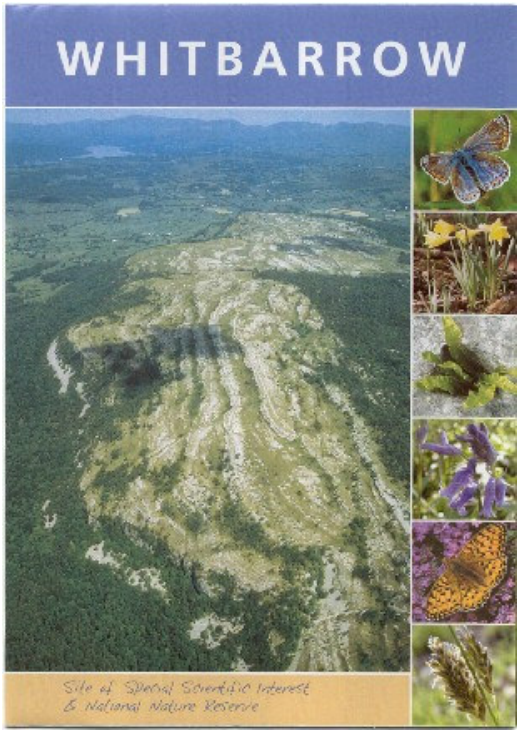
The Lowland Limestone Pavement Rehabilitation Project

Final Report



LIFE99/NAT/UK/006094: The Lowland Limestone Pavement Rehabilitation Project

The Lowland Limestone Pavement Rehabilitation Project
Final Report

Cover Photographs
The Whitbarrow leaflet front cover
Bloody crane's- bill on limestone pavement
Meandering runnel on pavement at Gait Barrows
Second technical workshop in progress

Introduction

Background to the project

The project is centred on the Morecambe Bay Pavements candidate Special Area of Conservation (cSAC) in northern England, UK. This site contains a mosaic of limestone habitats, all listed on Annex One of the 1992 EC Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna. The site includes the botanically richest limestone pavements in the UK, areas of yew-dominated woodland, lime woodlands, juniper stands on limestone, dry limestone grasslands, a calcium-rich, nutrient-poor lake and a sizeable population of the narrow mouthed whorl snail, *Vertigo angustior*.

The project area lies entirely within the cSAC and covers six component sites: Whitbarrow, Hutton Roof, Underlaid Wood, Marble Quarry & Hale Fell, Gait Barrows and Hawes Water. The component sites are split into 14 sub-sites as detailed in Table One.

Overview of main conservation issues being addressed

At the start of the project the main threats to the habitats within the cSAC were as follows:

- **Pavement removal to provide decorative garden stone.**

  Over 40% of the UK pavement resource has been removed for decorative garden rockery stone. The rate of loss has been reduced in recent years by improved legal protection and by education and awareness projects. The LIFE project will help to ensure protection of the pavement habitats within the project area.

- **Commercial Afforestation.**

  The limestone habitats within the project area are vulnerable to the impacts of commercial afforestation. The plantations consist of non-native conifer species and non-native beech. The closing canopy of non-native trees is shading the natural communities and, together with leaf and needle fall, is leading to a slow but significant deterioration of these habitats. The LIFE project aims to remove all non-native commercial forestry from within natural habitat areas.

- **Neglect: Woodlands**

  The woodland habitats within the project area need traditional rotational management to maintain their wildlife interest. These habitats have been commercially managed on this basis in the distant past but this is no-longer economically viable. The impacts of neglect within the woodlands are slow but considerable. The LIFE project will initiate thinning and coppicing within the woodland and remove some areas of overgrown scrub.

- **Neglect: Grasslands**

  The dry calcareous grassland within the project area requires low-intensity stock grazing to maintain its species diversity. The LIFE project will deliver stock grazing on two sites to prevent scrub encroachment and the spread of vigorous coarse grass species. The LIFE project will also prepare one site for future grazing.

- **Loss of natural conditions in the marl lake.**

  The marl lake within the project areas is subject to both scrub encroachment and an artificially low water table. The LIFE project will restore natural water levels and remove scrub from the marginal vegetation sequence of the marl lake.

- **Deer Grazing**

  The populations of red and roe deer within the project area are so high as to pose problems for the woodland management work and the regeneration of yew and lime woodlands. The LIFE project will cull deer within the project area to such a level that they will not compromise project objectives.

A mosaic of limestone habitats characterises the project area. The habitats include pavement, scrub, woodland, grassland and a marl lake.

Socio-economic context

The project area is currently under the ownership and management of the proponent and partners. All are committed to the aims of the project and to the long-term suitable management of the project area. The full ownership details are in appendix one. Some of the project sub-sites are under long-term (999 year) leases. The project land purchase will aim to obtain freehold ownership to improve the ability to fully manage the site.

Objectives of the project

The overall aim of the project is to restore the limestone habitats within the project area to favourable condition.

This will include:

- Restoration of limestone pavement, dry grassland, juniper scrub and native woodland, which have been affected by commercial afforestation. This will involve removal of non-native plantations by specialist techniques.

- Re-establishing traditional coppice and thinning management within the yew and lime woodlands.

- Maintaining grazing management of grassland habitats and preparing further areas for grazing management.

- Reducing to minimal the impact of deer grazing

- Managing the woodland and pavement habitats to ensure the survival and expansion of the populations of *Vertigo angustior*.

- Restoring water levels of the Marl Lake to their pre-drainage level and restoring marginal habitats to a near-natural condition.

