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English Nature Habitat Restoration Project: Final report

HABITAT RESTORATION PROJECT

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English Nature Habitat Restoration Project

Final report

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Preface

This report summarises the work of the Habitat Restoration Project from 1996 to 2000. The comments made and conclusions reached are based on the actual experience of the Project but would not necessarily be repeated in other places during other time frames. The views expressed here are not necessarily those of English Nature but will make a useful contribution to developing that view.

Rachel Thomas

August 2000

1. Executive summary

The Habitat Restoration Project was launched in 1996 to demonstrate the extent to which fragmentation could be reversed using existing mechanisms; to identify which policies and procedures were most effective in achieving habitat recovery and what new policies, funding or procedures were needed; and finally to disseminate this experience to influence partners to adopt those policies or procedures to achieve the reversal of habitat fragmentation. The project, which operated under the overall theme of building landscape for biodiversity, explored alternative ways of delivering the Biodiversity Action Plan in the English lowlands.

The strength of the project lay in its practical delivery of an agreed vision for nature conservation at a landscape scale in partnership with all land ownership sectors in four different areas, each typical of the English countryside.

After four years, a total of 1605ha and 145km of semi-natural habitats has been restored or created, key lessons learnt during the process have been established, and the results from the project disseminated through this and other reports.

The map-based landscape vision pioneered by the project was a useful and popular targeting and educational tool for both conservation professionals and land managers helping them agree and clarify habitat enhancement targets for large areas of countryside. The model could be developed to cover other areas, operate at a different scale and include historic, amenity and access considerations.

The project has produced the following reports which will help others learn from its experience: practical fact sheets to help land managers restore and create habitats (Dryden 1997); individual reports on the work in each trial area (Eppey 2000, Hewston and Scott 2000, Wheeler 1999, Williamson 1999); guidelines on ecological monitoring of habitat restoration or creation sites (Mitchley *et al* 1998, 2000; Burch *et al* 2000); standard protocol to convert Phase 1 data to a GIS format (Bailey and Isaacs 1999), baseline information on the habitat condition of selected sites in each area and the overall quality of the landscape for butterflies, bats and farmland birds; and finally a digital data set of potential future research use.

This project demonstrated that project officers were a vital tool in ensuring that landowners became engaged in habitat enhancement. They could be based with any advisory organisation but were most valuable when they had a wide remit, could coordinate the work of other land use advisers operating in an area and were not tied to any particular funding source. A five year time frame is probably the minimum required to coordinate work and change attitudes.

Achieving the level of land use change required to deliver the Biodiversity Action Plan will require both a fundamental change of agricultural practices in some landscapes and the availability of detailed practical advice and machinery in others depending on the level of change required. Continued work using the vision approach will help bring about this change.

2. Purpose and background to the project

2.1 Project objectives

The Habitat Restoration Project was launched in 1996 to:

- demonstrate the extent to which fragmentation could be reversed using existing mechanisms and incentives;
- identify which existing policies and procedures were most effective in achieving habitat recovery and also what new policies, funding or procedures are needed to improve this process;
- disseminate this experience to influence partners to adopt those policies and procedures to achieve the reversal of habitat fragmentation.

The project developed from theoretical work on habitat fragmentation which English Nature undertook during 1992 (Kirby 1995) to 'translate ideas about fragmentation and habitat corridors into a form which would be directly useful to conservation workers developing or implementing policies, ... deciding where new habitat patches were needed and presenting a framework for restoring lost ground'.

2.2 Habitat fragmentation

Kirby's report concluded that 'many habitats in England are now more fragmented (the patches are smaller and more isolated from each other) than they were 50 years ago' and that there was sufficient evidence that 'this is potentially an important cause of species decline to justify opposition to further habitat fragmentation'. The report considered that linear (and non-linear) features that link habitat patches have a conservation value in their own right whether or not they act as wildlife corridors and such features should be protected and new ones created but not solely for their linking value.

The report considered that it was desirable to develop more opportunities for species to move through and thrive in the whole countryside, not just in and around the areas that are currently species-rich. In many cases there was likely to be greater general wildlife benefit from putting the limited resources available into creating or encouraging the development of a series of small patches of new semi-natural habitat (stepping stones) than putting the same total area into a single block or corridor because specialist or slow moving species do not in practice use the larger blocks (even though they should do so in theory) and because these options are much more difficult to achieve.

2.3 Project development

The report identified the need for further research and trials to translate fragmentation theories into the practical steps necessary to make the English countryside a more attractive place for wildlife and people. At the time there were no studies which had looked at the patterns actually created by, for example, set aside, new woodland planting and to determine how far they corresponded to an ecologists' ideas as to what would be the best locations.

The framework for what became the Habitat Restoration Project was described as follows: a project in contrasting landscape types that would coordinate effort over 3-5 years amongst government and voluntary bodies to try to decrease the fragmentation of habitats accompanied by appropriate monitoring measures. The areas were to be 10 x 10 km or 5 x 5 km; small enough that only a few landowners would be involved but large enough that changes could be measured over the landscape in general. Over the time scale of the project the direct impact on most species populations would be difficult to assess but it would be possible to show changes in the area of semi-natural vegetation, changes in inter-patch distance and a crude measure of the 'wildlife friendliness' of the countryside in the areas targeted.

