilities may destroy valuable habitat and can lead to increased pollution.
- 2.1.7 Release of non-native plants and animals can be very damaging. The signal crayfish *Pacifastacus leniusculus*, has had the dual impact of destabilising the biota of some waters by consuming large amounts of aquatic vegetation and eliminating many populations of native crayfish by spreading crayfish plague.

3. Current action

3.1 Legal status

- 3.1.1 Approximately 200 eutrophic standing waters are designated as Site of Special Scientific Interest (SSSIs) in Britain and 32 have Area of Special Scientific Interest (ASSI) status in Northern Ireland. Some, for instance Slapton Ley in Devon, are National Nature Reserves. About 20 sites containing eutrophic standing waters (including composite sites such as the West Midland Meres) are designated as Wetlands of International Importance under the Ramsar Convention. Most of these are also designated as Special Protection Areas (SPAs) under the EC Birds Directive. Six sites have been proposed by the UK as Special Areas of Conservation (SACs) under the EC Habitats Directive, for the category 'natural eutrophic lakes'. These are the Norfolk Broads, the fluctuating meres of the Norfolk Breckland, Llyn Syfaddan (Llangorse Lake), some machair lochs in South Uist, Loch Watten in Caithness and Upper Lough Erne in Co. Fermanagh. The Breckland meres are covered by the aquifer-fed fluctuating water bodies habitat action plan.
- 3.1.2 Under The Conservation (Natural Habitats etc) Regulations, 1994, all public bodies and Government departments are required, when carrying out their functions, to ensure that the integrity of SACs is

maintained. Under the Environment Act, 1995, the Environment Agency (EA) and the Scottish Environment Protection Agency (SEPA) have a duty generally to promote the conservation of aquatic flora and fauna, so far as they consider it desirable, and to consult the statutory conservation agencies over any work likely to adversely affect an SSSI. Water companies, internal drainage boards, British Waterways, local authorities, the Environment and Heritage Service (Northern Ireland) and the Office of Water Services also have statutory duties towards nature conservation. Whilst there are tight legislative controls over point source pollution, contamination from diffuse sources is much more difficult to regulate. Statutes covering water pollution and control include the Water Act (Northern Ireland) 1972; the Control of Pollution Act, 1974 (as amended) (principally relevant to Scotland); and the Water Resources Act, 1991, which, in England and Wales, requires the monitoring of water pollution, allows the introduction of statutory water quality objectives and provides powers to designate Water Protection Zones to safeguard sensitive sites. Under the Urban Waste Water Treatment Directive sensitive areas are designated where phosphorus stripping must be carried out, although only at sewage works serving population equivalents of over 10,000. The EC Nitrates Directive may produce incidental improvement in the water quality of some eutrophic systems. This directive requires the identification of nitrate vulnerable zones where drinking water sources are protected through limiting the application of organic and inorganic fertilisers. Measures will need to be taken under the EC Water Framework Directive (yet to be finalised) to ensure that all surface waters have good ecological status and that there is no deterioration in water quality.

- 3.1.3 Environmentally Sensitive Areas (ESAs), created under the terms of the EC Common Agricultural Policy (CAP) include measures designed to benefit water courses and other water features. The Norfolk Broads and Upper Lough Erne lie within ESAs. The Arable Payments Scheme, of which set-aside is a part, has specific rules for the protection of water features on both cropped and set-aside land. Other agri-environment measures which can benefit eutrophic standing waters are Habitat Schemes, Wildlife Enhancement Schemes, Countryside Stewardship the Scottish Countryside Premium Scheme, Habitat Improvement Schemes in Northern Ireland and Tir Cymen in Wales (which will be replaced in 1999 by the new all Wales agri-environment scheme Tir Gofal).
- 3.1.4 The introduction of fish and fish spawn into inland waters in England and Wales, apart from fish farms, is subject to the EA's written consent under the terms of Section 30 of the Salmon and Freshwater Fisheries Acts 1975.
- 3.1.5 Under the Wildlife and Countryside Act, 1981 and the Wildlife (Northern Ireland) Order, 1985, the unlicensed release to the wild of non-resident alien animals, some established alien animals (including American mink *Lutreola vison*, European pond terrapin and certain species of wildfowl, amphibia, fish and crayfish) and some plants is prohibited. The keeping of non-native crayfish in England and Wales is also subject to licensing requirements under the Prohibition of Keeping Live Fish (Crayfish) Order, 1996. Similar legislation is in place in Scotland.

3.2 Management, research and guidance

3.2.1 A national strategy for the control of eutrophication in England and Wales is being prepared by the EA. This will be implemented largely through Local Environment Agency Plans (LEAPs), which establish requirements for water bodies. The EA, SEPA and the statutory conservation agencies are promoting the restoration of enriched waters of high nature conservation value. For example, phosphorus stripping is in operation on sewage effluent entering the Norfolk Broads, Llyn Penrhyn on Anglesey, Loch Leven, Lough Neagh and Lough Erne. A cross-border nutrient management scheme for Lough Erne has been agreed with the Republic of Ireland. In the Norfolk Broads the Broads Authority is carrying out suction dredging to stabilise the substrate and remove stored nutrients. Biomanipulation has also been undertaken in some Broads. This involves removing fish which prey on zooplankton, thereby increasing the grazing pressure on phytoplankton and reducing the population. Nutrient-rich water has been diverted away from parts of Bosherton Lakes in South Wales and weed harvesting has been carried out in an effort to remove nutrients. Some eutrophic lakes are to be included in water level management plans prepared by flood defence authorities under a MAFF/Welsh Office initiative.

3.2.2 The statutory nature conservation agencies have carried out botanical surveys of lakes throughout the UK and have produced classifications of water bodies based on plants. Research on the classification and monitoring of lakes is being conducted by EA, SEPA and CCW. The Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) is supporting research into pollution, hindcasting methodologies and target-setting, and SNIFFER, English Nature (EN) and the Countryside Council for Wales are using palaeolimnology to reconstruct lake histories. EN has conducted an audit of SSSI lakes in England subject to nutrient enrichment. Site-specific research includes an investigation by EN into the role of fish in the stability of meres in the West Midlands, annual aquatic plant surveys in the Norfolk Broads by the Broads Authority, an investigation of nutrient loading in Loch Leven and work by the Environment Agency on algal population dynamics in Bittel Reservoirs, Worcestershire.

3.2.3 CCW, the Royal Society for the Protection of Birds, the EA, the North Wales Wildlife Trust and the Welsh Office Agriculture Department have together produced a wetland strategy for Anglesey, covering some eutrophic lakes. A guide to the restoration of nutrient-enriched shallow lakes has been produced by the EA and the Broads Authority. EN has published an agenda for the sustainable management of fresh waters. The EA has issued a discussion document on a framework for monitoring the state of the environment in England and Wales.

4. Action plan objectives and proposed targets

4.1 It is proposed that eutrophic water bodies in the UK should be classified into three tiers distinguished on the grounds of naturalness, biodiversity and restoration potential. The exact criteria for these categories have yet to be agreed and the total number of sites falling into each Tier confirmed.

4.1.1 Ensure the protection and continuation of favourable condition of all 'Tier 1' eutrophic standing waters.

4.1.2 By 2005 take action to restore to favourable condition (typical plant and animal communities present) 'Tier 2'

eutrophic standing waters that have been damaged by human activity.

4.1.3 Ensure that no further deterioration occurs in the water quality and wildlife of the remaining 'Tier 3' eutrophic standing water resource.

5. Proposed action with lead agencies

5.1 Policy and legislation

5.1.1 By 1999 establish agreed criteria to identify Tier 1, Tier 2 and Tier 3 eutrophic standing waters. By 2002 produce a list of sites comprising Tiers 1 and 2. (Action: CCW, EA, EHS, EN, SEPA, SNH)

5.1.2 By 2005 establish site-specific plans to achieve appropriate water quality, water resource use, fishery management and biological status for all important (Tiers 1 and 2) eutrophic standing water bodies. Within these tiers, assign priorities to the sites according to threat, vulnerability, potential for restoration and nature conservation interest. Issues raised in England and Wales to be addressed principally through LEAPs. (Action: CCW, DETR, EA, EHS, EN, SEPA, SNH)

5.1.3 Develop an integrated national approach to measuring environmental change in eutrophic waters and to solving problems affecting these habitats and resources. (Action: CCW, DETR, EA, EHS, EN, JNCC, SEPA, SNH, JNCC)

5.1.4 Seek to ensure that phosphorus stripping is instituted on all sewage works serving population equivalents of over 10,000 within designated sensitive areas (as specified in the EC Urban Waste Water Treatment Directive), where this would contribute to the control of pollution in eutrophic standing waters. Carry out a review of the sensitive areas, make further appropriate designations and implement the required measures by 2004. (Action: DETR, EA, EHS, SEPA, SOAEFD, Water Service (NI))

5.1.5 Consider modifying and expanding agri-environment measures further to protect eutrophic standing waters from agricultural contaminants. Produce any proposals by 2000. (Action: CoCo, CCW, DANI, EHS, EN, MAFF, SOAEFD, WOAD).

5.1.6 By 2005 complete a review of the effectiveness of existing measures to control diffuse-source pollution, and where necessary introduce new controls. (Action: DANI, DETR, EA, EHS, MAFF, SEPA, SOAEFD, WOAD)

5.1.7 By 2005 complete a review of the effectiveness of existing measures to revoke existing damaging abstractions and if necessary introduce new controls. (Action: DANI, DETR, EA, EHS, MAFF, SEPA, SOAEFD, WOAD, Water Service (NI))

5.1.8 Ensure that forestry policy takes full account of the need to safeguard water quality in eutrophic standing waters. (Action: DANI, FC)

5.1.9 Make full use of the provisions of the Wildlife and Countryside Act, 1981 and the Wildlife (Northern Ireland) Order, 1985 to ensure effective control of the release to the wild of alien aquatic species. Review and where appropriate amend Schedule 9 of these Acts by 2000. (Action: CCW, DANI, DETR, EHS, EN, JNCC, MAFF, SNH, SOAEFD, WOAD)

5.1.10 Review the efficacy of legislation on fish introductions and fishery management, particularly in relation to bottom-feeding fish and high stocking densities. (Action: DETR, DANI, EA, EHS, EN, MAFF, SNH, SOAEFD)

5.2 Site safeguard and management

5.2.1 By 2005 embark upon a nationwide programme of nutrient control, targeting sites in priority order according to the strategy in Section 4. Aim to maintain the condition of all Tier 1 eutrophic standing waters and to improve by 2020 the condition of at least 50% of Tier 2 sites. Continue the programme beyond 2020, to complete coverage of all Tier 2 sites. (Action: DANI, EA, EHS, MAFF, SEPA, SOAEFD)

5.2.2 By 2004 complete the programme of notifying important eutrophic standing waters as SSSIs/ ASSIs. Prepare and where possible implement site management plans, taking special account of threats posed by pollution, water abstraction and recreational use (Action: Broads Authority, CCW, EA, EHS, EN, SNH).

5.2.3 Maintain or introduce appropriate fishery management. Where appropriate, institute restorative measures such as phosphorus control, biomanipulation and species reintroduction. (Action: Broads Authority, CCW, EA, EHS, EN, SNH)

5.2.4 Prepare and by 2010 implement catchment management plans for Tier 2 eutrophic standing waters which are not SSSIs or ASSIs. (Action: EA, EHS, SEPA)

5.2.5 By 2004 designate the eutrophic standing waters approved by the EC as Special Areas of Conservation under the Habitats Directive and classify, as appropriate, as Special Protection Areas (SPAs) under the EC Birds Directive. (Action: CCW, DETR, EHS, EN, JNCC, SNH, SOAEFD, WO)

5.2.6 Complete the programme for designation of eutrophic standing waters as Ramsar sites by 2004. (Action: CCW, DETR, EHS, EN, JNCC, SNH, SOAEFD, WO)

5.2.7 Prepare and implement water quality management strategies for the Lough Neagh and Lough Erne catchments by 2005. (Action: EHS)

5.2.8 Ensure that local planning mechanisms (e.g. Local Authority Structure Plans) take account of the wildlife interest of all (Tiers 1, 2 and 3) eutrophic standing waters. (Action: CCW, DETR, EA, EHS, EN, LAs, SEPA, SNH, SOAEFD, Planning Service (NI))

5.2.9 Contribute to the implementation of relevant priority species action plans for rare and declining species associated with eutrophic standing waters, in conjunction with the relevant species steering group. (Action: CCW, EA, EHS, EN, SEPA, SNH)

5.3 Advisory

5.3.1 Provide advice for managers and users of eutrophic standing waters, to promote the conservation of biodiversity in this habitat. (Action: EA, SEPA, CCW, EHS, EN, SNH)

5.3.2 Promote best practice in farming and encourage farmers to prepare and implement Farm Waste Management Plans in catchments of vulnerable eutrophic standing waters. (Action: DANI, MAFF, SOAEFD, WOAD)

5.3.3 Develop guidelines for best practice in fishery management. (Action: DANI, EA, EHS, SOAEFD)

5.4 International

5.4.1 Continue to prepare and implement joint water quality management strategy with the Republic of Ireland for eutrophic standing waters with catchments which have cross-country components. (Action: EHS, DANI)

5.4.2 Promote the interchange of information between the UK and other countries on management techniques, conservation and research relevant to eutrophic waters. (Action: DETR, EA, SEPA, CCW, EHS, EN, JNCC, SNH, IFE, IH, ITE)

5.5 Monitoring and research

5.5.1 By 1999 develop a rapid screening system to assess the biological quality of eutrophic standing waters, in order to classify them (see 5.1.1) as Tier 1, Tier 2 or Tier 3 and to determine priorities within these categories. (Action: CCW, EA, EHS, EN, JNCC, SEPA, SNH)

5.5.2 By 2000 complete current work on the development and testing of a water quality classification of lakes and produce systems for assessing the degree of past change and for monitoring lake water quality. Apply these schemes to all Tier 1 and Tier 2 eutrophic water bodies. (Action: EA, EHS, SEPA)

5.5.3 Continue to develop techniques of eutrophication risk assessment and to investigate means of controlling enrichment. Promote research into the role and transport of phosphorus and nitrogen in fresh waters and into the quantification of risks posed by diffuse-source pollution, including atmospheric nitrogen. (Action: DANI, EA, EHS, MAFF, SEPA, SOAEFD, WOAD)

5.5.4 Continue experimental work on remedial action for nutrient-enriched standing waters and monitor the results of procedures already taken. (Action: Broads Authority, CCW, EA, EHS, EN, SEPA, SNH)

5.5.5 Investigate the impact of introduced species on eutrophic standing waters and develop strategies to mitigate their effects. (Action: DETR, EA, JNCC, MAFF, SNH, SOAEFD)

5.5.6 Promote research into the likely effects of climate change and sea level rise on eutrophic standing waters. (Action: DETR, EA, SEPA)

5.5.7 Contribute information to a World Wide Web based catalogue of survey information as a means of improving access to information on eutrophic standing waters. (Action: CCW, EA, EHS, EN, SEPA, SNH)

5.6 Communications and publicity

5.6.1 Ensure that information on well-studied eutrophic standing waters is made readily available and publish advice on good management practice, targeting site managers and policy makers. (Action: CCW, EA, EHS, EN, JNCC, SEPA, SNH)

5.6.2 Continue to contribute to symposia on the conservation of fresh waters and to encourage the publication of papers on issues relating to eutrophic standing waters in peer-reviewed scientific literature. (Action: CCW, EA, EHS, EN, JNCC, SEPA, SNH)

- 5.6.3 In order to increase public awareness of the value of eutrophic standing waters, develop the use of suitable waters for educational purposes and as interpretive centres. (Action: LAs)

6. Costings

- 6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the habitat, primarily through agri-environment schemes and grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.
- 6.2 The cost of phosphate stripping and bio-remediation works necessary to meet the targets have not been included, for a number of reasons, in the figures presented. These costs will fall to the private water suppliers and will be partly required to meet the EU Urban Waste Water Treatment Directive as opposed to the objectives of this plan.

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Costings for eutrophic standing waters

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	377		
Total average annual cost / £000/Yr		587.7	659.5
Total expenditure to 2004/ £000		2938.5	
Total expenditure 2004 to 2014/ £000			6595.0

Lowland meadows

A Habitat Action Plan

1. Current status

1.1. Biological status

- 1.1.1 A wide-ranging approach is adopted in this plan to lowland grasslands treated as lowland meadows. They are taken to include most forms of unimproved neutral grassland across the enclosed lowland landscapes of the UK. In terms of National Vegetation Classification plant communities, they primarily embrace each type of *Cynosurus cristatus* - *Centaurea nigra* grassland, *Alopecurus pratensis* - *Sanguisorba officinalis* floodplain meadow and *Cynosurus cristatus* - *Caltha palustris* flood-pasture. The plan is not restricted to grasslands cut for hay, but also takes into account unimproved neutral pastures where livestock grazing is the main land use. On many farms in different parts of the UK, use of particular fields for grazing pasture and hay cropping changes over time, but the characteristic plant community may persist with subtle changes in floristic composition.
- 1.1.2 In non-agricultural settings, such grasslands are less frequent but additional examples may be found in recreational sites, church-yards, roadside verges and a variety of other localities. Excluded from this plan are maritime grassland communities confined to coastal habitats (which will be covered in maritime cliff and machair action plans), *Anthoxanthum odoratum* - *Geranium sylvaticum* grasslands (which are treated in a companion action plan for upland hay meadows) and *Molinia* - *Juncus* pastures (which are covered in the purple moor grass and rush pasture (*Molinia*-*Juncus*) plan).
- 1.1.3 As indicated in the Habitat Statement included in *Biodiversity: the UK Steering Group Report, Vol 2* (1995), unimproved neutral grassland habitat has undergone a remarkable decline in the 20th century, almost entirely due to changing agricultural practice. It is estimated that by 1984 in lowland England and Wales, semi-natural grassland had declined by 97% over the previous 50 years to approximately 0.2million ha. Losses have continued during the 1980s and 1990s, and have been recorded at 2 -10% per annum in some parts of England. Extensive agricultural modification of unimproved grasslands has also been recorded in Scotland between the 1940s and 1970s. Recent conservation survey findings in Britain and Northern Ireland reveal that the impact has been pervasive, and an estimated extent of less than 15,000 ha of species-rich neutral grassland surviving today in the UK is given in the Habitat Statement.
- 1.1.4 The plan concentrates on meadows and pastures associated with low-input nutrient regimes, and covers the major forms of neutral grassland which have a specialist group of scarce and declining plant species. Among flowering plants, these include fritillary *Fritillaria meleagris*, dyer's greenweed *Genista tinctoria*, green-winged orchid *Orchis morio*, greater butterfly orchid *Platanthera chlorantha*, pepper saxifrage *Silaum silaus* and wood bitter vetch *Vicia orobus*. Lowland meadows and pastures are important habitats for skylark and a number of other farmland birds, notably corncrake which has experienced a major range contraction across the UK.