- Developing and using sensitive, cost-effective and practical techniques to restore the project area. Disseminating information on these techniques to managers of similar habitats

Summary of progress

Summary of activities

Presentation of Results

We have followed the format used in our interim reports in the previous three years but in this final report we are also giving more of an overview of achievements over the whole project period. The detailed sections on individual action points discuss progress per site for each of the project sites over the four years of project operation. Where achievements have occurred in the final year this is either clearly mentioned in the commentary or for the more numerical targets shown in the year four columns of the tables. As with previous reports there is an initial overview and summary followed by a detailed breakdown of progress on each of the actions.

Haweswater. Lying close to the Gait Barrows reserve this marl lake has benefited from scrub removal from its marginal wetlands

Overview

Work on implementing the Lowland Limestone Pavement Rehabilitation LIFE project was initially constrained in the first year due to the proponent being unable to accept any advance funding from the EU and in the second year by foot and mouth disease restrictions. The third and fourth years of work have been relatively unconstrained and satisfying. There has been good progress in all areas and catch up on the targets that were behind schedule.

As shown in the overview tables below, the project has met its targets as specified in the bid and in some areas such as non-native tree removal, stock grazing and public involvement has exceeded our expectations.

Preparatory works and land purchase were completed early in the project allowing us to focus on the recurring and non-recurring biotope management. The project has effectively delivered restoration of habitats and has been well targeted to the habitats and species for which the cSAC is selected. Despite economic problems in the forestry and agriculture sectors we have confidence about the continuity of the project and the ongoing improvement of the condition of the habitats.

We have successfully engaged the local public through a publicity and dissemination project and through provision of new access and new leaflets. We have also created a suite of demonstration sites to use for future education work in the conservation sector. We have initiated links with southern Ireland and with the Limestone Country LIFE project and are set to continue with our close involvement with cattle grazing as a restoration tool.

These overview comments are further developed in the concluding sections of this report.

Overview tables of results

Preparatory Actions and management plans

Action	Description	Overall Target	Overall Progress
Action 1	New Forest Visit	Complete visit	Visit successfully organised and attended. Work complete.
Action 2	Management and Design plans	Complete plans	Six plans successfully completed. Work complete.

Land Purchase

Action	Description	Overall Target	Overall Progress
Action 3	Land Purchase	Purchase 204 ha of land at Whitbarrow	Land now purchased. Work complete.

Non-recurring biotope management

Action	Description	Overall Target	Overall Progress
Action 4	Removal of non-native species	Remove 158 ha of non-natives or scrub at five sites	166 ha of scrub removed, exceeding original and revised targets. Work complete and targets

			exceeded.
Action 5	Scrub removal by Chemical control	Remove 12 ha of scrub at five sites	12 ha achieved, mostly by ring barking. Work complete.
Action 6	Pine Plantation Removal	Remove 100 ha of pine plantation	100 ha of pine plantation removed. Work complete.
Action 7	Natural Regeneration	Promote natural regeneration on 5 ha at five sites	Target areas now cleared. Two areas fenced, but no other fencing needed. Natural regeneration establishing successfully. Seed/cutting propagation completed but will need future planting out. Work complete.
Action 8	Deer Fencing	Erect 4200 m of deer fence	3300 m of deer fence completed Felling work at Underlaid prevented further work there. Integrated with deer control measures. Work complete except for 900m of fence.
Action 9	Deer Management	Create glades to assist deer culling at five sites	Clearings completed on all five sites. Work complete.
Action 10	Bunding Work	Construct concrete bund at Little Hawes Water	Bund completed. Additional area also completed. Work complete and targets exceeded.
Action 11	Stock Fencing	Establish stock fencing	Fencing plan completed. Gates, fences and walls completed. Work complete.
Action 12	Trial Mowing	Mow 40 ha of grassland at Whitbarrow	Area now grazed by cattle instead. Work complete.

Recurring Biotope Management

Action	**Description**	**Overall Target**	**Overall Progress**
Action 13	Scrub Removal	Remove 279 ha of scrub from six sites	273.5 ha completed. No further areas to do, original target an over-estimate. Work complete.
Action 14	Maintain Deer Fences	Maintain fences on four sites	Fences maintained at four sites. Work complete.
Action 15	Coppicing	Coppice 20 ha on eight sites	20 ha coppiced on eight sites. Work complete.
Action 16	Deer Control	Conduct deer control on nine sites	Deer controlled on seven sites and deer population significantly reduced on all nine sites. Work complete.
Action 17	Bracken Control	Conduct bracken control on 3 ha at Hutton Roof and 10 ha at Whitbarrow	Control at both sites successfully conducted. Work complete.
Action 18	Maintain New woodlands	Maintain three woods	Natural regeneration establishing successfully. Work complete except for planting out of some young trees when big enough.

Action 19	Stock Grazing	Graze 330 ha at two sites	330 ha grazed and 250m of wall reinstated. Additional land (c60 ha) grazed at Whitbarrow. Work complete and targets exceeded.

Public awareness and dissemination of results

Action	Description	Overall Target	Overall Progress
Action 20	Press and Media	Local and national press coverage	Good local and national media coverage achieved throughout the project. Work complete.
Action 21	Project Launch and Events	Launch project	Formal launch completed. Two successful technical workshops held. Irish visit and report completed. Training day on management for Duke of Burgundy butterfly. Work complete.
Action 22	Public Involvement	Conduct guided walks and illustrated talks	Successful engagement of locals and visitors through 25 guided walks on various sites, public meetings and 10 illustrated lectures. Work complete.
Action 23	Technical Articles	Produce technical articles	Articles in Biodiversity News and ENACT magazine. Workshop Presentations as part of Action 21. 10 lectures as part of Action 22. Forestry students site visit. Work complete.
Action 24	Interpretation and Access	LIFE signboards on 4 sites. Temporary interpretation on 2 sites.	Sign boards on all five project sites. Interpretation on 3 sites. Improved access over 204 Ha. New project leaflet and Whitbarrow leaflet produced. Work complete and targets exceeded.
Action 25	Limestone Pavement Action Group	Education programme	The LPAG education programme is underway. Limestone pavement website established including LIFE section. Work complete.