2.4 English Nature's current work on habitat fragmentation

The importance of combatting habitat fragmentation continues to be a major issue for English Nature. The current work plan (1999-2002) describes the important wildlife and natural features of the lowlands as typically concentrated in a large number of relatively small, fragmented sites. The plan aims to 'achieve gains for wildlife and natural features across the lowland Natural Areas of England ... promoting landscapes for biodiversity by developing ... practical ways of linking fragmented habitats and isolated populations of species'.

Specific actions include:

- [demonstrating] the viability of environmentally friendly farming through trial schemes;
- test[ing] and evaluat[ing] habitat restoration schemes and changes in farming practice;
- linking existing fragmented natural habitats, and building landscapes which support the characteristic wildlife of lowland Natural Areas;
- increase[ing] the extent to which the recommendations arising from [such] projects are incorporated within agricultural practice.

The desired outcome is for fragmented habitats to be linked as a result of improved agricultural practice and the decline of species characteristic of lowland farming to have been arrested.

2.5 The Habitat Restoration Project

The Habitat Restoration Project has been conducted on this basis. It was designed to establish the lessons which could be learnt from coordinated practical restoration and to promote these widely to influence the wider agenda. This report describes the work and summarises these lessons, forming the first step towards wider promotion. However, due to their success all the trials are continuing in different forms through the local partnerships which initiated them so the opportunity now exists for lessons to continue to be drawn from them over a longer time frame.

2.6 The Biodiversity Action Plan

Planning for the project predated real take up of the Biodiversity Action Plan (BAP) (UK Biodiversity Steering Group 1995) as a driver of national nature conservation policy.

However, the project was well placed to explore delivery mechanisms for BAP at both a local and national level and these objectives were rapidly incorporated into its overall programme without losing sight of the original objectives. Lessons from the individual trials will help deliver individual local BAPs while the general conclusions will help deliver the BAP process more widely (Local Issues Advisory Group 1999). Similarly, the project was able to consider mechanisms to deliver Article 10 of the Habitats and Species Directive at a landscape scale. The project has explored some of the theoretical ideas described in Simonson and Thomas (1999) which considered the relationship between delivery of BAP habitat and species action plans.

2.7 Novel aspects of the Habitat Restoration Project

The most significant new aspect of the Habitat Restoration Project has been its holistic or landscape-scale approach to habitat restoration within the landscape, adopted through the vision map approach. The project has taken a coordinated, practical approach to the restoration of a 'wildlife friendly' landscape outside special sites and has worked with all landowners and agencies in the trial areas, whether sympathetic to nature conservation or not.

2.8 The vision map approach

The project has pioneered the use of vision maps for each of four trial areas. These map-based plans, and their supporting reports, translated BAP and Natural Area targets to appropriately quantified landscape-scale restoration objectives based on geology, topography, water table, former and current land use including areas of particular nature conservation importance (Figures 1.1 - 1.4).

Each map showed the distribution of existing semi-natural habitats, classed according to BAP priority types (solid colours) and suggested which habitats would be most appropriately restored to which locations to provide the greatest wildlife benefit (stippled or shaded colours). It was not anticipated that all of the trial area would be converted to the preferred habitat within the duration of the project. Rather, the map provided direction for individual landowners and their advisers considering carrying out habitat restoration as to which habitats and species would be most beneficial.

These maps were drawn up in consultation with local landowners or their representatives, local nature conservation organisations and other land management agencies through a local steering group. The voluntary principle operated throughout and project officers used the maps as an educational tool and means of clarifying what the delivery of the Biodiversity Action Plan meant for individual land owners. The maps had no statutory function and carried the following (or similar) rider: 'This vision plan shows an idealised picture of areas where the restoration or creation of particular habitats would be most beneficial to wildlife. The actual location of new habitats will of course depend on individual farm circumstances'.

Vision maps were published as part of a larger trial area report and as simple stand-alone documents which explained the objectives of the project and the characteristic species associated with each habitat which would be likely to benefit from restoration work. The trial area reports (section 3.4) described the characteristic species in the trial area, set targets for restoration and creation in keeping with BAP and Natural Area targets and suggested funding

options which might be available to landowners towards the restoration or creation of particular habitats.

Project officers used the vision maps in their discussions with landowners to help explain the overall project objectives. Because of the danger of misunderstanding, project officers introduced the vision maps during one-to-one discussions rather than part of large mail-outs. With time, the Alde project officer was more confident in her approach and included the vision map with display material about the project and with individual mail-outs. Overall the vision maps were well received by both landowners and conservation professionals.

3. The projects

3.1 How trial areas were selected

The project centred around four areas, each typical of different types of lowland English landscape. Each area covered approximately 100 km^2 located around the Alde Estuary in Suffolk, along a section of the River Great Ouse in north Buckinghamshire, within the Sherwood Forest area of Nottinghamshire and part of the Blackmore Vale in Dorset (Figures 2 and 3, Table 1).