1.1.5 The overall outcome of habitat change in the lowland agricultural zone is that *Cynosurus* - *Centaurea* grassland, the mainstream community of unimproved hay meadows and pastures over much of Britain, is now highly localised, fragmented and in small stands. Recent estimates for cover in England and Wales indicate that there is between 5000-10,000 ha of this community in total. There is an especially important concentration in Worcestershire and other particularly important areas include south-west England (Somerset, Dorset and Wiltshire), the East Midlands & East Anglia (Leicestershire, Northamptonshire, Cambridgeshire and Suffolk), in various parts of Wales and in West Fermanagh and Erne Lakeland in Northern Ireland. In certain areas, such as in the old district of Brecknock in Powys, remnant examples are locally aggregated. Scotland is estimated to have between 2000-3000 ha of this community, with particular concentrations in the crofting areas of Lochaber, Skye and the Western Isles. Local data for Northern Ireland are less complete, but the West Fermanagh and Erne Lakeland ESA in NI contains an important concentration of the resource.

1.1.6 Unimproved seasonally-flooded grasslands are less widely distributed. They have lower overall cover, but there are still a few quite large stands. *Alopecurus* - *Sanguisorba* flood-meadow has a total cover of <1500 ha and is found in scattered sites from the Thames valley through the Midlands and Welsh borders to the Ouse catchment in Yorkshire. These include well-known but now very rare Lammas meadows, such as North Meadow, Cricklade, and Pixey and Yarnton Meads near Oxford, which are shut up for hay in early spring, cropped in July, with aftermath grazing from early August; nutrients are supplied by flooding episodes in winter. *Cynosurus* - *Caltha* flood-pasture is also now scarce and localised, with probably <1000 ha cover in England and Wales. Scotland is estimated to have 600-800 ha of this community.

It will be important to ensure that such periodically flooded grasslands are taken into account during implementation of the action plan for coastal and floodplain grazing marshes; actions in the two plans need to be closely integrated.

1.1.7 Agricultural intensification has led to the extensive development of nutrient-demanding, productive *Lolium perenne* grasslands. These are managed for grazing and also silage production which has widely replaced traditional hay-making. Where fertiliser input is relaxed or in swards which have only been partially improved, *Lolium* - *Cynosurus* grassland is common; in many respects this is intermediate between improved and unimproved lowland neutral grasslands but has few uncommon species and is generally of low botanical value.

1.2 Links with species action plans

1.2.1 Lowland meadows are an important habitat for corncrake *Crex crex* and a number of farmland birds, including skylark *Alauda arvensis*. Their requirements should also be taken into account in the implementation of the plan.

2. Current factors affecting the habitat

- 2.1 The factors currently affecting lowland meadows reduce the quality and decrease the quantity of the habitat, and its fragmentation brings increased risk of species extinctions in the small remnant areas.
- 2.1.1 Agricultural improvement through, drainage, ploughing, re-seeding, fertiliser treatment, slurry application, conversion to arable and a shift from hay-making to silage production.
- 2.1.2 Decline in the perceived agricultural value of species-rich pasture and hay in farming regimes.
- 2.1.3 Abandonment leading to rank over-growth, and bracken (*Pteridium aquilinum*) and scrub encroachment.
- 2.1.4 Supplementary stock feeding, associated with increased stocking levels, which can lead to eutrophication as well as localised poaching.
- 2.1.5 Application of herbicides and other pesticides.
- 2.1.6 Atmospheric pollution and climate change, the influence of which is not fully assessed.
- 2.1.7 Reduced inundation frequency and duration, in water-meadows and floodplain grasslands associated with abandoned irrigation schemes, and lowered water tables as a result of land drainage, flood alleviation engineering, surface and ground water abstraction, floodplain gravel extraction and other activities.
- 2.1.8 Floristic impoverishment due to heavy grazing pressure and changes in stock species and breeds.
- 3.2.1 Management agreements have been established for many neutral grassland SSSIs, so that favourable low-intensity farming methods are maintained. Unimproved neutral grasslands are also included in a variety of recent UK agri-environment schemes which provide complementary incentives for farmers to conserve this habitat across wider agricultural landscapes. These include ESAs, the Countryside Stewardship Scheme (England), the Habitat Scheme, Tir Cymen (Wales) (which will be replaced in 1999 by the new all Wales agri-environment scheme Tir Gofal), the Countryside Premium Scheme (Scotland) and Countryside Management Scheme (Northern Ireland). For the most part, protection of remnant semi-natural pastures and meadows is given high priority; measures to restore modified stands or develop new species-rich swards are more limited. Certain ESAs, such as the Somerset Levels & Moors and the Upper Thames Tributaries, are of special importance for periodically flooded grasslands.
- 3.2.2 A major contribution has been made by various non-governmental organisations to the conservation of species-rich lowland meadows and pastures in many parts of the UK through the establishment of nature reserves.
- 3.2.3 Background research to support the conservation effort has included extensive descriptive regional survey. Recent estimates indicate that modern (post 1975) survey coverage for unimproved neutral grassland in England is about 70%. Survey in progress in Wales has achieved ca 80% coverage and is due to be completed in 1999. Survey coverage is considerably lower in Scotland and is estimated to be ca 30%.
- 3.2.4 Research required to provide appropriate guidance for conservation management falls into two major categories. The first concerns the relation between management treatments and habitat composition. In this respect, unimproved neutral grasslands are relatively well understood, and benefit from exceptionally long runs of data from the Park Grass experiment at Rothamsted and Cockle Park in Northumberland, as well as more recent studies at Tadhams Moor on the Somerset Levels. Nevertheless, there are several major issues which require further resolution, including appropriate forms and levels of minimum-input nutrient application, the relative efficacy of different types and breeds of livestock (sheep, cattle and horses in particular), desirable hydrological regimes in wet grasslands, and the timing of hay harvesting.
- 3.2.5 The second main need concerns guidance for habitat restoration and expansion. Several studies currently in progress are investigating possibilities for establishing species-rich grasslands by cessation of nutrient inputs, seeding and turfing with wild species and arable reversion. The role, if any, of direct seeding using wild species in habitat restoration and expansion requires further assessment; guidelines for selecting seed sources of local provenance need to be agreed. A less well-researched component concerns spatial aspects of habitat rehabilitation at a landscape scale, where the main concern is to counteract the detrimental effects of isolation and small patch size.
- 3.2.6 Additionally, there is a need to assess the impact of atmospheric nutrient deposition and climate change in this and other types of lowland grassland and to undertake autecological studies of priority species.

3. Current action

3.1 Legal Status

- 3.1.1 Precise data for the cover of unimproved neutral grassland communities within Sites of Special Scientific Interest (SSSIs) are unavailable. In England, there are approximately 400 SSSIs with *Cynosurus - Centaurea* grassland and 66 SSSIs with *Alopecurus - Sanguisorba* floodplain meadow. Several National Nature Reserves in England hold unimproved neutral grassland; particularly notable are Motte Meadows in the West Midlands and North Meadow in Wiltshire, which have impressive stands of flood-meadow, and Fosters Green Meadows in Worcestershire which has dry unimproved neutral grassland.
- 3.1.2 In Wales, unimproved neutral grassland independently qualifies at 103 SSSIs which collectively support 282 ha of the habitat; there are no NNRs with substantial examples of dry unimproved neutral grassland. In Scotland and Northern Ireland, a number of SSSIs, ASSIs and NNRs include *Cynosurus - Centaurea* grassland.
- 3.1.3 Unimproved neutral grassland is present on approximately 350 SSSIs in Scotland.
- 3.1.4 Lowland hay meadows (*Alopecurus - Sanguisorba* community) are included in Annex 1 of the EC Habitats Directive. Five sites in England have been proposed as Special Areas of Conservation by the UK government. The Directive does not currently cover *Centaureo - Cynosuretum* grasslands.

3.2 Management, research and guidance

3.2.7 There is also a lack of information on the invertebrate fauna associated with restored lowland meadows. Research might look at the colonisation of these grasslands by invertebrates, and the stability and resilience of these communities in the longer term.

4. Action plan objectives and proposed targets

4.1 The objectives and targets cover habitat conservation, restoration and expansion. Key components are the need to secure favourable conservation and, where necessary, restoration management at SSSIs and other significant localities, and also to develop carefully researched guidelines to restore and expand the habitat. The quantified cover target advanced for trial habitat expansion at this stage is a judgement based on current but incomplete information; development of more far-reaching targets, pending further investigation, is a key element of the action plan programme. Similar elements have been incorporated in each of the four action plans for dry lowland grasslands (covering lowland and upland hay meadows, lowland calcareous grasslands and lowland acid grasslands).

4.1.1 Arrest the depletion of unimproved lowland hay meadow throughout the UK.

4.1.2 Within SSSIs and ASSIs, initiate rehabilitation management for all significant stands of unimproved lowland hay meadow in unfavourable condition by 2005, with the aim of achieving favourable status wherever feasible by 2010.

4.1.3 For stands at other localities, secure favourable condition over 30% of the resource by 2005, and as near to 100% as is practicable by 2015.

4.1.4 Attempt to re-establish 500 ha of lowland hay meadow of wildlife value at carefully targeted sites by 2010.

5. Proposed action with lead agencies

5.1 Policy and legislation

5.1.1 Ensure the conservation requirements of lowland meadows are taken into account in the development and adjustment of agri-environment schemes; design measures to suit local needs and in particular target local concentrations of remnant semi-natural neutral grasslands. (Action: CCW, DANI, EHS, EN, MAFF, SNH, SOAEFD, WOAD)

5.1.2 Develop and implement strategies to restore and expand the cover of unimproved neutral grassland, taking into account the need to ameliorate the negative effects of small patch size, fragmentation and isolation. (Action: CCW, DANI, EHS, EN, MAFF, SNH, SOAEFD, WOAD)

5.1.3 Support initiatives to conserve unimproved neutral grassland within local government development plans and related policy, in forest management and planting schemes and by special projects. (Action: EA, DETR, DoE(NI), FC, LAs, SEPA, SO, WO)

5.1.4 Ensure that the conservation requirements of floodplain hay meadows are taken into account in Water Level Management Plans. (Action: EA, IDBs)

5.2 Site safeguard and management

5.2.1 Keep the extent of SSSI/ASSI coverage under review and notify further sites as necessary to fill significant gaps. (Action: CCW, EHS, EN, SNH)

5.2.2 Secure, by 2004, the uptake of positive management with owners and occupiers of SSSIs/ASSIs, where necessary to achieve favourable conservation conditions, and promote the uptake of such agreements on other wildlife sites. (Action: CCW, EHS, EN, SNH)

5.2.3 Consider the need to manage further key sites as National Nature Reserves and, where appropriate, support acquisition and management by conservation organisations. (Action: CCW, EHS, EN, SNH)

5.2.4 Encourage the development of new management techniques where required, e.g. for weed control, and the setting up of local farm networks, e.g. for livestock provision, that help to ensure sympathetic management. (Action: CCW, DANI, EHS, EN, JNCC, MAFF, SNH, SOAEFD, WOAD)

5.2.5 Contribute to the implementation of relevant species action plans for rare and declining species associated with lowland meadows in conjunction with the relevant species steering group. (Action: CCW, DANI, EHS, EN, MAFF, SNH, SOAEFD, WOAD)

5.3 Advisory

5.3.1 Encourage, develop and disseminate best practice for unimproved neutral grassland management, in particular the integration of conservation management into agricultural practice. (Action: CCW, DANI, EHS, EN, LAs, MAFF, SNH, SOAEFD, WOAD)

5.3.2 Produce and disseminate guidelines for appropriate methods and approaches to establish new stands of lowland hay meadow of wildlife value. (Action: CCW, EHS, EN, SNH)

5.3.3 Encourage the use and establishment of private and public demonstration sites, with special linkage to agri-environment schemes. (Action: CCW, DANI, EHS, EN, FC MAFF, SNH, SOAEFD, WOAD)

5.4 International

5.4.1 Promote conservation and management of Special Areas of Conservation as part of a European network and if a review of community coverage of Annex 1 of the Habitats Directive is undertaken support adequate coverage of this habitat within the site network. (Action: CCW, EHS, EN, JNCC, SNH)

5.4.2 Recommend favourable measures for unimproved lowland grassland conservation during future negotiations in Europe to revise the Common Agricultural Policy. (Action: DETR, MAFF)

5.4.3 Encourage actions at a European and international level which will help improve our understanding of the conservation of the resource at a UK level and promote measures which will strengthen the conservation of this habitat in Europe and elsewhere. (Action: CCW, EHS, EN, JNCC, SNH)

5.5 Monitoring and research

5.5.1 Contribute information to a World Wide Web based catalogue of survey information as a means of improving

access to information on lowland meadows. (Action: CCW, EHS, EN, SNH)

- 5.5.2 Undertake vegetation survey and assessment of unimproved neutral grasslands in parts of UK with poor survey coverage, using standardised and repeatable methodology. (Action: CCW, EHS, EN, SNH)
- 5.5.3 Formulate quantified and spatially referenced targets to expand the total cover of lowland meadows of wildlife value across the UK, with particular emphasis on amelioration of habitat fragmentation, by 2005. (Action: CCW, EHS, EN, SNH)
- 5.5.4 Review and promote research into the best ways of integrating modern agricultural practices with the conservation of species-rich grasslands in lowland farmland. (Action: CCW, DANI, EHS, EN, JNCC, MAFF, SNH, SOAEFD, WOAD)
- 5.5.5 Review current research and where appropriate promote applied research to inform the conservation and restoration of different forms of dry and floodplain neutral grasslands. (Action: CCW, DANI, EHS, EN, JNCC, MAFF, SNH, SOAEFD, WOAD)
- 5.5.6 Review current research and where appropriate promote research on the establishment and expansion of species-rich neutral meadows and pastures, covering methodology and landscape ecological components. (Action: CCW, DANI, EHS, EN, JNCC, MAFF, SNH, SOAEFD, WOAD)
- 5.5.7 Encourage and support conservation studies on scarce animal and plant taxa associated with unimproved neutral grasslands with particular relevance to amelioration of damaging impacts from habitat depletion and fragmentation. (Action: CCW, EHS, EN, JNCC, SNH)
- 5.5.8 Evaluate the need for impact assessment of the effect of atmospheric nutrient deposition and climate change on community composition, and commission research as appropriate. (Action: CCW, EA, EHS, EN, JNCC, SEPA, SNH)
- 5.5.9 Develop and implement appropriate surveillance and monitoring programmes to assess progress towards achieving action plan targets. (Action: CCW, DANI, EHS, EN, JNCC, MAFF, SNH, SOAEFD, WOAD)

5.6 Communications and publicity

- 5.6.1 Seek opportunities to present neutral meadow and pasture conservation in the scientific press and popular media. (Action: CCW, EHS, EN, JNCC, SNH)
- 5.6.2 Encourage appropriate public access for observation and enjoyment of lowland meadows. (Action: CCW, EHS, EN, SNH)
- 5.6.3 Consider commissioning marketing studies into ways to promote agricultural products from unimproved neutral grassland. (Action: CCW, DANI, EHS, EN, MAFF, SNH, SOAEFD, WOAD)

6. Costings

- 6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the

habitat, primarily through agri-environment schemes and grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.

7. Key references

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Costings for lowland meadows

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	1802		
Total average annual cost / £000/Yr		443.2	655.8
Total expenditure to 2004/ £000		2216.2	
Total expenditure 2004 to 2014/ £000			6557.7

Upland hay meadows

A Habitat Action Plan

1. Current status

1.1 Biological status

- 1.1.1 For the purposes of this plan upland hay meadows are treated as being equivalent to EC Habitats Directive Annex 1 habitat 38.3, Northern Hay Meadows (British types with *Geranium sylvaticum*). The habitat thus comprises the single National Vegetation Classification community MG3, *Anthoxanthum odoratum* - *Geranium sylvaticum* grassland and is characterised by a dense growth of grasses and herbaceous dicotyledons up to 60 - 80 cm high. No single grass species is consistently dominant and the most striking feature of the vegetation is generally the variety and abundance of dicotyledons, including wood crane's-bill *Geranium sylvaticum*, pignut *Conopodium majus*, great burnet *Sanguisorba officinalis* and lady's mantles *Alchemilla* spp.
- 1.1.2 Upland hay meadows considered in this plan are, for the most part, in upland valleys in the north of England, with outliers in Scotland. The main concentrations are in the northern Pennines of North Yorkshire, Durham and east Cumbria but there are scattered locations in west Cumbria, Lancashire, Northumberland, Perthshire and as far north as Aberdeenshire in Scotland. The most important centres are Teesdale, Lunedale, Weardale and Baldersdale in Durham, Swaledale and Wharfedale in North Yorkshire and around Tebay, Orton and Ravenstonedale in Cumbria. There are no known examples in Wales or southern England; certain stands of MG5 *Cynosurus cristatus* - *Centaurea nigra* grassland in Radnorshire and Herefordshire with frequent great burnet *Sanguisorba officinalis* are the nearest floristic equivalents but lack wood crane's-bill *Geranium sylvaticum* and some other MG3 constants. These and other species-rich mesotrophic grassland communities are covered in the companion plan for lowland meadows.
- 1.1.3 Past cover data are not available, but it is highly likely that meadows of this kind have become much reduced in the 20th century through agricultural intensification. Recent estimates indicate that there are less than 1000 ha in northern England. Scotland, is believed to have less than 100 ha.
- 1.1.4 Upland hay meadows are confined to areas where non-intensive hay-meadow treatment has been applied in a sub-montane climate. They are most characteristic of brown earth soils on level to moderately sloping sites between 200m and 400m altitude. Stands of *Anthoxanthum* - *Geranium* meadow are typically found in isolated fields or groups of fields, where many are still managed as hay meadows, but they are also recorded from river banks, road verges, and in woodland clearings. Most stands of the habitat are less than 2 ha in extent.
- 1.1.5 Most of the variation within this habitat is attributable to management treatments. The fields are grazed in winter, mainly by sheep, except in the worst weather. In late April to early May the meadows are shut up for hay. Mowing takes place in late July to early August though, in unfavourable seasons, it may be delayed as late as September. The aftermath is then grazed once more until the weather deteriorates. Traditionally, the meadows have been given a light dressing of farmyard

manure in the spring, and this, together with occasional liming, may have helped maintain the richness and diversity of the most species-rich stands.

1.2 Links with species action plans

- 1.2.1 Upland hay meadows were formerly used by the globally threatened corncrake *Crex crex* and their requirements should be taken into account in the implementation of the plan. They also support populations of other birds of interest particularly twite *Acanthis flavirostris*.

2. Current factors affecting the habitat

- 2.1 The factors currently affecting upland hay meadows reduce the quality and decrease the quantity of the habitat, and its fragmentation brings increased risk of species extinctions in the small remnant areas. The main factors are:
- 2.1.1 Agricultural improvement through ploughing, drainage, re-seeding, inorganic fertiliser treatment and slurry application.
- 2.1.2 A general shift from hay-making to silage production, with more frequent and often earlier annual cutting, as a result of a decline in the perceived value of hay in intensive modern farming regimes and the reduced reliance on good weather.
- 2.1.3 Changes in management from hay meadow to grazing pasture, particularly on the less accessible sites.
- 2.1.4 Increased grazing intensity and duration, particularly in spring.
- 2.1.5 Increased supplementary stock feeding associated with higher grazing levels leading to enhanced nutrient loadings and localised poaching.
- 2.1.6 Increased eutrophication as a result of too frequent application of farmyard manure.
- 2.1.7 Agricultural and other management neglect leading to rank over-growth.
- 2.1.8 Application of herbicides and other pesticides.
- 2.1.9 Atmospheric pollution and climate change, the influence of which is not fully assessed.