Overall project operation

Action	Description	Overall Target	Overall Progress
Section F	Project Operation	Project Management	Audit and tracking mechanisms in place and used throughout the project. Work complete.

Detailed report of activities

Progress on preparatory actions and management plans

Summary: Works completed to schedule.

Action One: New Forest visit

The visit to the New Forest LIFE project was completed by three representatives from our project as reported in the first interim report. The visit was the foundation of our systems for overall project operation and we adopted many of the protocols and systems demonstrated by this project.

Action Two: Management and Forest Design Plans

The Forest Design Plans required to cover works at Whitbarrow, Underlaid Wood, Marble Quarry and Hutton Roof were approved in the first two years of the project

The management plans required on CWT managed sites (Hervey (part of Whitbarrow) and Park Wood/Uberash Plain (on Hutton Roof)) were also formally approved in the first year of the project.

The management planning work required to underpin the LIFE work on the sites was therefore completed early in the project.

Progress on land purchase

Summary: Purchase of 204 hectares of Whitbarrow completed.

Action Three: Purchase of land

Land was purchased at Whitbarrow in the third year of the project. The land purchased was entirely within the SAC but was larger than that proposed in the original bid. There were significant advantages in purchasing the entire management unit, for example the entire area is now being grazed. This has enabled a larger area to be favourably managed than originally planned within the project bid. There is also an additional benefit of improved public access. Open public access has thus been created on 204 hectares of land. This is entirely attributable to the LIFE project and there is now the opportunity for the general public to view the major restoration works completed on the site. The production of the Whitbarrow leaflet (see Action 24) has increased public awareness of the new access opportunities.

Completing the land purchase has changed the requirements for stock fencing (see comments under Action 11).

The original project proposal had included purchase of land at Dalton Crags on Hutton Roof. Due to unwillingness of the vendor this has not been progressed as agreed with the European Commission. However we have since found an alternative way forward on this aspect. A bid to the Aggregates Levy Sustainability Fund (ALSF) was successful in obtaining some £120k of funding. This funding includes the purchase of the Dalton Crags Area. The LIFE project

Action Three

Farrer's Allotment (pictured left) was purchased by the LIFE project in year three

group are working closely with the managers of the ALSF project and assisted in putting together the proposal. This aspect is considered in further detail in the section titled continuity of the project.

Progress on non-recurring biotope management

Summary: The works required to complete the non-recurring biotope management are now completed. This has covered a range of different works mostly relating to removal of 266 hectares of non-native plantations, the introduction of livestock grazing, fencing work to reduce any impact of native deer populations and the re-establishment of natural water levels at Little Hawes Water. This work has been dramatic and visible and has attracted considerable attention from the general public.

The non-recurring biotope management is the most challenging and biggest area of work within the project and was the biggest obstacle to secure favourable condition on these habitats. These obstacles have now been removed and with respect to this area alone the project has been a major achievement. In some of these areas of work we have needed to adjust methodology to deliver the required results but we have responded well to the challenges and found new methods to resolve problems on site. There may well be other minor issues to resolve on the sites in the future. They however will not be as technically difficult, expensive or intimidating as the work undertaken in this section.

Action Four: Removal of non-native species

During the four years of the project non-native tree species have been removed from all of the project sites. A total of 166 ha has been restored which is 8 ha more than our original target. The additional 8 ha of work have been funded by savings elsewhere in the project.

Until the work on site was actually begun it was difficult to predict the exact amount of non-native species present and extractable from a site. In some areas these amounts were over estimated while in others they were under estimated. However our broad estimate of areas in need of restoration was good and the only slight change has been in the balance of effort

between sites. The overall target has been met and exceeded and this means that excellent progress has been made towards restoring the limestone habitats in these areas.

Action Four Removing non-native beech and pine at Dalton Crags

At Whitbarrow there was a significant under-estimation of the amount of non-native removal required. This originated at the bidding stage and resulted from the difficulty in estimating areas of mixed woodland that have non-natives planted within them. The target area for Whitbarrow was consequently increased by 27 ha. Large areas were cleared in years one (35 ha) and two (52 ha) and focused on red cedar, larch and a surprising amount of beech. In year three no further work was undertaken but in year four the Forestry Commission removed a further 10 ha and the LDNPA another 1 ha of spruce. This has meant that the revised target has been successfully achieved (97 ha in total).

Conversely, there was less non-native removal to do on Dalton Crags at Hutton Roof. As work progressed on clearing beech, pine and Lawson cyprus, we realized that this was not as big an area as we had thought and that there were about 22 ha less than originally estimated. Therefore the target for this area was reduced from 40 to 18 ha as shown in the following table. In year four 12 ha were cleared, making a total of 22 ha cleared overall.

In Underlaid Wood, work to remove non-native species was started in year three. This was mostly larch and red-cedar clearance that occurred both in discrete blocks and as under-plantings in the broadleaved woodland. Good progress was made with residue handling, ie. pulling the branch wood and tops away from the limestone pavement and limestone grassland areas. In some areas where there were large amounts of residue the brash was mounded to accelerate recovery of woodland ground flora. In year four further large blocks of woodland were removed making a total of 27 ha cleared over four years. Underlaid Wood has been totally transformed by the work carried out under this Life project.