Table 1. The Habitat Restoration Project trial areas

Local Project/ Trial Area Natural Area	Description
Renewing the Alde, Suffolk Suffolk Coasts and Heaths Natural Area	The trial area is situated on land around the Alde Estuary on the Suffolk coast. The landscape is very varied and contains many important wildlife habitats. Much of the low lying land adjacent to the river is used as grazing marsh. As the land gently slopes up from the estuary, the sandy soils, which once supported extensive areas of heathland, have been largely converted to arable use or to plantations of conifers. The heathland is now reduced to a few isolated blocks.
The Ouse Valley Link Project, Buckinghamshire West Anglian Plain Natural Area	The trial area is based on the River Great Ouse in north Buckinghamshire and south Northamptonshire within a landscape typical of middle England. Here the river meanders through a broad flat valley of rich pasture and arable farmland. Beyond the floodplain the land rises gently, in places forming a distinct ridge formed by an outcrop of limestone.
Renewing Sherwood's Wildlife, Nottinghamshire Sherwood Natural Area	The trial area is situated south-east of Worksop within the Dukeries area of Sherwood Forest. The most important places for wildlife are the remnant heathland and ancient oak/birch woodland, including wood-pasture. Three small rivers, which once supported marshland and flood meadows, flow through the trial area to the River Trent. The north of the area is dominated by a managed landscape of lowland mixed woodland, parkland, with artificial lakes and extensive areas of conifer plantation and arable farmland.
Enriching the Vale, Blackmore Vale, Dorset Wessex Vales Natural Area	The Blackmore Vale is a low-lying gently undulating clay vale south-east of Sherborne and south-west of Sturminster Newton. The land is used predominately for small dairy farms. The intensively managed grassland is dissected by a dense network of hedgerows and streams while small broadleaved woods are scattered throughout the area. Some arable farming is also present and, in the south-west of the area, more extensive areas of ancient woodland. Much of this woodland has been planted with conifers.

Trial areas were selected from a number of landscapes nominated by English Nature local team staff where habitat fragmentation was a critical issue, where local partnerships already existed or could be established and where coordinated work of this type would be welcomed. The landscapes and partnerships were each different and this report can make comparisons between the achievements in each area which may be attributable to different landscape features or partnerships (Sections 4.2 and 5).

3.2 The national overview

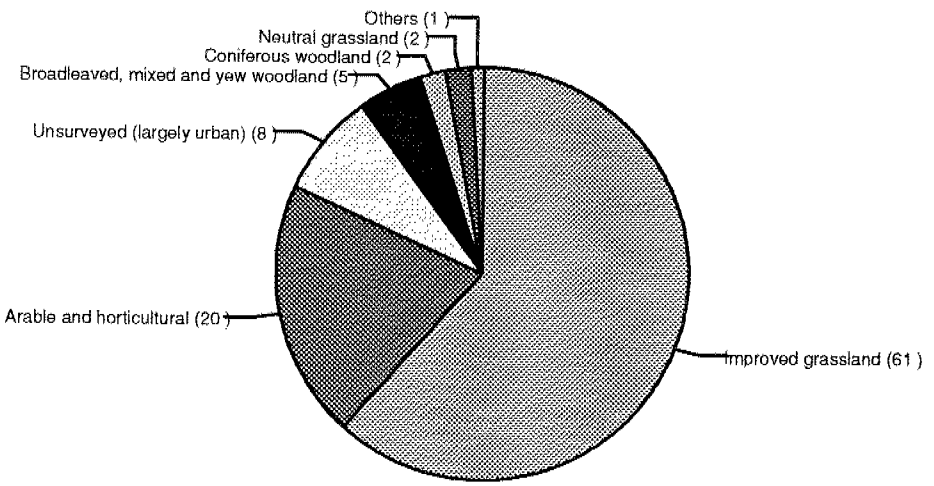
Overall, the project was managed through a national project board to which the project manager reported. The remit, composition and work of this board is summarised in Annex 2.

3.3 Location and landscapes

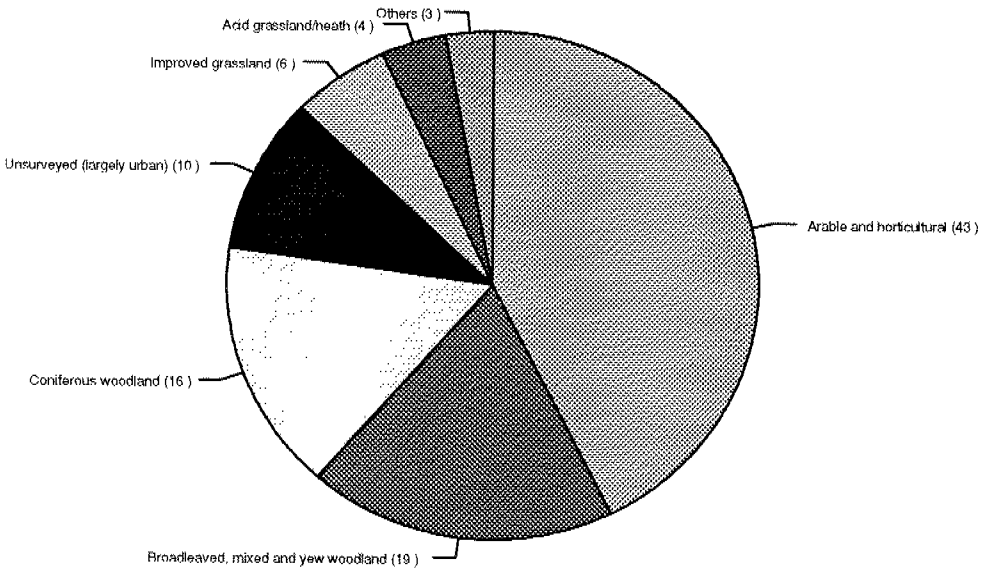
Figures 2 and 3 shows the location of each trial area. Early in each project, a Phase 1 survey was commissioned. The data from this was used to map each trial area by BAP habitat types. A link was established through the GIS system between Phase 1 codes and BAP broad and priority habitats (Bailey and Isaacs 1999). The resultant maps are shown in Figures 4.1.1 to 4.4.2 (BAP broad and priority maps) and the data are summarised in Annex 1. Table 2 and Figures 5.1-5.4 describe the land uses of the four trial areas.