3. Current action

3.1 Legal status

- 3.1.1 Between 500 -1000 ha of upland hay meadow are protected within 75 SSSIs in England; three of these are also NNRs. Less than 5 ha are protected within 3 SSSIs in Scotland, and the habitat is not represented within Scottish NNRs.
- 3.1.2 72 SSSIs designated for this habitat in England are included in two proposed Special Areas of Conservation, under the EC Habitats Directive.

3.2 Management, research and guidance

- 3.2.1 Management agreements are in place for many of the SSSIs containing this habitat in England and the few examples in Scotland. The aim of these is to maintain the traditional management regime.
- 3.2.2 English Nature runs Wildlife Enhancement Schemes in the Yorkshire Dales and Northumberland which fund positive management of upland hay meadows.
- 3.2.3 Incentives to maintain traditional low intensity management in upland hay meadows are provided by three government sponsored agri-environment schemes: the Countryside Stewardship Scheme (England), the Countryside Premium Scheme (Scotland), and the Environmentally Sensitive Areas scheme in both countries. Many of the meadows in North Yorkshire, Durham and Northumberland and Cumbria fall within the Pennine Dales and Lake District ESAs. Both of these ESAs have tiers with management prescriptions specifically aimed at the enhancement of hay meadows. The Countryside Stewardship Scheme provides payments for positive traditional management, and the Countryside Premium Scheme includes an option for the positive management of species-rich grassland.
- 3.2.4 The Yorkshire Dales, Lake District and Northumberland National Parks can also fund the positive management of upland hay meadows, although the ESAs have taken over most of this function in the Yorkshire Dales and the Lake District.
- 3.2.5 A major contribution has been made by various non-governmental organisations to the conservation of species-rich upland hay meadows through the establishment of nature reserves.
- 3.2.6 The University of Newcastle upon Tyne is currently undertaking research into the optimum management for upland hay meadow and into ways of reinstating the habitat on meadows which have become species-poor through fertilizer-induced nutrient enrichment.
- 3.2.7 There is a need to assess the impact of atmospheric nutrient deposition and climate change in this and other types of lowland grassland.
- 3.2.8 There is also a lack of information on the invertebrate fauna associated with restored upland hay meadows. Research might look at the colonisation of these grasslands by invertebrates, and the stability and resilience of these communities in the longer term.

4. Action plan objectives and proposed targets

- 4.1 The objectives and targets cover habitat conservation, restoration and expansion. Key components are the need to secure favourable conservation and, where necessary, restoration management at SSSIs and other significant localities, and also to develop carefully researched guidelines to restore and expand the habitat. The quantified cover target advanced for trial habitat expansion at this stage is a judgement based on current but incomplete information; development of more far-reaching targets, pending further investigation, is a key element of the action plan programme. Similar elements have been incorporated in each of the four action plans for dry lowland grasslands (covering lowland and upland hay meadows, lowland calcareous grasslands and lowland acid grasslands).

- 4.1.1 Arrest the depletion of unimproved upland hay meadow throughout its UK distribution.
- 4.1.2 Within SSSIs, initiate rehabilitation management for all significant stands of unimproved upland hay meadow in unfavourable condition by 2005, with the aim of achieving favourable status wherever feasible by 2010.
- 4.1.3 For stands at other localities, secure favourable condition over 30% of the resource by 2005, and as near to 100% coverage as is practicable by 2015.
- 4.1.4 Attempt to re-establish 50 ha of upland hay meadow of wildlife value at carefully targeted sites by 2010.

5. Proposed action with lead agencies

5.1 Policy and legislation

- 5.1.1 Take account of the conservation requirements of upland hay meadows when developing and adjusting agri-environment schemes. Design measures to suit local needs and to target local concentrations of upland hay meadow. (Action: EN, MAFF, SNH, SOAEFD)
- 5.1.2 Develop and implement strategies to restore and expand the cover of upland hay meadow, taking into account the need to ameliorate the negative effects of isolation, fragmentation and small patch size. (Action: EN, MAFF, SNH, SOAEFD)
- 5.1.3 Support initiatives to conserve upland hay meadow within local government development plans and related policy, within forest management and planting schemes and by special projects. (Action: FC, LAs, DETR, SOAEFD)

5.2 Site safeguard and management

- 5.2.1 Keep the extent of SSSI coverage under review and notify further sites as necessary to fill significant gaps. (Action: EN, SNH)
- 5.2.2 Secure the uptake of positive management with owners and occupiers of SSSIs where necessary to achieve favourable conservation conditions and promote such agreements at other upland hay meadow sites. (Action: EN, SNH)
- 5.2.3 Consider the need to manage further key sites as National Nature Reserves and, where appropriate, support site acquisition and management by conservation organisations. (Action: EN, SNH)
- 5.2.4 Encourage the development of new management techniques where required, e.g. for weed control, and the setting up of local farm networks, e.g. for livestock provision, that help to ensure sympathetic management. (Action: EN, JNCC, MAFF, SNH, SOAEFD)
- 5.2.5 Contribute to the implementation of relevant species action plans for rare and declining species associated with upland hay meadow in conjunction with the relevant species steering group. (Action: EN, MAFF, SNH, SOAEFD)

5.3 Advisory

- 5.3.1 Encourage, develop and disseminate best practice for upland hay meadow management, in particular the

integration of conservation management into agricultural practice. (Action: EN, LAs, MAFF, SNH, SOAEFD)

5.3.2 Produce and disseminate guidelines for appropriate methods and approaches to establish new stands of upland hay meadow of wildlife value. (Action: EN, SNH)

5.3.3 Encourage the use and establishment of private and public demonstration sites, with special linkage to agri-environment schemes. (Action: EN, MAFF, SNH, SOAEFD)

5.4 International

5.4.1 Promote conservation and management of Special Areas of Conservation as part of a European network. (Action: CCW, EHS, EN, JNCC, SNH)

5.4.2 Recommend suitable low-intensity farming provisions to favour the conservation of unimproved upland hay meadows during future negotiations in Europe to revise the Common Agricultural Policy. (Action: DETR, MAFF)

5.4.3 Review representation of upland hay meadows in other European countries, to determine their international extent and status, to help inform the conservation of the resource at a UK level. (Action: EN, JNCC, SNH)

5.4.4 Participate in initiatives to develop and strengthen measures for the conservation of unimproved upland meadows in Europe and elsewhere. (Action: EN, JNCC, SNH)

5.4.5 Seek opportunities to exchange information about the management and conservation of unimproved upland meadows in the international literature and at conferences. (Action: EN, JNCC, SNH)

5.5 Monitoring and research

5.5.1 Contribute information to a World Wide Web based catalogue of survey information as a means of improving access to information on upland hay meadows. (Action: EN, SNH)

5.5.2 Undertake vegetation survey and assessment of upland hay meadow in areas of Scotland and northern England where existing coverage is inadequate, using standardised and repeatable methodology. (Action: EN, SNH)

5.5.3 Formulate quantified and spatially referenced targets to expand the total cover of upland hay meadows of wildlife value across the UK, with particular emphasis on amelioration of habitat fragmentation, by 2005. (Action: EN, SNH)

5.5.4 Review current research and where appropriate promote Commission, undertake and promote appropriate applied research to inform the conservation management and restoration of upland hay meadow, and the best ways of integrating agricultural management with the conservation of this habitat type. (Action: EN, FC, JNCC, MAFF, SNH, SOAEFD)

5.5.5 Review current research and where appropriate support research into the establishment and expansion of upland hay meadow, covering methodology, geographical range and landscape ecological components. (Action: EN, JNCC, MAFF, SNH, SOAEFD)

5.5.6 Encourage and support conservation studies on scarce animal and plant taxa associated with upland hay meadow. (Action: EN, JNCC, SNH)

5.5.7 Evaluate the need for impact assessment of the effect of atmospheric nutrient deposition and climate change on community composition, and commission research as appropriate. (Action: EA, EN, JNCC, SEPA, SNH)

5.5.8 Develop and implement appropriate surveillance and monitoring programmes to assess progress towards action plan targets. (Action: EN, JNCC, MAFF, SNH, SOAEFD)

5.6 Communications and publicity

5.6.1 Seek opportunities to present upland hay meadow conservation in the scientific press and popular media. (Action: EN, JNCC, MAFF, SNH, SOAEFD)

5.6.2 Encourage appropriate public access for observation and enjoyment of upland hay meadows. (Action: EN, MAFF, SNH, SOAEFD)

5.6.3 Consider the need to commission marketing studies into ways to promote agricultural products from upland hay meadows. (Action: CoCo, CCW, EN, MAFF, SNH, SOAEFD)

6. Costings

6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the habitat, primarily through agri-environment schemes and grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.

6.2 Current expenditure could not be accurately determined for this distinctive habitat as it is not specifically identified within grant schemes. The figures presented in the table are based on an assumption of 800ha under an average payment of £135/ha.

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Costings for upland hay meadows

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	108		
Total average annual cost / £000/Yr		65.3	79.4
Total expenditure to 2004/ £000		326.6	
Total expenditure 2004 to 2014/ £000			793.6

Lowland dry acid grassland

A Habitat Action Plan

1. Current status

1.1 Biological status

- 1.1.1 Lowland acid grassland typically occurs on nutrient-poor, generally free-draining soils with pH ranging from 4 to 5.5 overlying acid rocks or superficial deposits such as sands and gravels. It includes the *Festuca ovina* - *Agrostis capillaris* - *Rumex acetosella* (U1), *Deschampsia flexuosa* (U2), *Agrostis curtisii* (U3) and *Festuca ovina* - *Agrostis capillaris* - *Galium saxatile* (U4) National Vegetation Classification grassland plant communities. Inland vegetation, but not coastal dunes, characterised by *Carex arenaria* (*Carex arenaria* dune *Festuca ovina* sub-community (SD10b) and *Carex arenaria* - *Cornicularia aculeata* dune, *Festuca ovina* sub-community (SD11b)) is also included but is highly localised.
- 1.1.2 Definition of lowland acid grassland is problematical but here it is defined as both enclosed and unenclosed acid grassland throughout the UK lowlands (normally below c. 300m). It covers all acid grassland managed in functional enclosures; swards in old and non-functional enclosures in the upland fringes, which are managed as free-range rough grazing in association with unenclosed tracts of upland, are excluded. It often occurs as an integral part of lowland heath landscapes, in parklands and locally on coastal cliffs and shingle. It is normally managed as pasture.
- 1.1.3 Acid grassland is characterised by a range of plant species such as heath bedstraw *Galium saxatile*, sheep's-fescue *Festuca ovina*, common bent *Agrostis capillaris*, sheep's sorrel *Rumex acetosella*, sand sedge *Carex arenaria*, wavy hair-grass *Deschampsia flexuosa*, bristle bent *Agrostis curtisii* and tormentil *Potentilla erecta*, with presence and abundance depending on community type and locality. Dwarf shrubs such as heather *Calluna vulgaris* and bilberry *Vaccinium myrtillus* can also occur but at low abundance. Lowland acid grassland often forms a mosaic with dwarf shrub heath, the latter being covered in the separate lowland heathland action plan. Acid grasslands can have a high cover of bryophytes and parched acid grassland can be rich in lichens. Acid grassland is very variable in terms of species richness and stands can range from relatively species-poor (less than 5 species per 4m²) to species-rich (in excess of 25 species per 4m²).
- 1.1.4 Parched acid grassland in particular contains a significant number of rare and scarce vascular plant species many of which are annuals. These include species such as mossy stonecrop *Crassula tillaea*, smooth rupturewort *Herniaria glabra*, slender bird's-foot-trefoil *Lotus angustissimus*, bur medick *Medicago minima* and clustered clover *Trifolium glomeratum* and spring speedwell *Veronica verna*. Perennial taxa associated with these grasslands include, sticky catchfly *Lychnis viscaria* and shaggy mouse-ear-hawkweed *Pilosella peleteriana*.
- 1.1.5 The bird fauna of acid grassland is very similar to that of other lowland dry grasslands which collectively are considered to be a priority habitat for conservation action. Bird species of conservation concern which utilise acid grassland for breeding or wintering include woodlark *Lullula arborea*, stone-curlew *Burhinus oedicnemus*, nightjar *Caprimulgus europaeus*, lapwing

Vanellus vanellus, skylark *Alauda arvensis*, chough *Pyrrhocorax pyrrhocorax*, green woodpecker *Picus viridis*, hen harrier *Circus cyaneus* and merlin *Falco columbarius*.

- 1.1.6 Many of the invertebrates that occur in acid grassland are specialist species which do not occur in other types of grassland. The open parched acid grasslands on sandy soils in particular, can support a considerable number of ground-dwelling and burrowing invertebrates such as solitary bees and wasps. A number of rare and scarce species are associated with the habitat, some of which are included on the UK Biodiversity Action Plan list of species of conservation concern, such as the field-cricket *Gryllus campestris*.
- 1.1.7 As with other lowland semi-natural grassland types, acid grassland has undergone substantial decline in the 20th century although there are no figures available on rates of loss. The decline is mostly due to agricultural intensification although locally, as in the Breckland, afforestation has been significant.
- 1.1.8 Cover data for lowland acid grassland across the UK for the full altitudinal range are not currently available. Stands remote from the upland fringe, which are the primary focus of conservation attention, are now of restricted occurrence and it is estimated that less than 30,000 ha now remain in UK. Important concentrations occur in the Breckland, the New Forest, Dorset, Suffolk Sandlings, the Weald, Dungeness, the coasts of SW England and the Welsh and English border hills of Powys and Shropshire. Scotland is estimated to have less than 5000ha and much of this is likely to be on the upland fringe. Extensive areas of acid grassland are included within sites designated as common land, but separate figures for uplands and lowlands are not available.
- 1.1.9 It will be important to ensure that acid grasslands are taken into account during implementation of the action plan for lowland heathland; actions in the two plans need to be closely integrated.

1.2 Links with species action plans

- 1.2.1 Lowland dry acid grassland is an important habitat for a number of priority species including tower mustard *Arabis glabra*, Deptford pink *Dianthus armeria*, field cricket *Gryllus campestris*, woodlark *Lullula arborea*, nightjar *Caprimulgus europaeus* and stone curlew *Burhinus oedicnemus*. Due regard should be given to the conservation requirements of these species during plan implementation.

2. Current factors affecting the habitat

- 2.1 The factors currently affecting acid grassland reduce the quality and quantity of acid grassland. The fragmentation of the habitat brings increased risk of species extinctions in the small remnant areas. The factors include:
- 2.1.1 Agricultural intensification by use of fertilisers, herbicides and other pesticide, liming, re-seeding or ploughing for arable crops.

- 2.1.2 Agricultural and other management neglect leading to rank over-growth, and bracken *Pteridium aquilinum* and scrub encroachment.
- 2.1.3 Over-grazing is a more localised problem, and is sometimes associated with supplementary feeding which can cause localised sward damage.
- 2.1.4 Afforestation particularly with softwoods on light sandy soils.
- 2.1.5 Development activities such as mineral and rock extraction, road building, housing and landfill.
- 2.1.6 Atmospheric pollution and climate change, the influence of which is not fully assessed.

3. Current action

3.1 Legal Status

- 3.1.1 Lowland acid grassland features prominently in the SSSI series in England and Wales. There are 271 SSSIs in England which have the habitat as a principal reason for notification. In Wales 22 SSSIs qualify independently for their lowland acid grassland interest with a further 150 where the habitat contributes to the special interest in tandem with other habitat or species interests. Comprehensive information on the amount of the resource included within SSSIs is not available in England, but in Wales approximately 700 ha of acid grassland occurs in lowland SSSIs. Lowland acid grassland is present on approximately 40 SSSIs in Scotland.
- 3.1.2 Nine English and Welsh NNRs contain significant areas of acid grassland, the majority concentrated in the Norfolk and Suffolk Breckland and the Suffolk coastal region although Stanner Rocks NNR in eastern Wales provides an important representation of drought-prone acid grassland supporting a large number of rare and scarce plant species. Rum NNR in Scotland includes a considerable area of lowland acid grassland.
- 3.1.3 A number of Special Protection Areas (SPAs) designated under the EC Birds Directive contain tracts of lowland dry acid grassland which form part of the habitat complex important for sustaining populations of dry grassland and heathland birds. These include the New Forest, Wealden Heaths and Minsmere-Walberswick. The habitat is also contained within some potential SPAs including Breckland and Dorset Heathlands.
- 3.1.4 Several plant, invertebrate and bird species of lowland grassland are protected under the Schedules of the Wildlife and Countryside Act 1981.

3.2 Management, research and guidance

- 3.2.1 Management agreements to conserve acid grassland on SSSIs have been made between owners and occupiers and EN, CCW and SNH, while agri-environment schemes play a role in providing incentives to conserve both statutory and non-statutory sites. ESAs with a significant component of lowland acid grassland are Breckland, the Shropshire Hills, Radnor, Cambrian Mountains, Argyll Islands and Stewartry; many others include smaller areas, especially around the upland fringe. The Countryside Stewardship Scheme in England, Tir Cymen and the Habitat Scheme in Wales (which will be replaced in 1999 by the new all Wales agri-

environment scheme Tir Gofal) and the Countryside Premium Scheme in Scotland include acid grassland as an eligible habitat. These schemes aim to provide incentives to maintain low intensity management by livestock grazing to maintain the habitat and in some cases to re-create areas of acid grassland.

- 3.2.2 A major contribution has been made by various non-governmental organisations to the conservation of acid grassland in parts of the UK through the establishment of nature reserves. Detailed scientific studies of the impact of military training on the ecology of calcareous grasslands are currently being undertaken by the Institute of Terrestrial Ecology and Liverpool University.
- 3.2.3 Survey of lowland acid grassland in the UK to underpin its conservation has been very limited in its coverage. A review of the extent, conservation interest and management of lowland acid grassland is currently in progress in England. This will provide an indication of future priorities for survey and assessment.
- 3.2.4 Research into the ecology of Breckland grass-heath, which includes acid grassland, is being undertaken at the University of East Anglia. MAFF is funding research into the reversion of arable land to a mosaic of lowland acid grassland and heathland in the Breckland ESA. Also, the natural regeneration of acid grassland on arable land is being monitored in Dorset by the Institute of Terrestrial Ecology.
- 3.2.5 Research related to favourable management regimes including livestock type and grazing intensity, needs to be reviewed for a number of lowland grassland communities. Such work needs to take account of habitat mixtures, in which dry acid grassland is associated with wet grassland, heath or mire communities. In addition, enhanced understanding of management techniques to restore and create acid grassland habitat is required if habitat expansion is to be widely undertaken. Habitat isolation and fragmentation also need to be taken into account.
- 3.2.6 There is a need to assess the impact of atmospheric nutrient deposition and climate change in this and other types of lowland grassland. As there is a lack of information on the invertebrate fauna associated with both existing and restored acid grasslands research might be focused on colonisation and the stability and resilience of these communities in the longer term.

4. Action plan objectives and proposed targets

- 4.1 The objectives and targets cover habitat conservation, restoration and expansion. Key components are the need to secure favourable conservation and, where necessary, restoration management at SSSIs and other significant localities, and also to develop carefully researched guidelines to restore and expand the habitat. The quantified cover target advanced for trial habitat expansion at this stage is a judgement based on current but incomplete information; development of more far-reaching targets, pending further investigation, is a key element of the action plan programme. Similar elements have been incorporated in each of the four action plans for dry lowland grasslands (covering lowland and upland hay meadows, lowland calcareous grasslands and lowland acid grasslands).
- 4.1.1 Arrest the depletion of unimproved lowland acid grassland throughout the UK.