At Gait Barrows the non-native clearance has been completed. This follows steady progress through years one to three and a significant amount of careful removal of pine from the limestone pavements in year two. Due to the sensitive nature of the pavements, the work was completed entirely by hand and the pine trunk-wood and residue was carried clear of the pavements for disposal in a non-sensitive area.

The work at Marble Quarry has also been completed, although the totals here were 1 ha less than estimated. This work was more difficult than predicted with higher density and heavier timber than anticipated. This was completed to timetable and budget only by an additional input of 8 man weeks of Forestry Commission staff to finish off individual trees missed by the contractor.

The following table details progress by site. This shows that the revised targets have been successfully completed and even exceeded during the four years of the project. Any differences between the original targets and the actual hectares removed are explained in the above text.

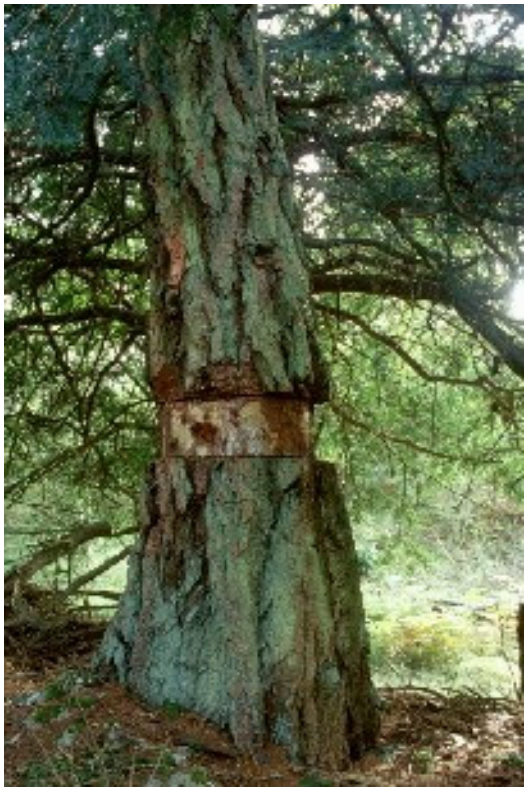
Site or subsite Action Four	Year One	Year Two	Year Three	Year Four	Original Target	Revised Target	Actual areas removed
Whitbarrow	**35**	**52**	**0**	**10**	**70**	**97**	**97**
Dalton Crags	**0**	**6**	**4**	**12**	**40**	**18**	**22**
Underlaid Wood	**0**	**0**	**9**	**18**	**27**	**27**	**27**
Marble Quarry	**0**	**14**	**0**	**0**	**15**	**14**	**14**
Gait Barrows	**2**	**2.5**	**0.5**	**0**	**5**	**5**	**5**
LDNPA Whitbarrow	**0**	**0**	**0**	**1**	**1**	**1**	**1**
Totals-actual per year	**37**	**74.5**	**13.5**	**41**			
Totals-cumulative	**37**	**111.5**	**125**	**166**	**158**	**162**	**166**
Target area for year	**39.5**	**39.5**	**39.5**	**39.5**	**Hectares**	**Hectares**	**Hectares**

Action Five: Non-native removal by chemical control

This work is part of implementing Action Four above but was intended to trial methods other than conventional felling. After the LIFE bid was submitted there were several changes in circumstances relating to Action Five. The first of these related to Gait Barrows and an application for organic status, which would preclude use of herbicides. The second event was the Forestry Certification of Forest Enterprise under the UK Woodland Assurance Scheme. This forest certification sets standards (in areas such as environment, health and safety, consultation and operations) that certified woodland owners must meet. As part of this certification Forest Enterprise had adopted a chemical reduction strategy. Both of these changes meant that chemical control was undesirable to meet the majority of this target.

Small areas of chemical control were completed at Whitbarrow and in the northern section of Underlaid Wood. These were relatively successful but it was undesirable to continue with this method of non-native removal.

This section has been progressed by using ring-barking rather than chemical poisoning. Ring-barking entails running a chainsaw around the bark of the tree which interrupts the uptake of sap. We are confident that the results will be identical although the delivery mechanism (how the trees are killed) has varied.



Action Five

Ring barking of Larch on Wakebarrow (part of Whitbarrow)

The larger non-native trees were selected for ring-barking. These are larch, beech and sycamore. The larger trees provide the best deadwood habitats as they have a higher volume of timber per stem and are likely to remain standing for longer. It is well known that standing dead wood is ecologically better than fallen dead wood and it is often the standing element that is absent from managed woodlands. The older and larger stems also have thicker bark and greater variety in form (more branches, scars and forks) and that is likely to result in better dead wood habitat.

This element of the project was substantially completed in year three (see table) with work at Underlaid Wood (2 ha) and Gait Barrows (1 ha) finished in the fourth year. In both areas beech was the predominant species although the occasional conifer and sycamore was included. Walking through the woodlands we now find occasional dead trees and clumps of trees which have been ring-barked and will provide varied deadwood habitat for many years to come. The technique is certainly not pretty and would not be appropriate for areas close to public footpaths or well-used amenity areas. In terms of cost effectiveness it is not much quicker or cheaper than simply felling the tree but there are benefits for long-term provision of deadwood habitat improving the structure and biodiversity of the woodlands.