Figures 5.1 to 5.4: Percentage land use in trial areas

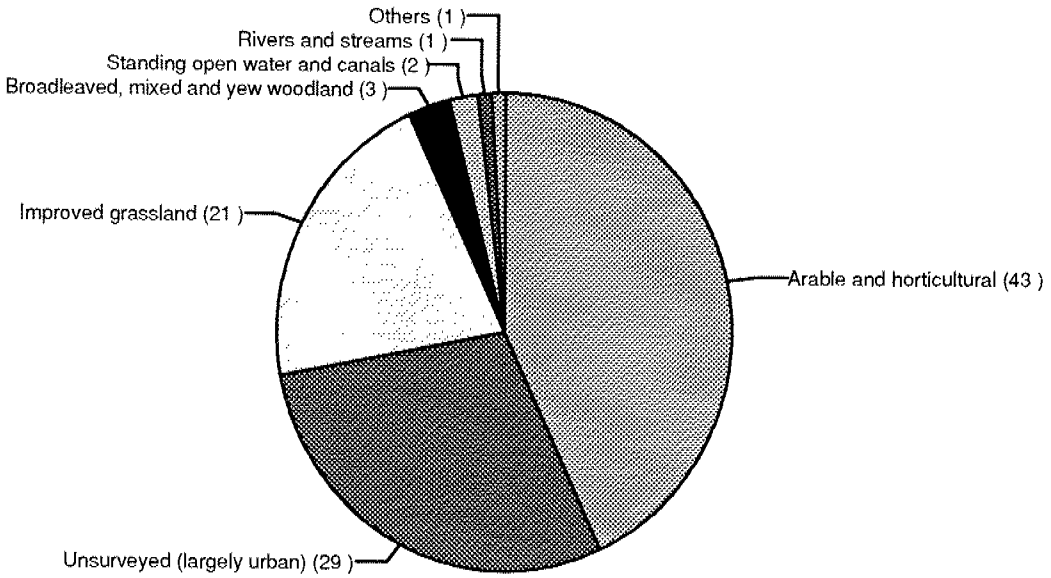
5.1 Blackmore Vale



5.2 Sherwood



5.3 Ouse Valley



5.4 Alde

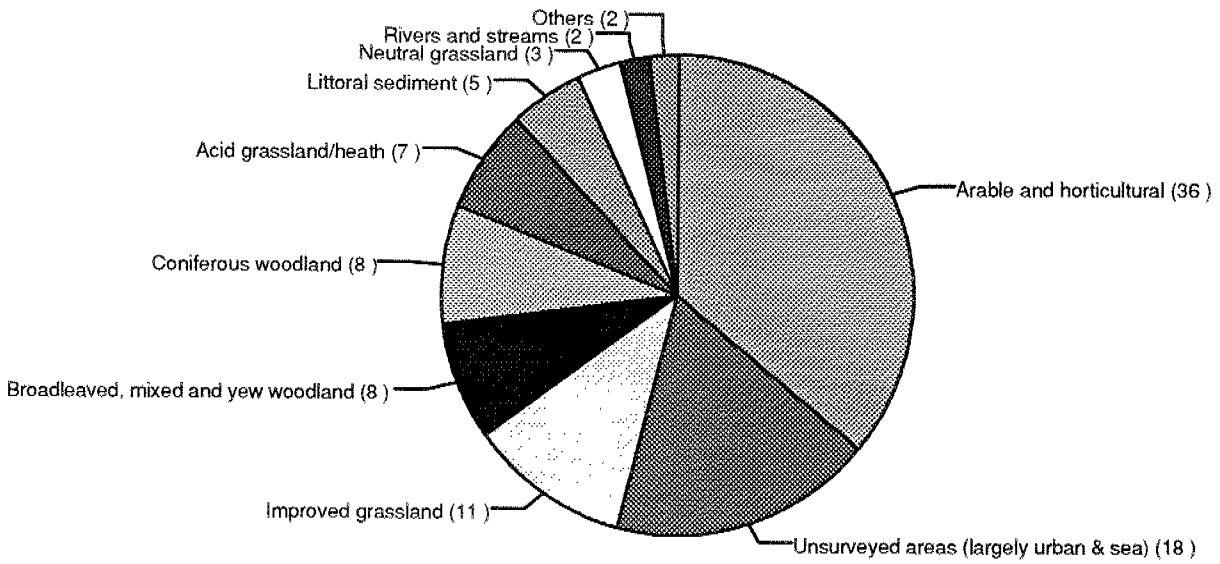

Others (2)
Rivers and streams (2)
Neutral grassland (3)
Littoral sediment (5)
Acid grassland/heath (7)
Coniferous woodland (8)
Broadleaved, mixed and yew woodland (8)
Improved grassland (11)
Arable and horticultural (36)
Unsurveyed areas (largely urban & sea) (18)