4.1.2 Within SSSIs, initiate rehabilitation management for all significant stands of unimproved lowland acid grassland in unfavourable condition by 2005, with the aim of achieving favourable status wherever feasible by 2010.

4.1.3 For stands at other localities, secure favourable condition over 30% of the resource by 2005, and as near to 100% as is practicable by 2015.

4.1.4 Attempt to re-establish 500 ha of lowland acid grassland of wildlife value at carefully targeted sites by 2010.

5. Proposed action with lead agencies

5.1 Policy and legislation

5.1.1 Take account of the conservation requirements of lowland acid grassland when developing and reviewing agri-environment schemes. Design measures to suit local needs and consider targeting local concentrations of this habitat. (Action: CCW, EN, MAFF, SNH, SOAEFD, WOAD)

5.1.2 Develop and implement strategies to restore and expand the cover of unimproved acid grassland, taking into account the need to ameliorate the negative effects of small patch size, fragmentation, isolation and scrub encroachment. (Action: CCW, EN, MAFF, SNH, SOAEFD, WOAD)

5.1.3 Support initiatives to conserve unimproved acid grassland within local government development plans and related policy, in forest management and planting schemes and by special projects. (Action: EA, DETR, FC, LAs, SEPA, SO, WO)

5.1.4 Consider mechanisms by which lowland acid grassland within areas designated as common land can be brought under sympathetic management. (Action: DETR, MAFF, SO, SOAEFD, WOAD)

5.2 Site safeguard and management

5.2.1 Keep the extent of the SSSI series under review and notify further sites as necessary to fill significant gaps. (Action: CCW, EN, SNH)

5.2.2 Complete the designation of lowland dry acid grassland SPAs and SACs and prepare and implement management plans on these by 2004. (Action: DETR, EN, JNCC)

5.2.3 Secure the uptake of positive management with owners and occupiers of SSSIs where necessary to achieve favourable conservation conditions, and promote the uptake of such agreements on other wildlife sites. (Action: CCW, EN, FC, SNH)

5.2.4 Secure the positive management of lowland dry acid grassland sites within the ownership or management of the Ministry of Defence and voluntary conservation bodies, and draw up site management plans with clear targets for this habitat and associated priority species for these sites by 2004. (Action: EN, FC, MoD)

5.2.5 Consider the need to manage further key sites as National Nature Reserves and, where appropriate, support acquisition and management by conservation organisations. (Action: CCW, EN, FC, SNH)

5.2.6 Encourage the development of new management techniques where required, e.g. for weed control, and the setting up of networks, e.g. for livestock provision,

that facilitate sympathetic management. (Action: CCW, EN, FC, JNCC, MAFF, SNH, SOAEFD, WOAD)

5.2.7 Contribute to the implementation of relevant species action plans for rare and declining species associated with lowland acid grassland in conjunction with the relevant species steering group. (Action: CCW, EN, MAFF, SNH, SOAEFD, WOAD)

5.3 Advisory

5.3.1 Encourage, develop and disseminate best practice for lowland acid grassland management, in particular the integration of conservation management into agricultural practice. (Action: CCW, EN, FC, LAs, MAFF, SNH, SOAEFD, WOAD)

5.3.2 Produce and disseminate guidelines for appropriate methods and approaches to establish new stands of lowland dry acid grassland of wildlife value. (Action: CCW, EN, SNH)

5.3.3 Encourage the use and establishment of private and public demonstration sites, with special linkage to agri-environment schemes. (Action: CCW, EN, MAFF, SNH, SOAEFD, WOAD)

5.4 International

5.4.1 Promote conservation and management of Special Areas of Conservation as part of a European network and if a review of Community coverage of Annex I of the Directive is undertaken support adequate representation of this habitat in the site network. (Action: CCW, DETR, EN, JNCC, SNH)

5.4.2 Recommend favourable measures for lowland acid grassland conservation during future negotiations in Europe to revise the Common Agricultural Policy. (Action: DETR, SOAEFD, WOAD)

5.4.3 Review representation of lowland acid grasslands in other European countries, to determine their international extent and status, to help inform the conservation of the resource at a UK level. (Action: CCW, EN, JNCC, SNH)

5.4.4 Participate in initiatives to develop and strengthen measures for conservation of the habitat in Europe and elsewhere. (Action: CCW, EN, DETR, JNCC, MAFF, SNH, SO, SOAEFD, WO, WOAD)

5.4.5 Disseminate information about the UK's experience in conservation of the resource in international literature and at conferences and take opportunities to learn from organisations in Europe and elsewhere. (Action: CCW, EN, DETR, JNCC, MAFF, SNH, SO, SOAEFD, WO, WOAD)

5.5 Monitoring and research

5.5.1 Contribute information to a World Wide Web based catalogue of survey information as a means of improving access to information on lowland dry acid grasslands. (Action: CCW, EHS, EN, SNH)

5.5.2 Undertake vegetation survey and assessment of lowland acid grasslands in parts of UK with poor survey coverage, using standardised and repeatable methodology. (Action: CCW, EHS, EN, SNH)

- 5.5.3 Formulate quantified and spatially referenced targets to expand the total cover of lowland dry acid grassland of wildlife value across the UK, with particular emphasis on amelioration of habitat fragmentation, by 2005. (Action: CCW, EN, SNH)
- 5.5.4 Review research needs into the conservation management of the habitat and the integration of this with agriculture, to identify significant gaps in knowledge. Commission and undertake new research as appropriate. (Action: CCW, EN, JNCC, MAFF, SNH, SOAEFD, WOAD)
- 5.5.5 Consider commissioning and promoting appropriate applied research to inform the conservation and restoration of different forms of lowland dry acid grasslands. (Action: CCW, EN, FC, JNCC, MAFF, SNH, SOAEFD, WOAD)
- 5.5.6 Review current research and where appropriate support research on establishment and expansion of lowland acid grassland, covering methodology and landscape ecological components. (Action: CCW, EN, FC, JNCC, MAFF, SNH, SOAEFD, WOAD)
- 5.5.7 Encourage and support conservation studies on scarce animal and plant taxa associated with lowland acid grasslands with particular relevance to amelioration of damaging impacts from habitat depletion and fragmentation. (Action: CCW, EN, FC, JNCC, SNH)
- 5.5.8 Evaluate the need for impact assessment of the effect of atmospheric nutrient deposition and climate change on community composition, and commission research as appropriate. (Action: CCW, EA, EN, JNCC, SEPA, SNH)
- 5.5.9 Develop and implement appropriate surveillance and monitoring programmes to assess progress towards action plan targets. (Action: CCW, EN, FC MAFF, SNH, SOAEFD, WOAD)

5.6 Communications and publicity

- 5.6.1 Seek opportunities to present lowland acid grassland conservation in the scientific press and the popular media. (Action: CCW, EN, JNCC, MAFF, SNH)
- 5.6.2 Commission marketing studies into ways to promote agricultural products from lowland acid grassland. (Action: CoCo, CCW, SNH)
- 5.6.3 Encourage appropriate public access for observation and enjoyment of lowland acid grassland. (Action: CCW, EN, MAFF SNH)

6. Costings

- 6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the habitat, primarily through agri-environment schemes and grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.

7. Key References

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Costings for lowland dry acid grassland

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	190		
Total average annual cost / £000/Yr		570.0	1178.7
Total expenditure to 2004/ £000		2850.0	
Total expenditure 2004 to 2014/ £000			11787.0

Lowland calcareous grassland

A Habitat Action Plan

1. Current status

1.1. Biological status

1.1.1 Lowland calcareous grasslands are developed on shallow lime-rich soils generally overlying limestone rocks, including chalk. These grasslands are now largely found on distinct topographic features such as escarpments or dry valley slopes and sometimes on ancient earthworks in landscapes strongly influenced by the underlying limestone geology. More rarely, remnant examples occur on flatter topography such as in Breckland and on Salisbury Plain. They are typically managed as components of pastoral or mixed farming systems, supporting sheep, cattle or sometimes horses; a few examples are cut for hay.

1.1.2 The definition of calcareous grasslands covers a range of plant communities in which lime-loving plants are characteristic. In the context of this Action Plan, lowland types are defined as the first nine calcareous grassland National Vegetation Classification communities, CG1 to CG9. With the exception of CG9, *Sesleria albicans* - *Galium sternerii* grassland, which straddles both lowlands and uplands, these communities are largely restricted to the warmer and drier climates of the southern and eastern areas of the United Kingdom. Lowland sub-communities of CG9 occur in the more clement conditions around Morecambe Bay in Cumbria, while upland sub-communities occupy colder and wetter localities in the Pennines. Lowland calcareous grassland sites occur in both enclosed and unenclosed situations but typically below the upper level of agricultural enclosure in any particular district; calcareous grasslands situated in the unenclosed uplands are covered by a separate Action Plan. As defined here, lowland calcareous grassland only occurs in England and Wales. None of the communities CG1 to 9 has been recorded from Scotland. While limestone grassland in Northern Ireland has affinities to CG9, it is largely confined to open upland localities and around their margins; some CG6 has also been recorded, but only in very small and scattered stands around the coast.

1.1.3 The cover of lowland calcareous grassland has suffered a sharp decline in extent over the last 50 years. There are no comprehensive figures, but a sample of chalk sites in England surveyed in 1966 and 1980 showed a 20% loss in that period and an assessment of chalk grassland in Dorset found that over 50% had been lost between the mid-1950s and the early 1990s.

1.1.4 Current estimates put the amount of lowland calcareous grassland remaining in the United Kingdom around 33,000 to 41,000 ha with less than 1,000 ha of this in Wales. The bulk of the resource is found on chalk (25,000 to 32,000 ha), with major concentrations in Wiltshire, Dorset and the South Downs.

1.1.5 Lowland calcareous grasslands support a very rich flora including many nationally rare and scarce species such as monkey orchid *Orchis simia*, hoary rockrose *Helianthemum canum* and pasque flower *Pulsatilla vulgaris*. The invertebrate fauna is also diverse and includes scarce species like the adonis blue *Lysandra bellargus*, the silver-spotted skipper *Hesperia comma*, the Duke of Burgundy fritillary *Hamaeris lucina* and the wart-biter cricket

Decticus verrucivorus. These grasslands also provide feeding or breeding habitat for a number of scarce or declining birds including stone curlew *Burhinus oediacnemus* and skylark *Alauda arvensis*.

1.1.6 Scrub is frequently associated with calcareous grassland and can contribute to local biodiversity by providing shelter for invertebrates and scrub edge conditions suitable for species such as bloody cranesbill *Geranium sanguineum*. Dwarf shrubs and herbs characteristic of acid soils are also sometimes associated with calcareous grassland, forming chalk or limestone heath. Limestone pavement is covered in a separate action plan.

1.2 Links with species action plans

1.2.1 Lowland calcareous grassland is an important habitat for a number of priority invertebrate, plant and birds. During plan implementation their requirements should be taken into account. The priority species include: leaf beetles *Cryptocephalus* sp., Northern brown argus *Aricia artaxerxes*, silver spotted skipper *Hesperia comma*, Adonis blue *Lysandra bellargus*, wart-biter grasshopper *Decticus verrucivorus*, a hover fly *Doros profuges*, several moths including the bordered gothic *Heliophobus reticulata*, pale shining brown *Polia bombycina* and the four spotted *Tyta luctuosa* and the prickly sedge *Carex muricata* ssp. *muricata* and the early gentian *Gentianella anglica* ssp. *anglica*.

2. Current factors affecting the habitat

2.1 The factors currently affecting calcareous grassland reduce the quality and quantity of the habitat, and its fragmentation brings increased risk of species extinctions in the small remnant areas. For example a survey of the Lincolnshire Wolds found that 66% of sites were less than 1 ha in size and none was more than 10 ha in size. The factors include:

2.1.1 Agricultural intensification by use of fertilisers, herbicides and other pesticides, re-seeding or ploughing for arable crops.

2.1.2 Farm specialisation towards arable cropping has reduced the availability of livestock in many lowland areas. The result is the increasing dominance of coarse grasses such as tor grass *Brachypodium pinnatum* and false oat grass *Arrhenatherum elatius* and invasion by scrub and woodland, leading to losses of calcareous grassland flora and fauna.

2.1.3 Over-grazing is a less widespread problem, and is sometimes associated with supplementary feeding, which can also cause localised sward damage, due to trampling and long-term nutrient enrichment.

2.1.4 Development activities such as mineral and rock extraction, road building, housing and landfill.

2.1.5 Localised afforestation with hardwoods and softwoods.

2.1.6 Recreational pressure bringing about floristic changes associated with soil compaction at some key sites.

2.1.7 Invasion by non-native plants, including bird-sown *Cotoneaster* species, causes problems by smothering calcareous grassland communities at some sites.

- 2.1.8 Atmospheric pollution and climate change, the influence of which is not fully assessed.

3. Current action

3.1 Legal Status

3.1.1 Lowland calcareous grassland features prominently in the SSSI series in England and Wales. There are 616 SSSIs in England which have the habitat as a principal reason for notification and 22 in Wales with a further 16 here including the habitat among several of interest. Comprehensive information on the amount of the resource included within SSSIs is not available but is estimated to be between 60% to 70% in both England and Wales.

3.1.2 The value of the habitat has long been recognised in the NNR series, with 28 containing calcareous grassland in England and two in Wales, including Parsonage Down (Wiltshire), the Derbyshire Dales, Barnack Hills and Holes (Cambridgeshire), and the Gower Coast. Several sites are Local Nature Reserves including Great Orme's Head (Conwy), Hackhurst Downs (Surrey) and Galley and Warden Hills (Bedfordshire). Several key sites are designated as common land, e.g. Rodborough Common (Gloucestershire).

3.1.3 Lowland calcareous grassland is included within the *Festuco-Brometalia* grassland identified in Annex 1 of the EC Habitats Directive as of Community interest. The habitat is a priority type if important orchid populations are present. Lowland calcareous grassland sites will form part of the Natura 2000 network. Species listed on Annex II of the Directive which occur in the habitat are early gentian *Gentianella anglica*, marsh fritillary *Eurodryas aurinia*, and large blue *Maculinea arion*. European Special Protection Areas for Birds include two important calcareous grasslands, Porton Down and Salisbury Plain.

3.1.4 Several plant, invertebrate and bird species of calcareous grassland are protected under the Schedules of the Wildlife and Countryside Act 1981.

3.2 Management, research and guidance

3.2.1 Management agreements to conserve calcareous grassland on SSSIs have been made between owners and occupiers and EN or CCW. Agri-environment schemes play a major role in providing incentives to encourage the appropriate management of sites, including SSSIs (where a management agreement is not already in place). ESAs with a significant component of lowland calcareous grassland include Breckland, the South Downs, the South Wessex Downs and the Cotswold Hills. The Countryside Stewardship Scheme in England and Tir Cymen and the Habitat Scheme in Wales (which will be replaced in 1999 by the new all Wales agri-environment scheme Tir Gofal) also include calcareous grassland as an eligible habitat.

3.2.2 The Ministry of Defence is by far the largest landowner (by area) of calcareous grassland with several sites including very large areas on Salisbury Plain, the Stanford Training Area and Porton Down. The MoD is developing integrated management plans for their properties to take account of nature conservation.

3.2.3 A major contribution has been made by various non-governmental organisations to the conservation of species-rich calcareous grasslands in parts of the UK through the establishment of nature reserves.

3.2.4 Techniques for calcareous grassland creation are currently being researched and the impact of climate change monitored on calcareous grassland through a DETR project. MAFF is sponsoring research on reversion of arable to calcareous grassland in relation to ESA prescriptions. Long term monitoring of change at Porton Down and Wytham Woods as part of the Environmental Change Network is also relevant.

3.2.5 There is a need to assess the impact of atmospheric nutrient deposition and climate change in this and other types of lowland grassland.

4. Action plan objectives and proposed targets

4.1 The objectives and targets cover habitat conservation, restoration and expansion. Key components are the need to secure favourable conservation and, where necessary, restoration management at SSSIs and other significant localities, and also to develop carefully researched guidelines to restore and expand the habitat. The quantified cover target advanced for trial habitat expansion at this stage is a judgement based on current but incomplete information; development of more far-reaching targets, pending further investigation, is a key element of the action plan programme. Similar elements have been incorporated in each of the four action plans for dry lowland grasslands (covering lowland and upland hay meadows, lowland calcareous grasslands and lowland acid grasslands).

4.1.1 Arrest the depletion of unimproved lowland calcareous grassland throughout the UK.

4.1.2 Within SSSIs, initiate rehabilitation management for all significant stands of unimproved lowland calcareous grassland in unfavourable conservation by 2005, with the aim of achieving favourable status wherever feasible by 2010.

4.1.3 For stands at other localities, secure favourable condition over 30% of the resource by 2005, and as near to 100% as is practicable by 2015.

4.1.4 Attempt to re-establish 1000 ha of lowland calcareous grassland of wildlife value at carefully targeted sites by 2010.