Site or subsite Action Five	Year One	Year Two	Year Three	Year Four	Original Target	Actual areas achieved
Wakebarrow	**0**	**1**	**5**	**0**	**5**	**6**
Dalton Crags	**0**	**0**	**1**	**0**	**2**	**1**
Underlaid Wood	**0**	**0**	**1**	**2**	**3**	**3**
Marble Quarry	**0**	**0**	**1**	**0**	**1**	**1**
Gait Barrows	**0**	**0**	**0**	**1**	**1**	**1**
Totals-actual per year	**0**	**1**	**8**	**3**		
Totals-cumulative	**0**	**1**	**9**	**12**	**12**	**12**
Target area for year	**3**	**3**	**3**	**3**	**Hectares**	**Hectares**

Action Six: Pine plantation removal

100 ha of pine plantation was cleared from Whitbarrow (Farrer's allotment) in the first year of the project. The residue harvesting (removing brash and waste wood from the site) was completed in the first and second years of the project, slightly ahead of schedule.

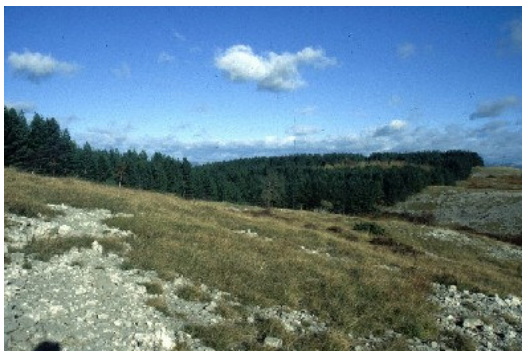
The plantation removal, spearheaded by Forest Enterprise was completed by mechanical harvester, which considerably speeded up the operation. Great care was taken not to damage the site by rutting or use of wheel chains and surface damage to the site was localised and minor. There was some follow up work required to remove any non-standard sized trees (the mechanical harvester can only cope with single stemmed and standard size trees).

To assist with residue harvesting, the brash (which is the tops and side branches of the trees) was put into rows by the harvester making later recovery quicker.

Brash and residue removal was programmed for the second year of the project but was brought forward. We experimented with a brash baler to assist with effective removal of brash. The brash baler was a Fiberpac 370 mounted on a conventional 8-wheeled forwarder. This gathers and hydraulically compresses brash into giant 'sausages' weighing 0.5 tonnes each. These are cut to a standard length and removed from site. The sausages can be cut to fit the standard size of timber lorry available from the UK transport industry.

The project has shown that this was a cost-effective and practical method for removing brash and restoring the habitat. The removal of material is effective and the residues of material left on site minimal. We used the machine for 4 weeks on the site at a cost of £7,000.

We encountered a difficulty in disposing of the brash sausages to the biofuel industry. The industry is in a development stage in the UK at the present time. Although they intend to utilise brash bales in the future, the industry would only accept chips at that time. After considering our options we gathered the remaining brash with a forwarder and chipped at a single location on site. The chips were then taken to roadside and some were sent to the power station at Selby. This power station subsequently went bankrupt and was not able to take any more chips.



Action Six. Before and After
A surprising new view opened up following pine plantation removal

The remaining brash sausages were eventually used at Forest Enterprise's Grisedale Forest to create and protect harvesting tracks. They were also used as a backdrop of a rifle range used for testing the sights of rifles required for deer control.

The result of the work so far is a spectacular restoration of some 95 ha of limestone grassland, some 5 ha of pavement and scree and small areas of juniper. The before and after air photographs contained within the first year report illustrate the results of this work. The restoration of this area received an extra boost with the introduction of cattle grazing detailed later in this report.

Action Seven: Establishment of natural regeneration

Action Seven was drawn up to promote the natural regeneration of yew, juniper or small-leaved lime. These three species represent three different Annex One habitats that occur within restricted areas in the Morecambe Bay Pavements cSAC.

The targets included 2 ha at Hutton Roof, 2 ha at Underlaid Wood and 1 ha at Whitbarrow. The identification and clearance of areas suitable for regeneration was completed on all three sites. Sites with slightly deeper soil were identified, as this is most likely to secure successful regeneration. The selected areas were cleared to promote conditions favourable for regeneration. Initially we had indicated that these areas would need to be deer fenced and two areas were fenced at Dalton Crags on Hutton Roof (0.5 ha) and Farrer's at Whitbarrow (0.5 ha). As the project has progressed, successful deer control measures were undertaken (as detailed elsewhere in this report) which have led to extensive natural regeneration that has not been browsed significantly. We therefore have not needed to fence to secure regeneration; yew regeneration at Whitbarrow for example was found to be prolific and thriving.

Although natural regeneration was the overall aim, the planting of some species was also planned. With this in mind there has been good progress with seed propagation and cuttings. Yew seedlings have been grown on from seeds collected at Whitbarrow. These have been planted out in the fenced area at Dalton Crags on Hutton Roof as well as at Whitbarrow.

In year four, two kilograms of juniper berries were collected from Whitbarrow to be propagated and grown on by a local nursery. These will be planted out in the areas identified for regeneration in due course. Work on establishment of juniper suggests that cuttings are in some circumstances more successful and quicker than seed propagation. Some cuttings have been taken from Whitbarrow and grown on and these will be planted out in due course (see also Action Seventeen). We shall compare the two different propagation techniques.

It was thought that small leaved lime was only likely to propagate by suckering from existing trees. We have however managed to germinate seeds from Gait Barrows and these have been grown on. It was hoped to plant these out in the final year of the project but they were found to be too small at that time. Therefore they have been maintained as seedlings and will be planted out in due course. We have also propagated trays of spindle, Lancastrian whitebeam, and buckthorn and these are presently being grown on, as they are too small for planting out.

Action Seven.