Table 2. Comparison of the Habitat Restoration Project trial areas

Trial area	Area and % of trial area notified as *c*SPA/*c*SAC, SSSI, County Wildlife Site	Principal BAP priority habitats	Area and % of trial area covered by BAP priority habitats	Area and % of trial area supporting arable and improved pasture	Area and % of trial area built up or not surveyed
Alde	5753 ha 53%	Heath land Reedbed Coastal grazing marsh Saltmarsh Mudflats Shingle Sand dunes	1849 ha 17%	5088ha 47%	2044 ha 19% mostly sea
Ouse	63 ha 0.6%	Wood-pasture and parkland Calcareous grassland Coastal and flood plan grazing marsh Fens	14 ha 0.12%	6904 ha 63%	3257ha 30%
Sherwood	2661 ha 26%	Wood-pasture and parkland Heathland Coastal and floodplain grazing marsh Lowland calcareous grassland Reedbeds	693 ha 7%	4905 ha 48%	1001ha 10%
Blackmore Vale	657 ha 7%	Neutral grassland Wood-pasture and parkland Chalk streams Acid grass/heath Purple moor grass and rush pasture Lowland hay meadows	336 ha 3%	8151 ha 82%	774ha 8%

Although the trial areas are each typical of lowland agricultural landscapes they are very different from each other. The Blackmore Vale is predominately a dairy area with 61% of the trial area managed as agriculturally improved permanent pasture. In contrast, the main agricultural land use in Sherwood and the Alde is arable while in the Ouse the farming is mixed. This reflects a national east-west spilt with dairy and beef production in the west and cereal and other arable crops produced in the east.

Forestry is a significant land use in Sherwood (where there are both broadleaf and conifer plantations managed by the private sector and the Forestry Commission and significant areas of lowland wood-pasture and parkland) and in the Alde (where large areas of former heathland have been planted with commercial conifer crops managed by the Forestry Commission). Elsewhere forestry is less important, although small woods contribute to the character of both the Blackmore Vale and Ouse trial areas.

The Sherwood trial area supported two additional distinct land uses; coal mining and the leisure industry, which single this area out from the other three. Some of the former mining land has been restored to agriculture but increasingly these areas are being restored to heathland or other non-agricultural land uses. The Sustrans long distance cycle way (part of the John O'Groats to Land's End route) runs through the trial area and this, together with Center Parcs and the Sherwood Forest Visitor Centre ensure that the leisure industry is a major employer and land use locally.

Tables 2 and 3 show the priority habitats important in each area and the degree of fragmentation of each. The Alde area is the highest biodiversity area with 17% supporting priority habitats defined under the Biodiversity Action Plan. This is reduced to 3% and 7% in the Blackmore Vale and Sherwood areas respectively and in the Ouse only 0.12% of the trial area supports BAP priority habitats. The area designated as important wildlife sites (*c*SAC, SPA, Ramsar, SSSI, County Wildlife Site/Site of Nature Conservation Interest) is higher than the area of priority habitats in all of the trial areas as there are important wildlife sites (eg oak/ash woods) which are not classed as BAP priority habitats.

Individual habitat parcels are larger in the Alde and Sherwood than elsewhere (7ha and 6ha respectively compared to 0.1ha in the Ouse and 2.5ha in Blackmore Vale). The level of fragmentation measured according to example mean inter-patch distance are similar in the Alde and Sherwood (less fragmented) than in the Blackmore Vale and Ouse (more fragmented).

Table 3. Example measures of fragmentation of BAP priority habitats for the trial areas before restoration work

Measure	Alde	Ouse	Blackmore Vale	Sherwood
Priority habitat as % of trial area	17%	0.12%	3%	7%
Number of individual priority habitat parcels	315	42	135	119
Mean priority habitat patch size (ha)	6.7	0.1	2.5	5.8
Example mean inter-patch distance (km)				
Saltmarsh	0.3	-	-	-
Heath land/acid grassland	0.4	-	0.9	0.3
Grazing marsh	0.6	0.5	-	0.25
Lowland wood-pasture and parkland	-	-	1.05	0.4

3.4 The projects locally

Table 4 shows the contractual partnerships which were established in each trial area to support the project officers and deliver the project. Project officers were employed under different contractual arrangements reflecting local arrangements with each partner. Again, although not a primary aim of the project, it is possible to compare the impact of advice from different sources and for different times in terms of their influence with the farming and landowning community (Section 4.2 and 5). Each trial ran for a minimum of three years.

Table 4

Trial area	Partner	Approx. cost *	Time	Cost/5-day week/year	Duration of project **
Alde	Suffolk Wildlife Trust	£48K	2 days per week	£40K	April 1996 to March 1999 ***
Ouse	Milton Keynes Parks Trust, Milton Keynes Council	£60K	Full time	£20K	April 1996 to March 2000 and ongoing
Blackmore Vale	Dorset Farming and Wildlife Advisory Group	£76K	4 days per week	£30K	April 1997 to March 2000 and ongoing
Sherwood	Sherwood Forest Trust	£76K	4 days per week	£30K	April 1997 to March 2000 and ongoing

* Includes English Nature's and partners' contractual contribution for the three years of the trial. Does not include English Nature's permanent staff time or partners overheads.