5. Proposed action with lead agencies

5.1 Policy and legislation

5.1.1 Take account of the conservation requirements of calcareous grassland when developing and adjusting agri-environment schemes. Design measures to suit local needs and in particular target local concentrations of semi-natural calcareous grassland. (Action: CCW, EN, MAFF, WOAD)

5.1.2 Develop and implement strategies to restore and expand the cover of unimproved calcareous grassland, taking into account the need to ameliorate the negative effects of isolation, fragmentation, small patch size and scrub encroachment. (Action: CCW, EN, MAFF, WOAD)

5.1.3 Support initiatives to conserve unimproved calcareous grassland within local government development plans and related policy, in forest management and planting schemes and by special projects. (Action: EA, DETR, FC, LAs, WO)

5.1.4 Consider mechanisms by which lowland calcareous grassland within areas designated as common land can be brought under sympathetic management. (Action: DETR, MAFF, WOAD)

5.2 Site safeguard and management

5.2.1 Keep the extent of SSSI coverage under review and notify further sites as necessary to fill significant gaps in coverage. (Action: CCW, EN)

5.2.2 Complete the designation of lowland calcareous grassland SPAs and SACs and prepare and implement management plans by 2004. (Action: CCW, DETR, EN, JNCC)

5.2.3 Secure the uptake of positive management with owners and occupiers of SSSIs where necessary to achieve favourable conservation conditions, and promote the uptake of such agreements on other wildlife sites. (Action: CCW, EN)

5.2.4 Secure the positive management of lowland calcareous grassland sites within the ownership or management of the Ministry of Defence and voluntary conservation bodies, and draw up site management plans with clear targets for this habitat and associated priority species for these sites by 2004. (Action: EN, MoD)

5.2.5 Consider the need to manage further key sites as National Nature Reserves and, where appropriate, support acquisition and management by conservation organisations. (Action: CCW, EN)

5.2.6 Encourage the development of new management techniques where required, e.g. for weed control, and the setting up of local farm networks, e.g. for livestock provision, that will ensure sympathetic management is possible. (Action: CCW, EN, JNCC, MAFF, WOAD)

5.2.7 Contribute to the implementation of relevant species action plans for rare and declining species associated with lowland calcareous grasslands in conjunction with the relevant species steering group. (Action: CCW, EN, MAFF, WOAD)

5.3 Advisory

5.3.1 Encourage, develop and disseminate best practice for unimproved calcareous grassland management, in particular the integration of conservation management into agricultural practice. (Action: CCW, EN, LAs, MAFF, WOAD)

5.3.2 Produce and disseminate guidelines for appropriate methods and approaches to establish new stands of lowland calcareous grassland of wildlife value. (Action: CCW, EN)

5.3.3 Encourage the use and establishment of private and public demonstration sites, with special linkage to agri-environment schemes. (Action: CCW, EN, MAFF, WOAD)

5.4 International

5.4.1 Promote conservation and management of Special Areas of Conservation as part of a European network. (Action: CCW, EN, JNCC)

5.4.2 Recommend favourable measures for unimproved calcareous grassland conservation during future negotiations in Europe to revise the Common Agricultural Policy. (Action: DETR, SOAEFD, WOAD)

5.4.3 Review representation of lowland calcareous grasslands in other European countries to determine their extent and status so that the international status of the UK resource can be determined. (Action: CCW, EN, JNCC)

5.4.4 Participate in initiatives to develop and strengthen measures for conservation of the habitat in Europe and elsewhere. (Action: CCW, DETR, EN, JNCC, MAFF, WO, WOAD)

5.4.5 Disseminate information about the UK's experience in conservation of the resource in international literature and conferences and take opportunities to learn from colleagues in Europe and elsewhere. (Action: CCW, DETR, EN, JNCC, MAFF, WO, WOAD)

5.5 Monitoring and research

5.5.1 Contribute information to a World Wide Web based catalogue of survey information as a means of improving access to information on lowland calcareous grasslands. (Action: CCW, EN)

5.5.2 Undertake vegetation survey and assessment of unimproved calcareous grasslands in parts of UK with poor survey coverage, using standardised and repeatable methodology. (Action: CCW, EHS, EN)

5.5.3 Formulate quantified and spatially referenced targets to expand the total cover of lowland calcareous grassland of wildlife value across the UK, with particular emphasis on amelioration of habitat fragmentation, by 2005. (Action: CCW, EN)

5.5.4 Review research needs into the conservation and restoration management of the habitat and the integration of this with agriculture, to identify significant gaps in knowledge. Commission and undertake new research as appropriate. (Action: CCW, EN, FC, JNCC, MAFF, WOAD)

5.5.5 Commission and support research on establishment and expansion of species-rich calcareous grassland, covering methodology and landscape ecological components. (Action: CCW, EN, FC, JNCC, MAFF, WOAD)

5.5.6 Encourage and support conservation studies on scarce animal and plant taxa associated with unimproved calcareous grasslands with particular relevance to amelioration of damaging impacts from habitat depletion and fragmentation. (Action: CCW, EN, JNCC)

5.5.7 Evaluate the need for impact assessment of the effect of atmospheric nutrient deposition and climate change on community composition, and commission research as appropriate. (Action: CCW, EA, EN, JNCC)

5.5.8 Develop and implement appropriate surveillance and monitoring programmes to assess progress towards action plan targets. (Action: CCW, EN, JNCC, MAFF, SNH, SOAEFD)

5.5.9 Commission marketing studies into ways to promote agricultural products from lowland calcareous grassland. (Action: MAFF, WOAD)

5.6 Communications and publicity

- 5.6.1 Seek opportunities to present lowland grassland conservation in the scientific press and the popular media. (Action: CCW, EN, JNCC)
- 5.6.2 Encourage appropriate public access for observation and enjoyment of lowland calcareous grassland. (Action: CCW, EN)

6. Costings

- 6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the habitat, primarily through agri-environment schemes and grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.
- 6.2 Since Countryside Stewardship does not differentiate between upland and lowland calcareous grassland the figure presented for current expenditure is a proportion of the total expenditure equivalent to the area of lowland as compared to upland calcareous grassland.

7. Key references

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Costings for lowland calcareous grassland

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	2305.9		
Total average annual cost / £000/Yr		1234.1	1395.6
Total expenditure to 2004/ £000		6170.5	
Total expenditure 2004 to 2014/ £000			13956.0

Lowland wood-pasture and parkland

A Habitat Action Plan

1. Current status

1.1 Biological status

1.1.1 Lowland wood-pastures and parkland are the products of historic land management systems, and represent a vegetation structure rather than being a particular plant community. Typically this structure consists of large, open-grown or high forest trees (often pollards) at various densities, in a matrix of grazed grassland, heathland and/or woodland floras.

1.1.2 There are no reliable statistics on the extent of the overall resource, nor on historical and current rates of loss or degradation of this type of habitat. The figure of 10-20,000 ha "currently in a working condition" given in the 'habitat statement' of the UK Biodiversity Steering Group report is the current best estimate. This habitat is most common in southern Britain, but scattered examples occur throughout the country for example Hamilton High Parks and Dalkeith Oakwood in Scotland. Outgrown wood-pasture and mature high forest remnants ('virgin forests') occur in northern and central Europe, but the number and continuity of ancient (veteran) trees with their associated distinctive saproxylic (wood-eating) fauna and epiphytic flora are more abundant in Britain than elsewhere. Parklands and wood-pasture may also be of interest for bats and birds and may preserve indigenous tree genotypes. These areas are outstanding at a European level.

1.1.3 These sites are frequently of national historic, cultural and landscape importance. Some, but not all, of the individual habitat components (lowland beech and yew woodland, lowland heathland, lowland dry acid grassland) are biodiversity action plan priority habitats in their own right. Requirements of these plans will need to be given due regard during implementation.

1.1.4 Included in this plan are:

- i. Lowland wood-pastures and parklands derived from medieval forests and emparkments, wooded commons, parks and pastures with trees in them. Some have subsequently had a designed landscape superimposed in the 16th to 19th centuries. A range of native species usually predominates amongst the old trees but there may be non-native species which have been planted or regenerated naturally.
- ii. Parklands with their origins in the 19th century or later where they contain much older trees derived from an earlier landscape.
- iii. Under-managed and unmanaged wood-pastures with veteran trees, in a matrix of secondary woodland or scrub that has developed by regeneration and/or planting.
- iv. Parkland or wood-pasture that has been converted to other land uses such as arable fields, forestry and amenity land, but where surviving veteran trees are of nature conservation interest. Some of the characteristic wood-pasture and parkland species may have survived this change in state.

1.1.5 Not included in this plan are:

- i. Upland sheep-grazed closed-canopy oak woodland or Caledonian pine forest (see the respective plans for these habitats).
- ii. Parklands with 19th century origins or later with none of the above characteristics.

1.1.6 In terms of the National Vegetation Classification (NVC) of plant communities lowland wood-pastures and parkland are most commonly associated with W10 *Quercus robur* - *Pteridium aquilinum* - *Rubus fruticosus* woodland, W14 *Fagus sylvatica* - *Rubus fruticosus* woodland, W15 *Fagus sylvatica* - *Deschampsia flexuosa* woodland and W16 *Quercus* spp. - *Betula* spp.-*Deschampsia flexuosa* woodland, although others may occur. In addition the more open wood-pastures and parkland may include various scrub, heathland, improved and unimproved grassland NVC communities.

1.2 Links with species action plans

1.2.1 Lowland wood-pasture and parkland is an important habitat for a number of priority species including violet click beetle *Limoniscus violaceus*, the stag beetle *Lucanus cervus*, a bark beetle *Emoporus tiliae*, a wood boring beetle *Gastrallus immarginatus*, orange-fruited elm lichen *Caloplaca luteoalba*, the lichens *Bacidia incompta*, *Enterographa sorediata* and *Schismatomma graphidioides*, the royal bolete fungi *Boletus regius*, oak polypore *Buglossoporus pulvinus* and the heart moth *Dicycla oo*. Their requirements should also be taken into account in the implementation of this plan. Other rare species include Moccas beetle *Hypebaeus flavipes*, and the lichen the New Forest parmelia *Parmelia minarium*.

2. Current factors affecting the habitat

- 2.1 Lack of younger generations of trees is producing a skewed age structure, leading to breaks in continuity of dead wood habitat and loss of specialised dependent species.
- 2.2 Neglect, and loss of expertise of traditional tree management techniques (e.g. pollarding) leading to trees collapsing or being felled for safety reasons.
- 2.3 Loss of veteran trees through disease (e.g. Dutch elm disease, oak dieback), physiological stress, such as drought and storm damage, and competition for resources with surrounding younger trees.
- 2.4 Removal of veteran trees and dead wood through perceptions of safety and tidiness where sites have high amenity use, forest hygiene, the supply of firewood or vandalism.
- 2.5 Damage to trees and roots from soil compaction and erosion caused by trampling by livestock and people and car parking.
- 2.6 Changes to ground-water levels leading to water stress and tree death, resulting from abstraction, drainage, neighbouring development, roads, prolonged drought and climate change.
- 2.7 Isolation and fragmentation of the remaining parklands and wood-pasture sites in the landscape. (Many of the species dependent on old trees are unable to move

between these sites due to their poor powers of dispersal and the increasing distances they need to travel).

- 2.8 Pasture loss through conversion to arable and other land-uses.
- 2.9 Pasture improvement through reseedling, deep ploughing, fertiliser and other chemical treatments, leading variously to tree root damage, loss of nectar-bearing plants, damage to the soil and epiphytes.
- 2.10 Inappropriate grazing levels: under-grazing leading to loss of habitat structure through bracken and scrub invasion; and over-grazing leading to bark browsing, soil compaction and loss of nectar plants.
- 2.11 Pollution derived either remotely from industry and traffic, or locally from agro-chemical application and nitrogen enrichment from pasture overstocking, causing damage to epiphyte communities and changes to soils.

3. Current action

3.1 Legal Status

- 3.1.1 For any woodland component of parkland and wood-pasture, national forestry policy includes a presumption against clearance of broad-leaved woodland for conversion to other land uses, and in particular seeks to maintain the special interest of ancient semi-natural woodland. Individual trees and groups may be afforded protection under the Town and Country Planning Act, 1990 and the Forestry Act, 1967. Felling licences from the Forestry Authority (FA) are normally required but veteran trees may be particularly at risk because fellings for safety reasons are exempt.
- 3.1.2 Statutory site protection plays an important part in the conservation of this habitat type. Designation as Sites of Special Scientific Interest (SSSI), or as Areas of Special Scientific Interest (ASSI) (Northern Ireland), of most larger areas of wood-pasture and parkland and most of the better-known sites of significance for invertebrates and lichens, ensures compulsory consultation with the statutory nature conservation agencies over management operations and development proposals. Designation under the EC Habitats Directive as Special Areas for Conservation will give additional protection to some parkland and wood-pasture sites. Some sites, including Moccas Park, Duncombe Park, Burnham Beeches, Leigh Woods, Hatfield Forest, parts of Bredon Hill, and Ashstead Common are also protected by National Nature Reserve (NNR) agreements.
- 3.1.3 Other sites receive some protection through initiatives such as the Inheritance Tax Exemption scheme or the declaration of National Trust and Corporation of London land properties as inalienable land. A few sites have specific legislation to protect them such as the Epping Forest Act of 1878.
- 3.1.4 The Moccas beetle *Hypebaeus flavipes*, violet click beetle *Limonicus violaceus* and the orange-fruited elm lichen *Caloplaca luteoalba* and New Forest parmelia *Parmelia minarium* (all confined to parkland or wood-pasture) are fully protected under the 1981 Wildlife and Countryside Act, as are all species of bat and most tree-hole nesting birds. This Act also offers some protection to their "place of shelter".

- 3.1.5 There is recognition of the value of the habitat and individual old trees in various development plans, and landscape designations (e.g. by English Heritage, and CADW: Welsh Historic Monuments).

3.2 Management, research and guidance

- 3.2.1 There are a number of significant but currently uncoordinated inventories, datasets and registers of lowland wood-pasture and parkland. These include the Nature Conservancy Council's 1970s survey of parklands and wood-pastures of importance for the 'Mature Timber Habitat'; the Forestry Commission's National Inventory of Woodlands and Trees; The National Trust (NT) biological survey of NT-owned parkland and wood-pasture sites and English Nature's parkland inventory pilot study (1995) for Norfolk and Bedfordshire. English Heritage also has a register of parks and gardens which is being upgraded between 1997 and 2000, and similar data for Wales is held by CADW: Welsh Historic Monuments. Scottish Natural Heritage maintains an inventory of Gardens and designed landscapes in Scotland. There is also an Inventory of Historic Parks and Gardens, based at University of York, which contains information on historically important sites and County Historic Gardens Trust data.
- 3.2.2 Surveys of saproxylic invertebrates and lichens have also been undertaken. These include the Countryside Council for Wales's strategic survey of Welsh parklands; K.N.A. Alexander's (National Trust) personal dataset on saproxylic beetle sites and the JNCC's Lower Plants and Invertebrate Site Registers. The British Lichen Society also maintains a database for parkland and wood-pasture.
- 3.2.3 Grant aid may be available for the management and restoration of parkland. The key sources of this aid include agri-environment schemes such as MAFF's Countryside Stewardship Scheme and the Countryside Council for Wales' Tir Cymen (which will be incorporated into an all-Wales Agri-environment scheme known as Tir Gofal in 1999) includes a scheme for Historic Landscapes and old orchards. Both of these schemes assist in the production of management plans, tree and grassland management and restoration of arable land to parkland. Other agri-environment schemes such as Environmentally Sensitive Areas (ESAs) and the Habitat Scheme (Wales) may subsidise the management or restoration of grassland and tree planting, and provide some protection for existing trees. The Forestry Authority's Woodland Grant Scheme is available for woodland with over 20% canopy cover.
- 3.2.4 The Veteran trees Initiative, launched in 1996, aims to promote the value and importance of veteran trees and to conserve them wherever possible. This initiative is the result of a partnership between English Nature, English Heritage, the National Trust, Countryside Commission, Forest Authority, FRCA, Corporation of London and the Ancient Tree Forum. The initiative is developing a database for recording veteran trees, and provides advice on their management. It runs a national programme of demonstration and training days, and produces publications.
- 3.2.5 English Heritage's Conservation Area Partnerships, Scheduled Monuments and outstanding registered parklands initiative may also provide grant-aid and some Local Authority schemes, such as the Essex County

Council's historic landscapes designation may also provide funding for management. The Countryside Council for Wales' "Orchards and Parklands Tree Scheme" grant aids management and restoration of parklands in Wales.

- 3.2.6 EC *Life* funding has also been awarded for management of the New Forest.
- 3.2.7 There is a wealth of information available from the Forestry Authority and other organisations and publications regarding all aspects of ancient woodland management. These include advice given locally through the statutory conservation agencies, the Farming and Wildlife Advisory Group, ADAS, the Countryside Advice and Information Service (Wales). The Forestry Commission's Arboricultural Advisory Service and English Heritage's Parks & Garden's Team of historians, landscape managers, ecologist and arboriculturalists can offer advice. The Ancient Tree Forum, an association of land managers, ecologists and arboriculturalists, provides advice, as do the voluntary and commercial sectors. The UK Forestry Standard and the Forestry Authority Guidelines for the management of semi-natural woodlands should be followed.
- 3.2.8 The British Lichen Society have produced a habitat management guide for lichens, including parklands and wood-pastures.

4. Action plan objectives and proposed targets

- 4.1 The objectives and targets cover habitat conservation, restoration and expansion. Key components include the need to secure favourable condition of key sites and, at appropriately targeted areas, to restore management or expand the habitat.
 - 4.1.1 Protect and maintain the current extent (10-20,000ha) and distribution of lowland wood-pasture and parkland in a favourable ecological condition.
 - 4.1.2 Initiate in areas where examples of derelict wood-pasture and parkland occur a programme to restore 2,500ha to favourable ecological condition by 2010.
 - 4.1.3 By 2002 initiate the expansion of 500ha of wood-pasture or parkland, in appropriate areas, to help reverse fragmentation and reduce the generation gap between veteran trees.

5. Proposed action with lead agencies

5.1 Policy and legislation

- 5.1.1 Implement the conclusions of the 1994 review of Tree Preservation Orders (TPO), including amendments to the Town and Country Planning Act 1990, to offer appropriate protection to veteran/dead trees. (Action: DETR)
- 5.1.2 Examine felling consent/licensing policy to consider whether additional protection for parkland, wood-pasture and individual veteran trees is needed. (Action: FA)
- 5.1.3 Examine whether improvements should be made in safety legislation, with respect to liability on owners in the event of injury or damage resulting from old trees, and its interpretation to reduce any unnecessary felling of trees on safety grounds. (Action: DETR, FA)

5.1.4 If Annex I of the EC Habitats Directive is revised ensure that it provides adequate coverage of UK parklands and wood-pasture habitats and species assemblages. (Action: DETR, JNCC)

5.1.5 When reviewing existing incentive schemes (e.g. Countryside Stewardship, Woodland Grant Scheme/ Woodland Improvement Grants, ESAs, Coed Cymru) attempt to ensure they enable and encourage the most appropriate management of parklands and wood-pasture, with their ancient trees. (Action: CCW, EN, FA, MAFF, SNH, SOAEFD, WOAD)

5.1.6 Promote modification of the Common Agricultural Policy to recognise and promote extensive pastoral systems, including wood-pasture. (Action: CCW, DETR, EN, MAFF, SNH, SOAEFD, WOAD).