Trays of juniper and Lancastrian whitebeam for planting out

Action Eight: Deer Fencing

The deer fencing was originally proposed to secure regeneration of coppice and woodland. Protection of re-growth has been integrated with deer control. This has in some cases led to changed opinions of the need for fencing – see below. Overall protection of re-growth has been excellent and we have monitored the sites regularly and responded to any changing deer pressure.

Fencing has been erected at Hutton Roof, Whitbarrow and at Gait Barrows. There has also been good use of dead hedging at Whitbarrow (Howe Ridding) and Hutton Roof (Lancelot Clark Storth) to establish successful regeneration after coppicing. The Hutton Roof and Gait Barrow areas were not however included in the original bid or the yearly targets (in error). They have nonetheless been completed and regeneration secured.

At Whitbarrow a total of 2300 m has been erected, made up of traditional deer fencing as well as dead hedging. Steady progress was made with this work throughout the project. The largest effort occurred in year four at Howe Ridding, with 600 m of dead hedging being completed by Cumbria Wildlife Trust and a further 400 m of traditional fencing erected by the LDNPA to protect coppice coupes.

Fencing work was started at Underlaid Wood with one coupe fenced at the northern end of the wood (200 m). However, further fencing work could not be started until the clear felling was completed. The clear felling continued until the end of year four of the project and therefore the remaining target distance of 900m has not been completed. This site accounts for the shortfall in fencing distance in Action 8.

At Marble Quarry, deer fencing was not erected because it was not found to be necessary. The deer control detailed elsewhere in this report proved so effective that sufficient regeneration occurred without any fencing and no significant browsing was witnessed. It is planned to use tree guards and stakes in this area in the future should it prove necessary. The small Marble Quarry budget allocation has been used at Hutton Roof, where in year four 300 m of dead hedging were erected at Lancelot Clark Storth.

At Gait Barrows, fencing has been completed in East Coppice and along the access track generally using the successful chestnut paling enclosures. Fencing has been coupled with deer control to ensure that regeneration gets away both within exclosures and outside.

Action Eight

Successful coppice re-growth at Gait Barrows protected by chestnut paling deer fencing

Site or subsite Action Eight	Year One	Year Two	Year Three	Year Four	Original Target	Actual lengths achieved
Whitbarrow	**400**	**300**	**600**	**1000**	**2800**	**2300**
Underlaid Wood	**0**	**200**	**0**	**0**	**1200**	**200**
Marble Quarry	**0**	**0**	**0**	**0**	**200**	**0**
Hutton Roof	**0**	**0**	**0**	**300**	**0**	**300**
Gait Barrows	**0**	**200**	**300**	**0**	**0**	**500**
Totals-actual per year	**400**	**700**	**900**	**1300**		
Totals-cumulative	**400**	**1100**	**2000**	**3300**	**4200**	**3300**
Target area for year	**400**	**600**	**800**	**2400**	**Metres Fence**	**Metres Fence**

Action Nine: Deer management

As part of preparatory works required to improve the ability to control deer numbers it was proposed to create glades to provide improved opportunities for culling deer. This work is part of the scrub removal programme in Action Four.

Clearings were completed on all five sites: Whitbarrow (Wakebarrow and Durham Bridge Wood) Hutton Roof, Gait Barrows and Marble Quarry and were used to assist with deer control.

Action Ten: Bunding Work

Action Ten

Dam building at Little Haweswater is part of restoring natural hydrology to the site

The water table on Little Hawes Water had been artificially lowered in the historical past. This drainage took the form of blasting a narrow drainage channel through a limestone ridge lowering the water table by approximately 0.5 metres.

A concrete bund was constructed in this narrow drainage channel. The bund was designed to hold the water table at a specific level with an overflow down to Hawes Water, which operates when the water table is too high. The constructed bund essentially restores the natural hydrology of the system.

The planned bunding works were completed in year three of the project and during year four of the project a site visit confirmed that the bund is working well at present and will increase the area of wetland vegetation.

An additional area of bunding was also completed within the project budget. This is within the catchment of Little Hawes Water, some 150 metres north-east of the concrete bund mentioned above. When scrub was cleared from this marginal wetland under Action 13 of the LIFE project an additional opportunity for restoring natural hydrology was revealed.

Interlocking plastic piles (Similar to those used in the Border Mires Active Blanket Bog Rehabilitation LIFE Project) have been driven into the sediment to impede direct water flow and increase the area of natural fen vegetation.

It is too early to judge the impact of these dams but they have held water throughout the summer of 2003, during which there was very little rainfall. Dragonflies have been observed breeding and laying eggs in the newly created pool and we have every reason to assume that the impact of the dams will be positive. There will need to be commitment of resources to prevent willow encroachment onto the wetland but this can be built into future reserves budgets.

Action Eleven: Establish Stock Fence

The boundary work required to establish grazing on the southern end of Whitbarrow has been completed. The works were programmed for year four of the project, but preparation work and some of the work itself was completed in year three. The land purchase changed the alignment and nature of the stock fence. It was initially proposed to fence only the former conifer plantation and graze this with cattle. The land purchase gave us the opportunity to graze the entire area rather than a smaller sub-section.

A survey and a boundary plan were drawn up and consultation was carried out to ensure general support for the proposals. Following the successful consultation, stone walling and gates were completed to secure the north and east boundaries. Sections of the south and west parts of the boundary needed fencing and this has now been completed. A new gate has also been created between the two grazed sections at Whitbarrow (Hervey and Farrer's). This means that stock can be moved between the two units at no cost.