* * Project officers' appointments were sometimes delayed several months from the start of the project to allow for recruitment.

** * Work will begin again in 2000 under a wider Landscapes for Biodiversity Project for the whole Natural Area.

Table 4 and Annex 3 compares the cost of running the individual projects for the duration of the trial. These figures reflect the contractual arrangements with partners, different salary and overhead costs, the time commitment made by the project officers and the contribution made by individual partners.

The different partnership arrangements, land ownerships and landscapes created four projects each with a distinctive local flavour. In the Blackmore Vale the dairy farms are predominately small (*c*250ha) free-hold or tenanted holdings. This, together with limited prior involvement of nature conservation projects, led to a longer lead in time to the project which ensured Country Landowners' Association and National Farmers Union support. At a public meeting at the start of the project its voluntary nature and confidentiality was stressed. FWAG were well placed to provide nature conservation advice in this environment. The economic constraints under which dairy and beef enterprises operated during the course of the trial meant that landowners found it difficult to undertake positive nature conservation work if this involved additional capital costs, increased time commitment or removing land from agricultural production.

The Ouse project followed the work of the Milton Keynes Wildlife Corridor Project which had also been local authority led. Although many of the holdings are freehold, mixed and arable farms, the urban fringe location, the involvement of the local authority and the ease of public access ensured that landowners were familiar with receiving advice on nature conservation from non-farming sources to promote multi-objective habitat restoration and creation. This positive attitude is reflected in the amount of work achieved.

The Sherwood Forest Trust was set up as a neutral partnership with a clear policy of avoiding involvement in planning issues or contentious lobbying to help maintain good working relationships with private landowners. Less than half the trial area was farmed and a significant area across all habitats was managed by leisure, mining or military landowners.

Of the four trial areas, nature conservation was most important in the Renewing the Alde project area. The project officer was hosted by the Suffolk Wildlife Trust and other nature conservation organisations (RSPB, Suffolk Coasts and Heaths Project, FWAG) were already active in the area. The trial area included part of the Suffolk River Valleys ESA and 17 % of the area supported BAP priority habitats. Although 47% of the land is privately farmed a number of farmers might be classed as 'hobby farmers' earning a significant part of their livelihood elsewhere or through other enterprises. The RSPB and Forestry Commission were also significant pro-nature conservation landowners. As a result, farmers were well used to receiving nature conservation advice from conservation organisations and managing their land to encourage wildlife within a landscape where nature conservation was a significant land use.

A steering group, drawn from local nature conservation and land management organisations, was set up in each trial area to give direction and support to the project officer. In some cases there was also a wider advisory group with a similar composition. These groups were responsible for overseeing the project locally. Membership typically was drawn from English Nature, local authorities, Country Landowners' Association and/or National Farmers Union, Environment Agency, the Wildlife Trust, Forestry Commission, FRCA and private landowners. Specific membership reflected land ownership interests locally. In the Alde the steering group comprised the established Coasts and Heaths Conservation Group which had already been set up as a forum to discuss conservation and landscape issues within the Suffolk Coasts and Heaths Area of Outstanding Natural Beauty (AONB).

In each area, a project officer was employed by the partner organisation, partly funded by English Nature. The project officers' first tasks were to organise a Phase 1 survey of the trial area to asses habitat condition and extent (contracted out and funded by English Nature) and to prepare a report describing the characteristic land uses, priority habitats and species and the extent to which they had suffered fragmentation and loss during the twentieth century, restoration targets (based on BAP and the Natural Area targets), potential funding mechanisms for habitat restoration and prepare the vision map for use in the trial area. The report, targets and vision map were agreed with the steering group which also signed off the final local project report. All Phase 1 data were subsequently digitised onto a GIS system and was held by English Nature for use within the project.

The results of the Phase 1 survey remained confidential within the Habitat Restoration Project. They have not been used to identify individual holdings nor passed to other organisations without the landowners' permission.

Initial reports are available for each trial area as follows: Alde (Williamson & Horton 1997), Ouse (Wheeler and Horton 1997), Sherwood (Hewston, Horton & Hall 1998) and Blackmore Vale (Eppey, Horton & Hall 1998).

Initial contacts with landowners established through the Phase 1 survey enabled project officers to work with individual landowners to achieve habitat restoration on the ground. Project officers encouraged landowners to become involved in habitat restoration through their enthusiasm and by providing practical assistance (free advice; help with form filling; locating specialist machinery; organising labour, seed or planting materials) and providing help in obtaining funds towards the work.

3.5 Target setting

Targets for habitat restoration were set for each trial area based on the national Biodiversity Action Plan targets and the local Natural Area targets to test the extent of land use change required to deliver BAP at the trial area scale and nationally. Local targets were scaled according to the national targets and the abundance of the habitat in the trial area. Annex 4 shows the relationship between the three levels for each habitat within each trial area. As targets are based on BAP they are similar for each trial area and are composed of a restoration and creation target for each habitat.