5.1.7 Provide specific guidance about parklands, wood-pasture and individual veteran trees in Planning Policy Guidance notes (PPGs) by 2001. (Action: DETR, SNH, SOAEFD)

5.1.8 Review policy and practice regarding fencing of registered commons to allow reinstatement or control of grazing in wood-pasture commons, but without impediment to access by 2001. (Action: CC, DETR, FA, FE)

5.2 Site and safeguard and management

5.2.1 Ensure that SSSI coverage of important lowland wood-pasture and parkland sites is adequate through periodic review of the series. (Action: CCW, DETR, EN, SNH, SOAEFD, WO)

5.2.2 By 2004 designate those lowland wood-pasture sites approved by the EC as SACs under the Habitats Directive. (Action: CCW, DETR, EN, JNCC, SNH, SOAEFD, WO)

5.2.3 Encourage applications to buy and manage appropriate sites from potential funding sources. (Action: CC, CCW, EH, EN, SNH)

5.2.4 Encourage the development and implementation by 2004 of long-term integrated management plans for conservation and use of parklands and wood-pastures through agreements with site owners and in partnership with statutory wildlife, landscape and heritage agencies. (Action: CC, CCW, EN, FA, MAFF, SNH, SOAEFD, WOAD)

5.2.5 Promote re-establishment of grazing where appropriate in derelict wood-pasture and encourage the development of subsequent generations of veteran trees in all sites. (Action: CCW, EN, MAFF, SNH, SOAEFD, WOAD)

5.2.6 Promote the restoration of wood-pasture and parkland where old trees remain in former sites that are now arable fields or forestry plantations. (Action: CCW, FE, MAFF, WOAD)

5.2.7 By 2002 initiate programmes to expand parklands and wood-pasture sites in targeted areas. (Action: CC, CCW, EH, EN, FA, SNH)

5.2.8 Contribute to the implementation of relevant priority species action plans, through the integration of management requirements and advice, in conjunction with relevant steering groups. (Action: CCW, EN, MAFF, SNH, SOAEFD, WO)

- 5.2.9 Consider (re)establishment of key species dependent on veteran trees via translocation. (Action: CCW, EN, FA, FE, SNH)

5.3 Advisory

- 5.3.1 Develop a handbook(s) on best practice in management of parklands and wood-pasture in relation to wildlife, heritage and landscape conservation. (Action: CCW, DETR, EN, FA, SNH)
- 5.3.2 Develop clear guidance on safety-related risk assessment and reasonable practice, in conjunction with relevant landowners and management groups. (Action: DETR, FA).
- 5.3.3 Encourage training in best practice in park and wood-pasture management for site owners, site managers, land-agents, foresters, arboriculturalists and also for advisors and incentive scheme managers. (Action: CCW, EN, FA, MAFF, SNH)

5.4 International

- 5.4.1 Develop links with European organisations and programmes, such as the European Forestry Institute, the European Environment Agency and the European Centre for Nature Conservation to obtain estimates of the extent and distribution of comparable and related habitats, and exchange experience on research and management, by 2000. (Action: CCW, EN, FA, JNCC, SNH)

5.5 Monitoring and research

- 5.5.1 Produce a comprehensive list of all parkland and wood-pasture sites with pointers to other data sources and evaluations relating to both the natural and cultural heritage of each site, by 2002. Make this information available, through a data catalogue linked to the National Biodiversity Network. (Action: CC, CCW, EHS, EN, JNCC, SNH)
- 5.5.2 Develop and implement methods to assess the condition of wood-pastures and parkland by 2000 and encourage standardised recording and monitoring of tree population age structure, survivorship and condition at key sites across the country in order to identify site specific and general trends. (Action: CCW, EHS, EN, FC, SNH)
- 5.5.3 Undertake a programme of targeted surveys of the biological interest of sites where lack of information is impeding their appropriate management, by 2005.
- 5.5.4 Ensure veteran tree recording is reflected in SSSI and Wildlife Site reporting and is input, as it becomes available, into local record centres as part of the National Biodiversity Network initiative. (Action: CCW, EN, FC, JNCC, SNH)
- 5.5.5 Develop and implement appropriate surveillance and monitoring programmes to assess progress towards action plan targets. (Action: CCW, EN, JNCC, SNH)
- 5.5.6 Encourage research into parkland and wood-pasture flora, including trees, and fauna in relation to tree and pasture management, including interactions and with invertebrates, fungi, soils, ground water levels and grazing animals and population dynamic studies. Ensure such research is co-ordinated with cultural heritage research. (Action: CCW, EH, EN, FC, SNH)

5.6 Communications and publicity

- 5.6.1 Increase awareness of the national and international importance and vulnerability of wood-pasture and parklands by promotional literature and events and encourage celebration of parkland and wood-pastures via the arts and media. (Action: CCW, EH, EN, SNH)
- 5.6.2 Increase awareness of the value in protecting veteran trees where these may be threatened by felling, for safety reasons, and promote alternative solutions such as pollarding or tree surgery. (Action: CCW, EHS, EN, FA, LA, SNH)

6. Costings

- 6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the habitat, primarily through agri-environment schemes and grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.
- 6.2 Current expenditure for the Woodland Grant Scheme has not been included as it was not possible to allocate expenditure to different woodland habitat types. It is estimated that 65-75% of the costs shown are additional to the current expenditure.

7. Key references

- Department of the Environment Transport and the Regions 1998. *Tree Preservation Orders Draft Regulations: a consultation paper*. DETR, London.
- Forestry Authority 1994. *Forestry Practice Guides: The management of semi-natural woodlands*. Edinburgh, Forestry Authority.
- Forestry Authority & Department of Agriculture for Northern Ireland 1998. *The UK Forestry Standard: the Government's approach to sustainable forestry*. Forestry Commission, Edinburgh.
- Harding, P.T. & Rose, F. 1986. *Pasture woodland in lowland England*. Huntingdon: Institute of Terrestrial Ecology.
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- Peterken, G.F. 1981. *Woodland conservation and management*. London, Chapman & Hall.
- Ratcliffe, D.A. 1977. *A nature conservation review*. Cambridge, Cambridge University Press.
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Costings for lowland wood-pasture and parkland

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	457.5		
Total average annual cost / £000/Yr		674.6	429.7
Total expenditure to 2004/ £000		3373.0	
Total expenditure 2004 to 2014/ £000			4297.4

Wet woodland

A Habitat Action Plan

1. Current status

1.1 Biological status

1.1.1 Wet woodland occurs on poorly drained or seasonally wet soils, usually with alder, birch and willows as the predominant tree species, but sometimes including ash, oak, pine and beech on the drier riparian areas. It is found on floodplains, as successional habitat on fens, mires and bogs, along streams and hill-side flushes, and in peaty hollows. These woodlands occur on a range of soil types including nutrient-rich mineral and acid, nutrient-poor organic ones. The boundaries with dryland woodland may be sharp or gradual and may (but not always) change with time through succession, depending on the hydrological conditions and the treatment of the wood and its surrounding land. Therefore wet woods frequently occur in mosaic with other woodland key habitat types (e.g. with upland mixed ash or oakwoods) and with open key habitats such as fens. Management of individual sites needs to consider both sets of requirements.

1.1.2 In terms of National Vegetation Classification (NVC) plant communities this habitat is characterised by W1 *Salix cinerea* - *Galium palustre* woodland, W2 *Salix cinerea* - *Betula pubescens* - *Phragmites australis* woodland, W3 *Salix pentandra* - *Carex rostrata* woodland, W4c *Betula pubescens* - *Molinia caerulea* woodland: *Sphagnum* sub-community, W5 *Alnus glutinosa* - *Carex paniculata* woodland, W6 *Alnus glutinosa* - *Urtica dioica* woodland, and W7 *Alnus glutinosa* - *Fraxinus excelsior* - *Lysimachia nemorum* woodland. Some birch stands classified as W4 are relatively dry and in management terms better treated alongside other extensive birch stands. As a provisional division, sub-communities W4a and W4b are better associated with Upland/Northern Birchwoods. Just as small wet woodland patches may be treated as part of a dry land mosaic, so dry land fringes of predominantly wet woodland areas are linked with the accompanying wet woodland. Wet flood plain forests of ash, elm and oak, lacking alder, are most likely to fall into W8 *Fraxinus excelsior* - *Acer campestre* - *Mercurialis perennis* woodland.

1.1.3 Many alder woods are ancient and have a long history of coppice management which has determined their structure, and in some situations it appears that this practice has maintained alder as the dominant species and impeded succession to drier woodland communities. Other wet woodland may have developed through natural succession on open wetlands (sometimes following cessation of active management) and structurally are little influenced by direct forestry treatments.

1.1.4 Notable concentrations of wet woodland on fens occur in East Anglia, Shropshire and Cheshire, while hill-side and plateau alder woods are more restricted to Wales, Cumbria and western Scotland. Fragments of ancient floodplain forest are rare, and the best examples are probably in the New Forest and northern Scotland. Bog woodlands of pine on bog are confined to Scotland, but fragments of birch bog woodland occur more widely in scattered stands across the UK.

1.1.5 Some wet woods include habitats identified under Annex 1 of the EC Habitats Directive, for example Residual alluvial forests and Bog Woodland.

1.1.6 There are no precise data on the total extent of wet woodland in the UK, but in the late 1980s the Nature Conservancy Council estimated the total extent of this type in ancient semi-natural woodland to be about 25,000 - 30,000 ha. The area of recent wet woodland may be at least as large again. Thus a crude estimate of the total wet woodland area in the UK is 50,000 - 70,000 ha.

1.1.7 Wet woodland combines elements of many other ecosystems and as such is important for many taxa. The high humidity favours bryophyte growth. The number of invertebrates associated with alder, birch and willows, is very large, although some are now confined to just a few sites, for example the biodiversity priority species beetles *Melanopion minimum* and *Rhynchaenus testaceus*. Even quite small seepages may support crane-flies such as *Lipsothrix errans* and the endemic *Lipsothrix nervosa*. Dead wood within the sites can be frequent, and its association with water provides specialised habitats not found in dry woodland types - the fly *Lipsothrix nigrisigma* for example is associated with log jams in streams. Wet woodland provides cover and breeding sites for otters *Lutra lutra*. While few rare plant species depend on wet woodland *per se*, there may be relict species from the former open wetlands on the site such as the marsh fern *Thelypteris palustris*.

1.2 Links with species action plans

1.2.1 Wet woodland is an important habitat for a number of priority species including otter *Lutra lutra*, the weevils *Melanopion minimum* and *Rhynchaenus testaceus*, the crane-flies *Lipsothrix eucullata*, *L. nervosa*, *L. errans* and *L. nigrisigma* and the netted carpet moth *Eustromia reticulata*. Their requirements should also be taken into account in the implementation of the plan.

2. Current factors affecting the habitat

2.1 Wet woodland is affected by the following factors that impact directly or indirectly upon its current condition and dynamics:

2.1.1 Clearance and conversion to other land-uses, particularly in woods recently established on wetland sites.

2.1.2 Cessation of management in formerly coppiced sites may encourage succession to drier woodland types.

2.1.3 Lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types.

2.1.4 Inappropriate grazing levels and poaching of the soil by sheep, cattle and deer leading to a change in the woodland structure, ground flora impoverishment and difficulties for regeneration.

2.1.5 Flood prevention measures, river control and canalization, leading to loss of dynamic disturbance-succession systems and invertebrate communities, as well as possible reductions in the extent of individual sites.

- 2.1.6 Constraints on the spread of woodland from conservation sites onto adjacent ground from agriculture, industrial or residential development, leading to greater uniformity of structure across the site.
- 2.1.7 Poor water quality arising from eutrophication, industrial effluents or rubbish dumping leading to changes in the composition of the ground flora and invertebrate communities.
- 2.1.8 Invasion by non-native species which alter vegetation composition and lower conservation value (e.g. Indian balsam *Impatiens glandulifera*); air pollution which may influence particularly bryophyte and lichen communities; and diseases such as *Phytophthora* root disease of alder.
- 2.1.9 Climate change, potentially resulting in changes in the vegetation communities.

3. Current action

3.1 Legal status

- 3.1.1 Statutory site protection plays an important part in the conservation of this habitat type. Designation as Sites of Special Scientific Interest (SSSI) or as Areas of Special Scientific Interest (ASSI) (Northern Ireland) of about 5-10% of the more important areas of wet woodland ensures compulsory consultation with the statutory nature conservation agencies over management operations and development proposals. Some wet woods that include habitats identified under Annex 1 of the EC Habitats Directive, for example Residual alluvial forests and Bog Woodland have also been proposed as Special Areas of Conservation (SACs).
- 3.1.2 Other important sites receive protection through the Inheritance Tax Exemption scheme and National Trust properties can be declared to be inalienable land.
- 3.1.3 National forestry policy includes a presumption against clearance of broad-leaved woodland for conversion to other land uses, and in particular seeks to maintain the special interest of ancient semi-natural woodland. Felling licences from the Forestry Authority (FA) are normally required if the woods are not managed under plans approved by them. Relevant hydrological policy issues include water level management plans, and impoundment licences and consents for abstraction and land drainage issued by the Environment Agencies.
- 3.1.4 Some woods may receive additional protection through policies and strategies within development plans, through National Park Management plans or by being subject to Tree Preservation Orders.

3.2 Management, research and guidance

- 3.2.1 There are a number of significant inventories on woodlands available, including the Forestry Authority's National Inventory of Woodland and Trees (NIWT), initiated in 1995, which provides information on the extent, distribution and composition of woodland in the whole of GB. Information on woodland type and management is also collected as part of the FA's Woodland Grant Scheme (WGS), documentation through local woodland management initiatives or information held on the Forest Enterprise compartment database. The country conservation agencies also hold relevant information in Ancient Woodland Inventories as well as information from individual surveys of statutory protected sites.

- 3.2.2 Other relevant information is gathered by the Environment Agency through surveys and monitoring of rivers and water quality; Local Authority and non-governmental organisation site and species survey and monitoring programmes; and local and national recording schemes and centres covering relevant species and sites.

- 3.2.3 All woodland is expected to be managed according to the UK Forestry Standard.

- 3.2.4 Grants for, and advice on, management, including regeneration, planting and some other operations, are available from FA and in some circumstances from other government agencies and local authorities (including the national park authorities). Some Environmentally Sensitive Areas and the Habitat Scheme in Wales include woodland prescriptions or require the agreement holder to seek management advice and provide incentives for woodland and wetland management. Woodland, landscape and local biodiversity strategies may provide also support for woodland creation and management. Local woodland initiatives and fora such as the Wild Rivers Project, Highland Birchwoods, Coed Cymru, Cumbria Broadleaves, Tayside Native Woods also promote the expansion and/or management of these woods.

- 3.2.5 The FA guide to the management of wet woods was published in 1994. Management should follow this guide, as well as other FA guidelines (in particular the Forestry and Water Guidelines) in order to qualify for grant aid or felling licences from FA. The Forest Enterprise is also expected to follow these guides on their land. Guidance on ways of creating new native woodland is also available in the FA Bulletin 112 and on desirable locations for new woods from reports by SNH, CCW and EN.

- 3.2.6 Wildlife and tree management advice is available locally through the statutory conservation agencies, the Farming and Wildlife Advisory Group, ADAS, the Countryside Advice and Information Service (Wales), plus the voluntary and commercial sectors (e.g. the Wildlife Trusts, and local woodland initiatives). The experience of woodland managers is also developed and promoted by organisations such as the Small Woods Association, the Timber Growers Association, Royal and Royal Scottish Forestry Societies, Institute of Chartered Foresters and Association of Professional Foresters.

- 3.2.7 Research is undertaken by various bodies and individuals, for example by the Forestry Authority (e.g. into *Phytophthora* disease and into the conservation of black poplar), the conservation agencies (e.g. re-introduction of beavers in Scotland), by NGOs (e.g. RSPB work on the impacts of alder on water quality) and the Environment Agency (e.g. potential for restoration of floodplain woodland).

4. Action plan objectives and proposed targets

- 4.1 The targets established in this plan are based on the objective of maintaining the current extent of semi-natural wet woodlands and encouraging a balance of appropriate management regimes (for example re-establishment of natural hydrological systems by blocking drains or removing unnecessary embankments) within regions and across the distribution of the type. This will encourage the range of characteristic associated species, communities and ecological/hydrological processes to persist. The restoration targets are based on

the desirability of restoring some of the former areas of ancient semi-natural wet woodlands (around 10%) which have become dominated by non-native species since World War II. Creation targets aim to encourage the expansion of wet woodland by encouraging natural colonisation and by planting using species mixtures of site-native and local genetic provenance.

- 4.2 The targets will require review and adjustment during the course of the plan. As an early step in plan implementation more precise estimates of extent, and distribution of wet woodland will need to be determined. Criteria for determining the appropriate balance of different management regimes; suitable areas for woodland expansion and restoration (including creation of wet woodland within other woodland types) will also need to be developed.
- 4.2.1 Maintain current area (currently estimated at 24,000-30,000ha) of ancient semi-natural wet woodlands and total area of the type.
- 4.2.2 Initiate measures intended to achieve favourable condition in 100% of wet woodlands within SSSI/ASSIs and Special Areas of Conservation, and in 80% of the total resource by 2004, and achieve favourable condition over 70% of the designated sites and 50% of the total resource by 2010.
- 4.2.3 Initiate restoration of 3,200 ha to native wet woodland. Complete restoration to site-native species over half of this area by 2010 and all of it by 2015.
- 4.2.4 Initiate colonisation and/or planting of 6,750 ha of wet woodland on unwooded or ex-plantation sites. Complete establishment of half of this by 2010 and all of it by 2015.

5. Proposed actions with lead agencies

5.1 Policy and legislation

- 5.1.1 Develop a national framework for management indicating an appropriate balance of minimum intervention, coppice and high forest across the range of variation within wet woodland. (Action: CCW, DANI, EHS, EN, FC, SNH)
- 5.1.2 Encourage the development of forestry/landscape strategies to provide a context for and to promote expansion and positive management of wet woodland. (Action: CC, CCW, DANI, DETR, DOE(NI), EA, EHS, EN, FA, LAs, (including NPAs), MAFF, SEPA, SNH, SOAEFD, WOAD)
- 5.1.3 Evaluate the appropriateness of the Woodland Grant Scheme and other funding mechanisms to encourage the desired management and expansion targets in these woods by 2000 and amend as necessary by 2002. (Action: CC, CCW, DANI, EHS, EN, FC, SNH, SOAEFD, WO)
- 5.1.4 Investigate ways of assisting wet woodland development as an alternative to current regimes through changes to CAP. (Action: CCW, DANI, EN, EHS, FA, MAFF, SNH, SOAEFD, WOAD)
- 5.1.5 Evaluate implications of water level management plans for the expansion, restoration and management of these woods and seek changes as appropriate. (Action: CCW, DANI, EA, EHS, EN, FA, MAFF, SEPA, SNH, SOAEFD, WOAD)

5.2 Site safeguard and management

- 5.2.1 By 2004 designate those wet woodlands approved by the EC as SACs under the Habitats Directive and ensure that SSSI/ASSI coverage of important wet woodland sites is adequate through periodic review of the series. (Action: CCW, DANI, DETR, EHS, EN, SNH, SOAEFD, WO)
- 5.2.2 Develop and promote the use of long-term management plans (20 years +) by woodland owners aimed at integrating the appropriate diversity of species and structure to benefit nature conservation (including restoration of replanted areas) with other management objectives. (Action: CCW, DANI, EHS, EN, FC, SNH)
- 5.2.3 Continue to support existing woodland initiatives such as Coed Cymru and encourage new ones in areas not covered by existing schemes. (Action: CCW, DANI, EHS, EN, FA, SNH)
- 5.2.4 Promote and implement the management and restoration of wet woodland in state-owned forests through for example Forest Design Plans. (Action: DANI, FC)
- 5.2.5 Develop and agree criteria for identifying priority areas for woodland expansion, for example around small sites, to connect sites, to restore hydrological zonation of woodland; to create new large floodplain forests, whilst avoiding other priority habitats. Establish by 2005 a small number of demonstration sites to show good practice. (Action: CC, CCW, DANI, EA, EHS, EN, FA, MAFF, SEPA, SNH, SOAEFD, WOAD)
- 5.2.6 Develop methods for assessing the condition of wet woods suitable for use on both designated and non-designated sites and initiate sample surveys by 2000. (Action: CCW, EHS, EN, FA, JNCC, SNH)
- 5.2.7 Contribute to the implementation of relevant priority species action plans, through the integration of management requirements and advice, in conjunction with relevant steering groups. (Action: CCW, DANI, EN, EHS, FA, SNH)

5.3 Advisory

- 5.3.1 Develop and promote training on the conservation and management of semi-natural woodland including the special features and conditions that apply to wet woods. (Action: CCW, DANI, EHS, EN, FA, NPA, SNH)
- 5.3.2 Encourage and provide advice on the marketing and sustainable use of products from wet woodland as a means of supporting appropriate management. (Action: FA)
- 5.3.3 Review (and if necessary re-issue) the Management of Semi-Natural Woodlands Forestry Practice Guides, other relevant Guidelines and advisory material by 2001. (Action: CCW, DANI, EA, EHS, EN, FC, SEPA, SNH)
- 5.3.4 Provide advice to woodland managers on appropriate management regimes for wet woodland, including grazing regimes within wet woods and promote the management of deer in areas where they are, or might become, major limitations on the regeneration and spread of wet woods. (Action: CCW, DANI, DCS, EHS, EN, FC, MAFF, SNH, SOAEFD, WOAD)

5.4 International

5.4.1 Develop links with European organisations and programmes, such as European Forestry Institute, the European Environment Agency and the European Centre for Nature Conservation to obtain estimates of the extent and distribution of comparable/related woodland, and exchange experience on research and management. (Action: CCW, EHS, EN, FA, JNCC, SNH)

5.4.2 Explore the possibilities for funding to support conservation work in these woods from the European Union. (Action: CCW, EHS, EN, FA, JNCC, SNH)

5.5 Monitoring and research

5.5.1 Develop and implement systems for recording the occurrence, distribution, management and composition of wet woods, based on the National Inventory of Woodland and Trees by 2000, and explore opportunities to make this information widely available through the National Biodiversity Network initiative. (Action: CCW, EHS, EN, FC, JNCC, SNH)

5.5.2 Develop a small suite of demonstration wet woodland sites (c10-20) where detailed structure, process and species monitoring is carried out to complement the simpler, condition assessments that will be adopted by the statutory agencies more widely by 2005. (Action: CCW, EN, FA, SNH)

5.5.3 Identify about four large-scale (>50 ha) sites for the re-creation of floodplain forests in the UK, including both hydrological, wildlife conservation, economic and amenity considerations by 2005. (Action: CCW, DANI, EA, EHS, EN, FA, SEPA, SNH)

5.5.4 Investigate the relationships and dynamics of this habitat in relation to other priority habitats with which it commonly occurs, both other woodland types (e.g. upland mixed ash, upland oakwoods, native pinewoods) and open habitats (e.g. fens and mires), and for a range of taxa for which little information currently exists. (Action: CCW, EHS, EN, FFL, FA, SNH)

5.5.5 Review the impact of major invasive herbaceous species (e.g. *Impatiens glandulifera*) and devise appropriate guidance on their control (where appropriate) by 2001. (Action: CCW, EHS, EN, FA, SNH)

5.5.6 Monitor restoration of damaged wet woodland so that restoration efforts can be focused on sites most likely to show a positive response. (Action: CCW, EHS, EN, FA, SNH)

5.5.7 Develop and implement appropriate surveillance and monitoring programmes to assess progress towards action plan targets. (Action: CCW, EN, EHS, FC, JNCC, SNH)

5.6 Communications and publicity

5.6.1 Devise a strategy for distribution of existing advisory material to woodland managers and, if appropriate, produce material to fill any significant gaps identified. (Action: CCW, EA, EN, FA, LA, SEPA, SNH)

6. Costings

6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the

habitat, primarily through agri-environment schemes and grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.