The costs of stock boundaries has been in line with the original bid as predicted in the year three interim report

Action Twelve: Trial mowing of grassland

It was proposed to carry out mowing of 40 ha of grassland at Whitbarrow in the final quarter of the third year and the first quarter of the fourth year. The mowing of grasslands was proposed to improve the condition of the sward to allow earlier introduction of grazing stock.

An opportunity arose to introduce grazing stock to this area (and other areas beyond the originally proposed 40 ha) without mowing. This is significantly better than just mowing and we have been delighted to have cattle grazing on the site so soon after its initial restoration. The mowing had little ecological benefit in its own right but was proposed to make introduction of stock more likely. The budget assigned to mowing has been used to pay for the grazing.

Further detail is provided in the commentary under Action Nineteen (Stock Grazing)

Progress on recurring biotope management

Summary: The programmes of ongoing biotope management required to deliver optimal management of the candidate Special Areas of Conservation are now in place. The work is broadly divided into two categories: woodland work and grazing management.

Work in the woodlands included almost 280 hectares of scrub control, 20 hectares of new coppice and much deer protection and deer management effort. We have seen successful management of the deer problem, which had the potential to damage some of our work. This has been achieved through an integrated cull and through strategic fencing, with regular review and adjustment of effort throughout. The woodlands are now thinned, open and have improved structure and ground flora. Butterfly populations have responded in a positive manner.

On the open habitats 20 hectares of bracken have been regularly controlled and almost 500 hectares are now under grazing management. Although the work in the woodlands has been excellent, the highlight of recurring management has been in securing grazing on the pine plantation area of Whitbarrow - beyond everyone's expectations.

Action Thirteen: Scrub Removal

Action Thirteen covered removal of native and non-native scrub from six project sites. Progress in the first year was severely constrained due to lack of capital funding. Despite the foot and mouth restrictions, year two saw some catch up of the targets. Progress in the third year was good with a total of 70.25 ha removed. In year four a further 112.25 ha were cleared, making a total of 273.5 ha cleared during the Life project**.** This is some 7 ha (or 2.5%) less than our original estimates.

The bulk of the work has been completed on the largest site, Whitbarrow, where a total of 159 ha have been removed during the LIFE project. Removal was largely of beech blocks where dense shade had impoverished the ground flora. The enormous change at this site has achieved the required conditions for the limestone habitats to recover and move towards attaining favourable condition.

Action Thirteen

Scrub clearance was undertaken on all six project sites. Desirable species such as yew, juniper, buckthorn and spindle were identified in advance and retained.

The work at Marble Quarry is completed and the site transformed. A total of 16 ha were cleared and there are now large areas of open habitat and un-shaded pavement where previously impenetrable conifers and native scrub existed. Again, the habitats can now begin to recover and move towards favourable condition. Similarly at Underlaid Wood a further 16 ha were removed in year four, completing the task as planned and making a total of 29 ha of scrub removed.

Work at Hutton Roof was divided between clearance at Uberash Plain and Lancelot Clark Storth, and at Dalton Crags. The majority of this area was open pavement that had become progressively overgrown by ash, hazel and sycamore. Work targeted the most overgrown pavements by comparing present day and 1975 air photos. This work was carefully supervised to ensure that trees and shrubs of interest were not removed. Thus juniper, yew, purging buckthorn, spindle, wayfaring tree and all whitebeam were carefully identified in advance and retained. In year four a further 20.5 ha were cleared at Hutton Roof, making a total of 51 ha over the period of the Life project, one hectare over our original target.

As indicated in the third interim report there were some difficulties in meeting targets at Gait Barrows, simply because there was an over estimation of the amount of work required. In the fourth year 4 hectares were cleared on east pavement and the areas south of the barn. A resurvey confirmed that there were some 7 hectares over-estimated for this site. It is not that we have not completed the work; just that further scrub clearance was not required on this area.

Site or subsite Action Thirteen	Year One	Year Two	Year Three	Year Four	Original Target	Actual areas cleared
Whitbarrow	3	42	43	71	159	159
Marble Quarry	0	12	4	0	16	16
Hutton Roof	0	21	9.5	20.5	50	51
Underlaid Wood	0	5	8	16	29	29
Gait Barrows	3	1	5	4	20	13
Little/Hawes Water	0	2	2.75	.75	5	5.5
Totals-actual per year	6	83	72.25	112.25		
Totals-cumulative	6	89	161.25	273.5	279	273.5
Target area for year	69.75	69.75	69.75	69.75	Hectares	Hectares

Action Fourteen: Maintaining deer fences

It was proposed to maintain deer fences on four sites (Whitbarrow, Hutton Roof, Underlaid Wood and Gait Barrows) within the project area.

The regular checks and any repairs have been completed to programme and deer have not browsed within any of the project exclosures. Although successful deer control has locally reduced populations there is still pressure on the exclosures and a need for regular appraisal of fences and deer pressure outside the exclosures. This is especially important in the winter period when trees can knock fences down and when the deer are at their most hungry.

Action Fifteen: Coppicing

Coppicing was proposed for eight sites as detailed in the table below. Coppicing was successfully completed to programme on all of the eight sites, although the balance of the actual areas achieved on the different sites varied from the original plan.