3.6 Co-ordination of nature conservation advice within the trial area

In each trial area project officers contributed to coordination of nature conservation advice across the area. Their role was different in each area reflecting local circumstances. In the Ouse, and to a lesser extent in Blackmore Vale, the project officer was the main source of nature conservation advice to land owners. Neither the county wildlife trust (BBOWT) nor FWAG were active in north Buckinghamshire during the course of the Ouse trial while in the Blackmore Vale FWAG agreed to act as the principal conduit for advice for farmers.

In Sherwood there were many organisations providing fragmented and slightly different advice on nature conservation at the start of the project. These included FWAG, ADAS, Forestry Commission, FRCA and the Environment Agency which all directed landowners towards applications to Countryside Stewardship, the Woodland Grant Scheme or Nottinghamshire

County Council small grants for funds. In addition, the Countryside Agency's Land Management Initiative was active in the Sherwood area. Because of this complex position, the project officer integrated these main grant schemes and sources of advice through a short introductory leaflet and, with the agreement of the other organisations, promoted the Sherwood Forest Trust as the first point of contact for advice (a one-stop-shop). Organisations included in the leaflet were: Sherwood Forest Trust, FWAG, ADAS, Nottinghamshire County Council Countryside Management Service, FRCA, Forestry Commission, Environment Agency and Nottinghamshire Wildlife Trust. Although there was still some 'competition for custom' between the semi-commercial organisations, the project initiated an 'Advisors' Liaison Group' which met quarterly to share information, identify specialist sources of advice and contractors, encourage joint promotion, management and funding of practical work. The Liaison Group included advisers from FWAG, ADAS, Nottinghamshire County Council Countryside Management Service, the district councils, English Nature, the Environment Agency, the Forestry Commission, FRCA, Nottinghamshire Wildlife Trust and the Sherwood Forest Trust.

A similar approach could also have been adopted in the Alde where there were several advisory and practical management organisations able to help landowners deliver habitat restoration.

In these last two areas particularly, the vision map approach proved a valuable tool to help the many conservation professionals operating in the trial area agree the desirable restoration changes and provide the same basic advice to landowners on the most desirable habitat changes.

4. Restoration/creation achieved

4.1 Definitions

A distinction is made between habitat restoration and habitat creation. For the purposes of this project, habitat restoration is defined as the positive management of existing semi-natural habitat to improve its nature conservation value, eg the removal of scrub or conifers from lowland heathland or the raising of the water table across grazing marsh, while habitat creation is the establishment by planting, seeding, natural regeneration etc of new areas of semi-natural habitat on land which had formerly been managed for other purposes eg arable, improved grassland, industrial uses, gravel pits.

Throughout this report, it is assumed that through both habitat restoration and creation, habitats of equivalent quality to the semi-natural habitats present at the start of the trial have been created. The extent to which this is true depends on the location of the site, its previous land use and the management techniques which have been used in its establishment. A programme of site-based ecological monitoring has been established to assess the vegetational and structural changes which are taking place (see section 6) and test whether the botanical composition and structure are moving towards the predicted semi-natural composition.

In addition, a large parcel of one semi-natural habitat, composed of several smaller parcels of the same habitat but of varying qualities or dissected by footpaths or forest rides is assumed to be one uniform habitat parcel. These assumptions are used in calculating the impact of the project in reducing habitat fragmentation but are only strictly valid for certain more mobile and wide ranging species.

4.2 Restoration/creation achieved and its impact on fragmentation

Table 5 and Figures 6.1- 6.4 summarises the extent of restoration and creation achieved in each of the trial areas by habitat while Table 6 illustrates the impact this has had of fragmentation with reference to several example measures. The pattern of restoration/creation shown in Figure 6.1 - 6.4 is drawn at a small scale and distorted geographically to preserve the confidentiality of the landowners involved. Annexes 5 and 6 show the contribution made by individual categories of landowners and financial mechanisms. More detailed consideration of the changes achieved in each trial area are contained in the individual trial area reports (Eppey 2000, Hewston and Scott 2000, Wheeler 1999, Williamson 1999).

Overall, 1605ha of semi-natural habitat and 145km of linear features have been created or restored in the four trial areas. These are not evenly spread across the four areas with the greatest extent in the Alde (651ha) and the least in the Ouse (212ha). Similarly, restoration/creation of linear features was not evenly spread with the longest length in the Ouse (60km) and the shortest in the Alde (17km). Restoration is consistently more readily achieved than habitat creation as the former involves the management of existing habitat while the latter frequently involves taking land out of agriculture or another production system.

Habitat creation work increased the percentage of the trial area supporting priority habitats and, although the hectarage was greatest in the Alde, the percentage increase was greatest in the Ouse. The number of individual parcels increased in most cases as work was scattered across the trial area except in the Alde, where work was connected to existing parcels leading to a smaller number of larger parcels. Overall however, this work had consistently little impact on the mean inter-patch distance of the different habitats.

This pattern reflects the land use pattern in each of the trial areas, the size of individual habitat and land use parcels and the mechanisms which were available to land owners and project officers in encouraging restoration.