6.2 Estimate of current expenditure has not been shown separately as it has not been possible to allocate expenditure within the Woodland Grant Scheme to different woodland habitat types. It is estimated that 65-75% of the costs shown are additional to current expenditure.

7. Key references

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Costings for wet woodland

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	-		
Total average annual cost / £000/Yr		2214.5	1997.2
Total expenditure to 2004/ £000		11072.6	
Total expenditure 2004 to 2014/ £000			19972.1

Upland mixed ashwoods

A Habitat Action Plan

1. Current status

1.1 Biological status

- 1.1.1 The term upland mixed ashwoods is used for woods on base-rich soils in the north and west, in most of which ash is a major species, although locally oak, birch, elm, small-leaved lime and even hazel may be the most abundant species. Yew may form small groves in intimate mosaics with the other major tree species and alder may occur where there are transitions to wet woodland. Despite variations in canopy composition the ground flora remains broadly similar. Upland in the name reflects the abundance of this type of woodland on base-rich soils in upland Britain rather than to the altitude at which individual sites occur - some, such as Rassal Ashwood, are only just above sea level.
- 1.1.2 In terms of National Vegetation Classification (NVC) plant communities this habitat is characterised by W8 *Fraxinus excelsior* - *Acer campestre* - *Mercurialis perennis* woodland, sub communities d. *Hedera helix*, e. *Geranium robertianum*, f. *Allium ursinum* and g. *Teucrium scorodonia*, and W9 *Fraxinus excelsior* - *Sorbus aucuparia* - *Mercurialis perennis* woodland, together with W13 *Taxus baccata* woodland for the yew groves on the Carboniferous and Magnesian limestones. Less frequent sub-communities that may occur in mosaic with the above are the relatively dry alder-ash stands W7c and the more southerly and eastern sub-communities of W8 (a-c).
- 1.1.3 The largest examples occur on limestone, i.e. well-drained, base-rich soils, but the type is also found on more acid poorly-drained soils where there is flushing of nutrients. Often these latter are just small fragments of woodland with irregular margins or narrow strips along flushes, riparian tracts, outcrops and steep banks. Most upland mixed ashwoods are probably ancient, but ash is a vigorous colonist of open ground, and some important areas such as Derbyshire Dales are mosaics of ancient and recent ash woodland. Many woods have been treated as coppice in the past, others have been wood-pastures, but most now have a high forest structure.
- 1.1.4 They are found throughout upland Britain and in Northern Ireland, though they are limited in the north-west Highlands. In the north-east they include the Angus glens and a high level ashwood near Glen Shee, while south-west examples include the Mendips. The boundaries between this type and lowland mixed deciduous woodland may be unclear in places, for example in Somerset and South Wales, because the two types form an ecological continuum determined by climate. In South Wales and the Wye Valley, upland ashwoods may also merge with beechwoods on base-rich soils (see the Lowland beech and yew woodland habitat action plan). In the north-west of Scotland ash is often scarce, but the type is represented by some of the most westerly European examples of hazel scrubs that are rich in lichens and higher plants.
- 1.1.5 There are no precise data on the total extent of upland ashwoods in the UK, but in the late 1980s the Nature Conservancy Council estimated the total extent of ancient semi-natural woodland of this type to be 40,000 - 50,000 ha. It has declined in area by clearance, overgrazing and replanting with non-native species, by

about 30-40% over the last 50 years. A crude estimate places the total area of upland ashwood at 67,500 ha.

- 1.1.6 Mixed ashwoods are amongst the richest habitats for wildlife in the uplands, notable for bright displays of flowers such as bluebell *Hyacinthoides non-scripta*, primrose *Primula vulgaris*, wood cranesbill *Geranium sylvaticum* and wild garlic *Allium ursinum*. Many rare woodland flowers occur mainly in upland ashwoods, such as dark red helleborine *Epipactis atrorubens*, Jacob's ladder *Polemonium caeruleum*, autumn crocus *Colchicum autumnale*, and whorled solomon's seal *Polygonatum verticillatum*. Some rare native trees are found in these woods, notably large-leaved lime *Tilia platyphyllos* and various whitebeams (*Sorbus* spp.). Upland mixed ashwoods also harbour a rich invertebrate fauna, which may include uncommon or declining species. The dense and varied shrub layer found in many examples can in the southern part of the types range provide suitable habitat conditions for dormice *Muscardinus avellanarius*. The alkaline bark of old ash (and elm where it still survives) supports an important lichen flora, particularly the Lobarion community. The remains of dead trees such as old elm trees provide habitat for rare beetles, flies and other invertebrates.

1.2 Links with species action plans

- 1.2.1 Upland mixed ashwoods are an important habitat for a number of priority species whose requirements should be taken into account during implementation of this plan. These include the netted carpet moth *Eustromia reticulatum*, pearl bordered fritillary *Boloria euphrosyne*, high brown fritillary *Argynnis adippe*, and dormouse *Muscardinus avellanarius*.

2. Current factors affecting the habitat

- 2.1 The main factors affecting the habitat are considered to be as follows.
- 2.1.1 Overgrazing by sheep, deer and rabbits in the western and northern uplands, and expansion of populations of deer in southern districts, leading to change in the woodland structure, ground flora impoverishment and difficulties for regeneration.
- 2.1.2 Invasion by sycamore, beech and other species which are generally not native to these woods in most of Britain, leading to changes in the composition of the woods.
- 2.1.3 Dutch elm disease has changed the structure and composition of many woods since the early 1970s, and recurrences may still be affecting them. Canopies opened by disease may be subject to higher rates of windthrow, and invasion of the gaps by unrepresentative species becomes more likely.
- 2.1.4 Quarrying, particularly of Carboniferous limestone in England and Wales has destroyed and continues to threaten some sites.
- 2.1.5 Replacement of native trees with planted conifers was a major threat until the early 1980s. Large scale felling and modification of the composition of the woodland by intensive planting of inappropriate broadleaved species may reduce the diversity of the woodland.

- 2.1.6 Agricultural practices may lead to simplification of the landscape and greater ecological isolation of these woods through the removal of trees in field boundaries and small patches of ash-rich scrub in fields. Locally nutrient enrichment leading to changes in soils and ground flora may occur from spray drift or runoff from adjacent agricultural land.
- 2.1.7 Cessation of traditional management practices such as coppicing may in some areas lead to a reduction in structural diversity within the woods.
- 2.1.8 Climate change, potentially resulting in changes in the vegetation communities.

3. Current action

3.1 Legal Status

- 3.1.1 National forestry policy includes a presumption against clearance of broad-leaved woodland for conversion to other land uses, and in particular seeks to maintain the special interest of ancient semi-natural woodland. Felling licences from the Forestry Authority (FA) are normally required if the woods are not managed under plans approved by them. Some woods may receive additional protection through policies and strategies within development plans, through National Park Management plans or by being subject to Tree Preservation Orders.
- 3.1.2 Designation as Sites of Special Scientific Interest (SSSI) or as Areas of Special Scientific Interest (under the Nature Conservation and Amenity Lands Order (NI) 1985) of about 20-30% of the more important areas of upland mixed ashwoods ensures compulsory consultation with the statutory nature conservation agencies over management operations and development proposals. Some upland ashwoods that include habitats identified under Annex 1 of the EC Habitats Directive, for example *Tilio-Acerion* ravine forests, wooded limestone pavements and yew stands, have also been proposed as Special Areas of Conservation (SACs).
- 3.1.3 Some significant sites receive protection through the Inheritance Tax Exemption scheme and National Trust and National Trust for Scotland properties can be declared to be inalienable land.

3.2 Management, research and guidance

- 3.2.1 There are a number of significant inventories on woodlands available, including the Forestry Authority's National Inventory of Woodland and Trees (NIWT), initiated in 1995, which provides information on the extent, distribution and composition of woodland in the whole of GB. Information on woodland type and management is also collected as part of the FA's Woodland Grant Scheme (WGS) documentation, through local woodland management initiatives or information held on the Forest Enterprise compartment database. The country conservation agencies also hold relevant information in Ancient Woodland Inventories as well as information from individual surveys of statutory protected sites.
- 3.2.2 Other relevant information is gathered through Local Authority and non-governmental organisation site and species survey and monitoring programmes, and local and national recording schemes and centres covering relevant species and sites.

3.2.3 All woodland is expected to be managed according to the UK Forestry Standard.

3.2.4 Grants for and advice on management, including regeneration, planting and some other operations, are available from FA and in some circumstances from other government agencies and local authorities (including the national park authorities). Some Environmentally Sensitive Areas, the Habitat Scheme and Tir Cymen in Wales (which will be replaced in 1999 by the all Wales agri-environment scheme Tir Gofal) include woodland prescriptions or require the agreement holder to seek management advice and provide incentives for woodland and wetland management. Local woodland initiatives and fora such as Highland Birchwoods, Coed Cymru, Cumbria Broadleaves, Tayside Native Woods) promote the expansion and/or management of these woods in their areas.

3.2.5 The FA guide to the management of upland mixed ashwoods was published in 1994. Management should follow this guide, as well as other FA guidelines in order to qualify for grant aid or felling licences. The Forest Enterprise are also expected to follow these guides on their land. Guidance on ways of creating new native woodland is also available in the FA Bulletin 112 and on desirable locations for new woods from reports by SNH, CCW and EN.

3.2.6 Woodland management advice is available locally through the statutory conservation agencies, the Farming and Wildlife Advisory Group, ADAS, the Countryside Advice and Information Service (Wales), plus the voluntary and commercial sectors (e.g. the Wildlife Trusts, and local woodland initiatives). The experience of woodland managers is also developed and promoted through organisations such as the Small Woods Association, the Timber Growers Association, Royal and Royal Scottish Forestry Societies, Institute of Chartered Foresters, Association of Professional Foresters and the like.

3.2.7 Research is undertaken by various bodies and individuals, for example by the FA (e.g. on methods for achieving natural regeneration, squirrel control, deer management etc.), by the conservation agencies (e.g. work on regeneration within enclosures), by university departments (e.g. the regeneration dynamics of ash and sycamore), by NGOs (e.g. work by National Trust on lime pollination in the Derbyshire Dales) and by other groups (e.g. a project to develop methods of regenerating broadleaved woodland on fragile sites within the Caledonian forest area is being carried out by Caledonian Partnership).

4. Action plan objectives and proposed targets

4.1 The targets established in this plan are based on the objective of maintaining the current extent of upland mixed ashwood and encouraging a balance of appropriate management regimes (for example minimum intervention, coppice, managed high forest) within regions and across the distribution of the type. The restoration targets are based on the desirability of restoring some of the former areas of ancient sites for upland mixed ashwood semi-natural wet woodlands (around 10%) that have been substantially planted with conifers in the last 50 years or that are currently dominated by other non-native species. Creation targets aim to encourage the expansion of upland mixed ash woodland by encouraging natural colonisation and by

planting using species mixtures of site-native and local genetic provenance.

4.2 The targets will require review and adjustment during the course of the plan. As an early step in plan implementation more precise estimates of extent, and distribution of upland mixed ash woodland will need to be determined. Criteria for determining the appropriate balance of different management regimes and suitable areas for woodland expansion and restoration will also need to be developed.

4.2.1 Maintain the current extent of ancient semi-natural woodland (considered to be 40,000 to 50,000 ha) and the total extent and distribution of upland mixed ashwood.

4.2.2 Initiate measures intended to achieve favourable condition in 100% of upland mixed ashwoods within the SSSI/ASSIs and Special Areas of Conservation, and in 80% of the total resource by 2004, and achieve favourable condition over 70% of the designated sites and 50% of the total resource by 2010.

4.2.3 Initiate restoration to upland mixed ashwood cover at least 2,400 ha. Complete restoration to site-native species over half this area by 2010 and all of it by 2015.

4.2.4 Initiate colonisation or planting of 6,000 ha of upland mixed ashwood on unwooded or ex-plantation sites. Complete establishment of half of this by 2010 and all of it by 2015.

5. Proposed action with lead agencies

5.1 Policy and legislation

5.1.1 Develop a national framework for management indicating an appropriate balance of minimum intervention, coppice and high forest across the range of variation within upland mixed ashwoods by 2000. (Action: CCW, DANI, EHS, EN, FC, SNH)

5.1.2 Encourage the development of forestry/landscape strategies to provide a context for and to promote expansion and positive management of upland mixed ash woodland. (Action: CC, CCW, DANI, DETR, DoE(NI), EHS, EN, FA, DETR, LAs (including NPAs), MAFF, SNH, SOAEFD, WOAD)

5.1.3 Examine by 2000 the success and appropriateness of the Woodland Grant Scheme and other funding mechanisms to encourage the desired management and expansion targets in these woods and amend as necessary. (Action: CC, CCW, DANI, EHS, EN, FC, MAFF, SNH, SOAEFD, WOAD)

5.1.4 Investigate ways of assisting woodland development as an alternative to current agricultural regimes through changes to CAP. (Action: CC, CCW, DANI, EN, FA, MAFF, SNH, SOAEFD, WOAD)

5.2 Site safeguard and management

5.2.1 By 2004 designate those upland mixed ashwoods approved by the EC as SACs under the Habitats Directive and ensure that SSSI/ASSI coverage of important upland mixed ash woodland sites is adequate through periodic review of the series. (Action: CCW, EHS, EN, SNH, DETR, WO, SO)

5.2.2 Develop methods for assessing the condition of upland mixed ashwoods suitable for use on both designated and non-designated sites and initiate sample surveys by 2000. (Action: CCW, EHS, EN, FA, SNH)

5.2.3 By 2000 develop and agree criteria for identifying appropriate areas (i.e. avoiding other priority habitats) for restoration and expansion of upland mixed ashwood, for example around small sites, to connect sites, to restore altitudinal zonation of woodland. Establish by 2005 a small number of sites that can be used to demonstrate good practice (Action: CC, CCW, DANI, EHS, EN, FA, MAFF, SNH, SOAEFD, WOAD)

5.2.4 Support existing woodland initiatives such as Coed Cymru and encourage the development of new ones in areas not covered by existing schemes by 2000. (Action: CCW, DANI, EHS, EN, FA, SNH)

5.2.5 Develop and promote the use of long-term management plans (20 years +) by woodland owners aimed at integrating the appropriate diversity of species and structure, in different regions, to benefit nature conservation (including restoration of replanted areas) with other management objectives. (Action: CCW, EHS, EN, FC, SNH)

5.2.6 Promote and implement the management and restoration of upland mixed ashwoods in state-owned forests through for example Forest Enterprise Endangered Habitat plans and Forest Design Plans. (Action: DANI, FC)

5.2.7 Contribute to the implementation of relevant priority species action plans, through the integration of management requirements and advice, in conjunction with relevant steering groups. (Action: CCW, DANI, EHS, EN, FA, SNH)

5.3 Advisory

5.3.1 Develop and promote training on the conservation and management of upland mixed ashwoods, including the provision of advice on the marketing and sustainable use of products. (Action: CC, CCW, DANI, EHS, EN, FA, NPA, SNH)

5.3.2 Review (and if necessary re-issue) the Management of Semi-Natural Woodlands Forestry Practice Guides, other relevant Guidelines and advisory material by 2001. (Action: CCW, DANI, EN, FC, SNH)

5.3.3 Provide advice to land managers on management regimes, including grazing regimes, appropriate to the geographical distribution and ecological variation found in this habitat, and promote the management of deer and rabbits in areas where they are (or might become) major limitations on the regeneration and spread of upland mixed ashwoods. (Action: CCW, DCS, DANI, EHS, EN, FA, MAFF, SNH, SOAEFD, WOAD)

5.4 International

5.4.1 Develop links with European organisations and programmes, such as the European Forestry Institute, the European Environment Agency and the European Centre for Nature Conservation to obtain estimates of the extent and distribution of comparable and related woodland, and exchange experience on research and management by 2000. (Action: CCW, EN, FA, JNCC, SNH)

5.4.2 Review, by 2000, the status of species-rich coastal hazel scrub of west Scotland and investigate the possibility of adding this, as one of (with Ireland) the most westerly European example of this type, to the habitats listed under the EC Habitats Directive. (Action: DETR, JNCC, SNH, SOAEFD)

5.4.3 Explore the possibilities for funding to support conservation work in these woods from the European Union. (Action: CCW, EN, FA, JNCC, SNH)

5.5 Monitoring and research

5.5.1 Develop and implement systems for recording the occurrence, distribution, management and composition of upland mixed ashwoods, based on the National Inventory of Woodland and Trees by 2000, and explore opportunities to make this information widely available through the National Biodiversity Network initiative. (Action: CCW, EHS, EN, FC, JNCC, SNH)

5.5.2 Develop a small suite of mixed upland ashwood sites (c10-20) where detailed structure, process and species monitoring is carried out to complement the simpler, condition assessments that will be adopted more widely by 2005. (Action: CCW, EN, FA, SNH)

5.5.3 Support research on the history and past management of upland mixed ashwoods, including an investigation of the dynamics and management of sycamore and beech in this habitat, to improve our understanding of their development, present condition, distribution and future management. (Action: CCW, EHS, EN, FA, SNH)

5.5.4 Investigate the relationships and dynamics of this habitat in relation to other priority habitats with which it commonly occurs (limestone pavement, upland oakwood, beechwood and wet wood types) and for a range of taxa for which little information currently exists. (Action: CCW, EHS, EN, FA, SNH)

5.5.5 Research the benefits in nature conservation terms of establishing a number (5-10) of substantial demonstration sites (50ha+) as areas of minimum intervention high forest sites where natural processes can be allowed to proceed with as little interference as possible. (Action: CCW, EN, FA, SNH)

5.5.6 Monitor restoration of damaged upland mixed ash woodland so that restoration efforts can be focused on sites most likely to show a positive response. (Action: CCW, EHS, EN, FA, SNH)

5.5.7 Develop and implement appropriate surveillance and monitoring programmes to assess progress towards action plan targets. (Action: CCW, EHS, EN, FA, JNCC, SNH)

5.6 Communications and publicity

5.6.1 Devise a strategy for ensuring effective distribution of existing advisory material to woodland managers and if gaps are identified produce and disseminate appropriate material to fill these. (Action: CCW, DANI, EN, FA, LA, SNH)

6. Costings

6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the

habitat, primarily through agri-environment schemes and grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.

6.2 Estimates of the current expenditure for this habitat are not shown as it has not been possible to allocate expenditure in the Woodland Grant Scheme to different habitat types. It is estimated that 65%-75% of the costs shown are additional to the current expenditure.

7. Key references

Commission of the European Communities. 1991. *CORINE biotopes manual*. Luxembourg, Office for Official Publications of the European Communities.

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Costings for upland mixed ashwoods

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	-		
Total average annual cost / £000/Yr		2482.0	2438.7
Total expenditure to 2004/ £000		12410.0	
Total expenditure 2004 to 2014/ £000			24386.8

Lowland beech and yew woodland

A Habitat Action Plan

1. Current status

1.1 Biological status

- 1.1.1 Lowland beech and yew woodland spans a variety of distinctive vegetation types reflecting differences in soil and topographical conditions. Beech can grow on both acidic and calcareous soils, although its association with yew tends to be most abundant on the calcareous sites. These woods have been managed historically as coppice, coppice with standards, wood-pasture, high forest and minimum intervention. They are often found as intricate mosaics with other woodland communities. The wood-pasture and parkland element is dealt with in another Habitat Action Plan, although some of the issues apply to this plan also. Yew stands on the Carboniferous and Magnesian limestones of central and northern Britain are considered under the upland mixed ashwood plans.
- 1.1.2 In the United Kingdom beech is considered native only in southern England and southern Wales. Beech would certainly have spread naturally to other areas of the British Isles had forest fragmentation not impeded its progress. This Habitat Action Plan largely considers lowland beech and yew woodlands within their native range, but long-established planted beech woods outside the native range are included where they have acquired a high nature conservation value.
- 1.1.3 There are no precise data on the total extent of native lowland beech and yew in the UK. In the late 1980s the Nature Conservancy Council estimated the total extent of ancient semi-natural woodland of this type at between 15,000 and 25,000 ha which with recent beech woodland brings the total area to about 30,000ha. It has declined in area by clearance and replanting with non-native species over the last 50 years.
- 1.1.4 Calcareous beech and yew woodland forms perhaps 40% of the total amount of lowland beech and yew habitat type defined above. The canopy can include mixtures of beech, ash, sycamore (non-native), yew and whitebeam. Oak is less common than in the other beechwoods, and pure stands of yew occur in places. Promotion of high quality beech for silviculture has often led to an artificial dominance of beech. Characteristic uncommon or rare plants can include box *Buxus sempervirens*, red helleborine *Cephalanthra rubra*, coralroot bitter-cress *Cardamine bulbifera*, and bird's nest orchid *Neottia nidus-avis*. In some areas, this woodland type occurs as intricate mosaics with lowland mixed deciduous woods. The majority of stands have a high forest structure. This type occurs on the limestone and chalk outcrops in southern Britain e.g. chalk scarps of the North and South Downs, the Chilterns and the Cotswolds.
- 1.1.5 Beech woodland on neutral-slightly acidic soils comprises about 45% of the habitat. It is found on heavier soils (pH 7 to 4) and often where the drainage is poor or impeded. The boundary with the other beech types is often defined by pH, drainage and soil texture; thus it is common to find this type grading into one of the others. Again stands tend to be dominated by beech, but oak *Quercus robur* and sometimes *Q. petraea* is a common associate. Bramble *Rubus fruticosus* forms a characteristic ground layer. Often a shrub layer is lacking, although holly can form a second tier of trees,

occasionally with yew. Violet helleborine *Epipactis purpurata* is a rare plant found in this community. Mosaics with oak/ bracken/ bramble woodland are common, and in some areas beech can be found colonising western oakwoods. This type tends to occur as high forest or relict wood-pasture (with pollards), less often abandoned coppice. It is common in (but not confined to) the High and Low Weald, the Chilterns plateau, the New Forest, the Cotswolds and the Wye Valley.

- 1.1.6 Acidic beech woodland forms the remaining 15% of the habitat type. It usually occurs as high forest but also makes up a large percentage of the lowland wood-pasture sites in England. Acidic beech stands are usually found on light sandy or sometimes gravelly soils that are well drained (pH 3.5 to 4.5). Holly is the main understorey species, less often yew, with oak being the common canopy associate. Mosaics with oak/ birch/ wavy-hair grass communities are not uncommon. The western edge of its range is ill-defined and beech clearance from and spread into western oakwoods occur in almost equal measure. Typical sites are found in the High Weald (on Greensand), Hampshire and London basins, the Chilterns plateau and at a few sites in East Anglia.
- 1.1.7 The main corresponding National Vegetation Classification (NVC) plant communities associated with this habitat type are W12 *Fagus sylvatica* - *Mercurialis perennis* woodland (base-rich soils), W14 *Fagus sylvatica* - *Rubus fruticosus* woodland (mesotrophic soils), W15 *Fagus sylvatica* - *Deschampsia flexuosa* woodland (acidic soils). Yew stands fall into W13 *Taxus baccata* woodland.

1.2. Links with species action plans

- 1.2.1 Lowland beech and yew woodland is an important habitat for a number of priority species including devil's bolete fungus *Boletus satanus*, a hedgehog fungus *Hericeum erinaceum* and the knothole moss *Zygodon forsteri*. Their requirements should be taken into account during implementation of this plan.

2. Current factors affecting the habitat

- 2.1 Beech and yew woodland has been less affected than other woodland types by replanting with conifers and clearance for agriculture because of the productive value of beech high forest and the relatively poor soils with which it is often associated. Changes in the composition and structure of lowland beech and yew woodland are however occurring. The main factors affecting the habitat are seen to be as follows:
- 2.1.1 Grey squirrels (and in the Chilterns, edible dormouse *Glis glis*) strip the bark from beech trees (between 10 and 40 years old) which can result in tree death, disruption of normal age structure and shifts in species composition; rabbits can also cause damage (bark stripping and eating regeneration) in some beech and yew areas.
- 2.1.2 Deer browsing on seedlings and saplings, is a widespread problem, which limits capacity for regeneration.

- 2.1.3 Introduced species, that replace native beech and yew woodland species. Some woods were planted with conifers in the past; locally, invasive species may include sycamore, rhododendron, Turkey oak *Quercus cerris* and cherry laurel *Prunus laurocerasus*.
- 2.1.4 The predominance of the older age classes in much beech high forest has increased the susceptibility of the beech population to damage from droughts and storms.
- 2.1.5 Lack of interest, expertise and incentives amongst some owners results in much beech and yew woodland being unmanaged, or managed unsympathetically.
- 2.1.6 Air pollution may cause 'decline' in beech trees (increasing their susceptibility to disease), and damage to epiphyte populations.
- 2.1.7 Fragmentation of the habitat as a result of development.
- 2.1.8 Climate change, potentially resulting in changes in the vegetation communities.

3. Current action

3.1 Legal Status

- 3.1.1 National forestry policy includes a presumption against clearance of broad-leaved woodland for conversion to other land uses, and in particular seeks to maintain the special interest of ancient semi-natural woodland. Felling licences from the Forestry Authority (FA) are normally required if the woods are not managed under plans approved by them. Some woods may receive additional protection through policies and strategies within development plans, through National Park Management plans or by being subject to Tree Preservation Orders.
- 3.1.2 Designation as Sites of Special Scientific Interest (SSSI) of about 20% of the more important areas of lowland beech, and approximately 50% of yew woodland, ensures compulsory consultation with the statutory nature conservation agencies over management operations and development proposals. Some lowland beech and yew woodlands that include habitats identified under Annex 1 of the EC Habitats Directive (*Asperulo-Fagetum* beech forests, *Taxus baccata* forests, and beech forests with *Ilex* and *Taxus*) have been proposed as Special Areas of Conservation (SACs).
- 3.1.3 Some significant sites receive protection through the Inheritance Tax Exemption scheme and National Trust properties can be declared to be inalienable land.

3.2 Management, research and guidance

- 3.2.1 There are a number of significant inventories on woodlands available, including the Forestry Authority's National Inventory of Woodland and Trees (NIWT), initiated in 1995, which provides information on the extent, distribution and composition of woodland in the whole of GB. Information on woodland type and management is also collected as part of the FA's Woodland Grant Scheme (WGS) documentation, through local woodland management initiatives or information held on the Forest Enterprise compartment database. English Nature and CCW also hold relevant information in Ancient Woodland Inventories as well as information from individual surveys of statutory protected sites.

3.2.2 Other relevant information is gathered through Local Authority and non-governmental organisation site and species survey and monitoring programmes, and local and national recording schemes and centres covering relevant species and sites.

3.2.3 All woodland is expected to be managed according to the UK Forestry Standard.

3.2.4 Grants for and advice on management, including regeneration, planting and some other operations, are available from FA and in some circumstances from other government agencies and local authorities (including the national park authorities). Some Environmentally Sensitive Areas and the Habitat Scheme in Wales include woodland prescriptions or require the agreement holder to seek management advice and provide incentives for woodland management such as stock exclusion. Local woodland initiatives and fora (such as within Areas of Outstanding Natural Beauty) promote the expansion and/or management of these woods in their areas. Examples include Bucks Woodland Forum, Chilterns Woodland Project etc.. Woodland, landscape and local biodiversity strategies may also provide support for woodland creation and management.

3.2.5 The FA guides to the management of lowland beech-ash woods and lowland acid beech and oak woods were published in 1994. Management should follow the relevant guide, as well as other FA guidelines in order to qualify for grant aid or felling licences. The Forest Enterprise also follow these guides on their land. Guidance on ways of creating new native woodland is also available in the FA Bulletin 112 and on desirable locations for new woods from reports by CCW and EN.

3.2.6 Woodland management advice is available locally through the statutory conservation agencies, the Farming and Wildlife Advisory Group, ADAS, the Countryside Advice and Information Service (Wales), plus the voluntary and commercial sectors (e.g. the Wildlife Trusts, and local woodland initiatives). The experience of woodland managers is also developed and promoted through organisations such as the Small Woods Association, the Timber Growers Association, Royal Forestry Society, Institute of Chartered Foresters and Association of Professional Foresters.

3.2.7 Research is undertaken by various bodies and individuals, for example by the FA (e.g. on methods for achieving natural regeneration, squirrel control, deer management etc.), by the conservation agencies (e.g. ground flora responses to management) and by university departments (e.g. the regeneration dynamics of ash and sycamore, effects of fragmentation, genetic differences between tree populations).

4. Action plan objectives and proposed targets

- 4.1 The targets established in this plan are based on the objectives of maintaining the current extent and distribution of lowland beech and yew woodland and encouraging a balance of appropriate management regimes (for example minimum intervention, coppice, managed high forest) within regions and across the distribution of the type. The restoration targets are based on the desirability of restoring some of the former areas of ancient sites (around 10%) for lowland beech and yew woodland that have been substantially planted with conifers in the last 50 years or that are currently dominated by other non-native species. Creation targets aim to encourage the expansion of this habitat by

encouraging natural colonisation and by planting using species mixtures of site-native and local genetic provenance.

- 4.2 The targets will require review and adjustment during the course of the plan. As an early step in plan implementation more precise estimates of extent, and distribution of lowland beech and yew woodland will need to be determined. Criteria for determining the appropriate balance of different management regimes and suitable areas for woodland expansion and restoration will also need to be developed.
- 4.2.1 Maintain the existing areas of ancient semi-natural lowland and beech yew woodland (estimated to be 15,000 to 25,000 ha) and the total current extent and distribution of the type.
- 4.2.2 Initiate measures intended to achieve favourable condition in 100% of lowland beech and yew woodland within SSSI/ASSIs and Special Areas of Conservation, and in 80% of the total resource, by 2004 and achieve favourable condition over 70% of the designated sites and 50% of the total resource by 2010.
- 4.2.3 Initiate restoration to lowland beech and yew cover at least 1,500 ha. Complete restoration over half of this area by 2010 and all of it by 2015.
- 4.2.4 Initiate colonisation or planting of 3,000 ha of lowland beech and yew woodland on unwooded or ex-plantation sites. Complete establishment of this by 2010 and all of it by 2015.

5. Proposed action with lead agencies

5.1 Policy and legislation

- 5.1.1 Develop a national framework for management indicating an appropriate balance of minimum intervention, coppice and high forest across the range of variation within lowland beech and yew woodland by 2000. (Action: CCW, EN, FC)
- 5.1.2 Encourage the development of forestry/landscape strategies (e.g. Natural Areas, local Biodiversity Action Plans, AONBs etc) to provide a context for and to promote expansion and positive management of lowland beech and yew woodland. (Action: CC, CCW, DETR, EN, FA, MAFF, LA (including National Park Authorities), WOAD)
- 5.1.3 Examine by 2000 the success and appropriateness of the Woodland Grant Scheme and other funding mechanisms to encourage the desired management and expansion targets in these woods and amend as necessary. (Action: CC, CCW, EN, FC, MAFF, WOAD)
- 5.1.4 Investigate ways of assisting woodland development as an alternative to current agricultural regimes through changes to CAP by 2000. (Action: CC, CCW, EN, FA, MAFF, WOAD)

5.2 Site safeguard and management

- 5.2.1 By 2004 designate those lowland beech and yew woodlands approved by the EC as SACs under the Habitats Directive and ensure that SSSI coverage of important lowland beech and yew woodland sites is adequate through periodic review of the series. (Action: CCW, DETR, EN, JNCC, WO)

- 5.2.2 Develop methods for assessing the condition of lowland beech and yew woodlands suitable for use on both designated and non-designated sites and initiate sample surveys by 2000. (Action: CCW, EN, FA)
- 5.2.3 By 2000 devise and agree criteria for identifying priority areas in which to restore damaged or former beech and yew woodland, for example around small sites or to connect sites. Establish by 2005 a small number of demonstration sites to show good practice. (Action: CC, CCW, EN, FA, MAFF)
- 5.2.4 Develop and promote the use of long-term management plans (20 years +) by woodland owners aimed at integrating the appropriate diversity of species and structure to benefit nature conservation (including restoration of replanted areas) with other management objectives. (Action: CCW, EN, FC)
- 5.2.5 Promote and implement the management and restoration of lowland beech and yew woodland in state-owned forests through for example Forest Enterprise Endangered Habitat plans and Forest Design Plans. (Action: FC)
- 5.2.6 Contribute to the implementation of relevant priority species action plans, through the integration of management requirements and advice, in conjunction with relevant steering groups. (Action: CCW, EN, FA)

5.3 Advisory

- 5.3.1 Promote training courses on the conservation and management of semi-natural woodland including the special features and conditions that apply to the habitats and species of beech and yew woodland (e.g. grey squirrel damage control). Develop training opportunities at a local level. (Action: CC, CCW, EN, FA)
- 5.3.2 Encourage the development of woodland initiatives that provide quality advice on woodland establishment, management and marketing opportunities where there are gaps in existing coverage. (Action: CC, CCW, EN, FC, LA)
- 5.3.3 Develop co-ordinate strategies for targeted control of damage caused by deer, grey squirrel and other damaging species (including non-native plants), in existing beech and yew woods and in areas targeted for expansion by 2002. (Action: CCW, EN, FC, LA)

5.4 International

- 5.4.1 Develop links with European organisations and programmes, such as European Forestry Institute, the European Environment Agency and the European Centre for Nature Conservation to obtain estimates of the extent and distribution of comparable and related woodland, and exchange experience on research and management by 2000. (Action: CCW, EN, FA, JNCC)
- 5.4.2 Explore the possibilities for funding to support conservation work in these woods from the European Union. (Action: CCW, FA, EN)

5.5 Monitoring and research

- 5.5.1 Develop and implement systems for recording the occurrence, distribution, management and composition of lowland beech and yew woodland, based on the National Inventory of Woodland and Trees by 2000 and explore opportunities to make this widely available

through the National Biodiversity Network initiative (Action CCW, EN, FC, JNCC).

- 5.5.2 Develop a small suite of lowland beech and yew sites (c10-20) where detailed structure, process and species monitoring is carried out to complement the simpler, condition assessments that will be adopted more widely by 2005. (Action: CCW, EN, FC)
- 5.5.3 Study effects (on tree and ground layer) of co-existence of beech with other canopy dominants (particularly where beech lies at the edge of its range) so we can judge the importance and predict outcomes of structural and species modifications and to help achieve better regeneration success. (Action: CCW, EN, FA)
- 5.5.4 Research the benefits in nature conservation terms of establishing a number (5-10) of substantial demonstration sites (50ha+) as areas of minimum intervention high forest sites where natural processes can be allowed to proceed with as little interference as possible by 2005. (Action: CCW, EN, FA)
- 5.5.5 Monitor restoration of damaged beech and yew woodland so that restoration efforts can be focused on sites most likely to show a positive response. (Action: CCW, EN, FA)
- 5.5.6 Develop and implement appropriate surveillance and monitoring programmes to assess progress towards action plan targets. (Action: CCW, EN, FC, JNCC)

5.6 Communications and publicity

- 5.6.1 Devise a strategy for distribution of existing advisory material (booklets, field demonstrations *etc.*) to woodland managers and if gaps are identified produce and disseminate additional material by 2004. (Action: CCW, EN, FA, LA)

6. Costings

- 6.1 The successful implementation of the habitat action plans will have resource implications for both the private and public sectors. The data in the table below provides an estimate of the current expenditure on the habitat, primarily through agri-environment schemes and grant schemes, and the likely additional resource costs to the public and private sectors. These additional resource costs are based on the annual average over 5 and 10 years. The total expenditure for these periods of time is also given. Three-quarters of the additional resources are likely to fall to the public sector.
- 6.2 Current expenditure has not been shown separately as it was not possible to allocate expenditure within the Woodland Grant Scheme to different habitats. It is estimated that 65-75% of the costs shown are additional to current expenditure.
- 6.3 The costs are presented for the UK as a whole, however, because of the distribution of this habitat the majority of these will relate to England and Wales only.

7. Key references

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Costings for lowland beech and yew woodland

	Current expenditure	1st 5 yrs to 2003/2004	Next 10 yrs to 2013/2014
Current expenditure / £000/Yr	-		
Total average annual cost / £000/Yr		1134.5	993.4
Total expenditure to 2004/ £000		5672.5	
Total expenditure 2004 to 2014/ £000			9934.0