Table 5. Restoration achieved in each trial area

Restoration/creation work	Alde	Ouse	Blackmore Vale	Sherwood
Heathland and acid grassland	345ha restored 100ha created	-	-	136ha restored 167ha created
Neutral grassland Grazing marsh Lowland hay meadow	 140ha restored 8 ha created -	 147ha restored -	 - 11ha restored, 19ha created	 2ha created
Saltmarsh	31ha created	-	-	-
Fen, marsh and swamp Reedbeds Purple moorgrass and rush pasture	 6ha restored 0ha created -	 -	 - 28ha restored	 4.1ha created -
Calcareous grassland	-	14ha created	-	
Other grassland	1ha created	-	28ha restored 4ha created	8ha restored 41ha created
Hedges	5km restored to species rich status 1km of hedges created	19km restored/created	19km restored 1km created	20km restored 6km created
Standing open water Ponds	 8ha	 2ha ponds restored	 0.7ha restored 0.4ha created	0.07ha restored 1ha created
Broadleaf woodland Parkland and wood pasture	12ha -	28ha created/ managed 21ha restored	101ha restored 9ha created 43ha restored	27ha restored 40ha created 47ha restored 18ha created
Arable field margins	11km created	32km created	2ha?? and 3km created	15km created
River and stream courses		9km restored	2km restored 2km created	4ha restored 0.8ha created
Total	651 ha + 17 km	212 ha + 60 km	246ha + 27km	496ha + 41km

Table 6. Impact on fragmentation of restoration/creation achieved (comparison with Table 3)

Measure	Alde Before	Alde After	Ouse Before	Ouse After	Blackmore Vale Before	Blackmore Vale After	Sherwood Before	Sherwood After
Priority habitat as % of trial area	17%	20%	0.12%	1.5%	3%	4%	7%	9%
Number of individual priority habitat parcels	315	307	42	112	135	147	119	158
Mean priority habitat patch size (ha)	6.7	7.2	0.1	1.4	2.5	2.6	5.8	5.6
Mean patch size (all land uses)	4.0	4.0	6.2	5.9	2.8	2.8	4.2	4.2
Mean patch size of restoration/creation work (ha)	-	9.0	-	0.81	-	0.98	-	3.1
Example mean inter-patch distance (km)								
Saltmarsh	0.3	0.3	-	-	-	-	-	-
Heath land/acid grassland	0.4	0.4	-	-	0.9	0.9	0.3	0.35
Grazing marsh	0.6	0.6	0.5	0.7	-	0.02	0.25	0.48
Semi-natural woodland	-	-	0.5	-	-	-	-	-
Lowland wood-pasture and parkland	-	0.06	-	0.6	1.05	1.05	0.4	0.37

4.2.1 The Alde

The largest area of restoration/creation was achieved in the Alde where nature conservation bodies are most active and funding mechanisms are most readily available. Overall, as a result of the habitat creation work undertaken, priority semi-natural habitats increased from 17% to 20% of the trial area. There was an overall decrease in the number of habitat parcels from 315 to 307 and their mean patch size increased from 6.7ha to 7.2ha reflecting the location of the new work in areas which linked habitat parcels together. Continued at this rate, creation work could have led to a quarter of the area supporting semi-natural habitats in 10 years.

4.2.2 The Ouse

The majority of enhancement work carried out in the Ouse trial area was to grazing marsh and other grassland improving the quality and extent of semi-natural grassland in the area. Farmers and landowners preferred to change the management regime on areas of existing improved grassland to benefit wildlife rather than revert arable land to grassland. Overall this increased the proportion of the trial area supporting semi-natural habitat from 0.12% to 1.5% and decreased the mean parcel size from 6.2ha to 5.9ha. The mean size of worked areas was smallest in the Ouse (0.81ha), compared to 9ha in the Alde, 3.1ha in Sherwood and 0.98ha in Blackmore Vale. Restoration work was scattered over the entire trial area reflecting the involvement of particular private landowners rather than the availability of particular funding mechanisms or other strong land use or geographical influences. The larger blocks of grassland restoration occurred on land managed primarily for conservation, recreation or landscape; for example on land owned by a fishing club and on riverside parkland. Where grassland restoration occurred on farmland it was usually on either permanent set-aside, or on the least productive land, for example on a wet grassland fen. These areas were often much smaller in size. Only 10ha (7%) was created from arable. Both riparian grassland and areas of limestone grassland were restored in the preferred zones identified on the vision map.

4.2.3 The Blackmore Vale

Overall, the creation work led to a 33% increase in the area of trial area supporting priority habitats (3% to 4%). This was in small parcels (0.98ha) increasing the total number of parcels of priority habitat types but making little difference to their mean size and, because of their location, little impact on the mean inter-patch distance.

4.2.4 Sherwood

As with the other trial areas the majority of work undertaken was of habitat restoration, rather than creation and this was concentrated on the two principal habitats within the trial area; heathland and wood-pasture. As a result work was concentrated where these habitats already existed. Outside the trial area (Clipstone Forest) and in Birklands Bilhaugh area the Forestry Commission is removing forest crops to restore vestigial heathland. The influence of the Sustrans long distance cycle route can be seen in the pattern of enhancement achieved. The project officer concentrated much of his effort advising the landowners who owned portions of the route on the benefits of heathland restoration along its length. As in the Ouse and Alde, creation of cereal field margins funded by Countryside Stewardship were popular with landowners in arable areas.