Site or subsite Action Fifteen	Year One	Year Two	Year Three	Year Four	Original Target	Actual areas achieved
Whitbarrow (FE)	0	1	1	2.5	4	4.5
Underlaid Wood	0	0.5	0.5	0	2	1
Howe Ridding	0.5	0.5	0.5	1	2	2.5
Hutton Roof	0.5	0.25	0.5	0.75	2	2
Park Wood	0.75	1.25	0	0	2	2
Gait Barrows	1.8	0.5	1	2.7	4	6
Whitbarrow LDNPA	0	0	0	1	3	1
Durham Bridge Wood	0.25	0.25	0.25	0.25	1	1
Totals-actual per year	3.8	4.25	3.75	8.2		
Totals-cumulative	3.8	8.05	11.8	20	20	20
Target area for year	5	5	5	5	Hectares	Hectares

In year four coppicing at Whitbarrow took place at Farrer's Allotment (2.5 ha), Howe Ridding (1 ha), Durham Bridge Wood (0.25 ha) and on the LDNPA reserve (1ha). The last of these sites was a particular success as we had struggled to initiate management on this site. In other areas year four saw major results at Hutton Roof (0.75 ha) and a considerable 2.75 ha at Gait Barrows. At Gait Barrows some of the coppice coups were exceptionally prominent, being roadside or next to footpaths and have attracted much comment. Coupled with temporary on-site interpretation this sends strong messages about the desirability of actively managed woodlands and is an ideal place to demonstrate a flush of ground flora, an influx of butterflies and strong healthy re-growth of coppice.

Action Fifteen

Volunteers in action burning coppice residue (brash) in Howe Ridding Wood

As mentioned in previous reports coppicing has been carried out across the project sites. Overall we have met our targets, although on two of the sites we have achieved a smaller area than originally planned. At Underlaid Wood the scale of the scrub and non-native removal has

been so great that we have been unable to coppice on the site in year four. Felling of trees, removal of timber and movement of machinery has made it physically impossible to work on the site. The missing area was made up on other sites once we realised that this was the case. At the LDNPA reserve on Whitbarrow, coppice works did not start until year four of the project. The key point here is that a programme has now been put in place and work will continue into the future.

The coppicing programme has been one of the most rewarding areas of work within the project. There has been an excellent response in the ground flora, especially those species, such as violets and primroses, used by butterflies. Good butterfly populations are seen using the LIFE coupes during the summer including observations of High Brown Fritillaries laying eggs in newly cleared areas. Re-growth of coppice stools has been strong; an indicator of the success of deer fencing and deer population control.

Action Sixteen: Deer control

Deer control was proposed on nine sites and the overall deer cull figures are shown below.

Site or subsite Action Sixteen	Year One	Year Two	Year Three	Year Four	Totals
Whitbarrow (FE)	16	25	21	24	86
Underlaid Wood	6	5	10	2	23
Howe Ridding	4	4	2	2	12
Marble Quarry	0	0	0	0	0
Hutton Roof	2	2	4	8	16
Park Wood	0	0	0	0	0
Gait Barrows	9	6	4	2	21
Whitbarrow LDNPA	0	0	2	5	7
Durham Bridge Wood	0	0	2	0	2
Totals-actual per year	37	42	45	43	
Totals – cumulative	37	79	124	167	167

Deer control has been constant over the four years of the project as shown in the table. On some sites that are adjacent we have shot heavily on one of the sites and the impacts have been seen on both sites. For example any zero take from Whitbarrow LDNPA and Park Wood represents good control in the adjacent Hutton Roof and Howe Ridding areas.

The results of deer control have been good. On site indicators such as yew growth and bramble and even coppice re-growth outside fenced areas show that on the LIFE project sites, where deer control has been carried out, deer populations are maintained at such a level as to not compromise nature conservation.

The numbers of deer culled have been greatest at Whitbarrow where the herd size was considerable. At Gait Barrows the same effort was put into deer control each year and the declining returns are a good indicator that the control has been effective. Declining numbers there are also due to a greater level of deer control on the surrounding land, as well as poaching being rife in the Gait Barrows area.

It was decided that deer stalking would not be carried out at Marble Quarry for a number of reasons. It is adjacent to a caravan park and has significant levels of public access, and is

therefore not the best place for deer stalking. The deer here are also part of the same herd affecting other sites and so the control undertaken elsewhere (eg. Gait Barrows and Underlaid Wood) has benefited this site.

Mention has been made in previous interim reports of the potential problems at Dalton Crags (Hutton Roof) with deer control. It was originally proposed to purchase the freehold ownership of Dalton Crags and along with it the sole right to control deer. This was not possible and an alternative option at Whitbarrow made full and pleasing use of the land purchase budget. At Hutton Roof therefore, the project partners have had less than full control of the shooting rights. To address this problem in year three we negotiated an agreement with the agent of the freehold owners allowing Forest Enterprise to start a more active control programme on this site. The deer glades required for safe and effective shooting were already in place and an increased cull occurred in years three and four (see table). Browsing was significantly reduced and because Forest Enterprise now have an improved influence on deer management here no further deer fencing has been necessary.

We are making an effort to co-ordinate the approach to deer management over the whole project area. Project partners are represented on the Arnside–Silverdale and South Lakes Deer Management Groups. These groups agree a strategy for overall control and are influenced by the argument that overall populations are too high. This voluntary deer management group is however not a guarantee to effective deer control. It does not represent all land managers in the area and its members represent only those with an interest in deer.

The nature of this area is agricultural land with fragmented pockets of woodland. Thus it is impossible to wholly manage the deer population. There will always be pockets of land where no control is carried out. We therefore focused our deer management on two levels. First a strategic level through the management groups and second on a site level. Control on a site level was driven by indicators of deer impact, as detailed in our bid, and by the speed at which deer in-filled a site, giving an indication of the population in the wider area.

Action Sixteen

Careful deer control on project sites has secured good regeneration of coppice

Action Seventeen: Bracken control

Within the project it was proposed to control bracken on the deeper soil areas within the limestone pastures. This was proposed for two sites as follows:

Hutton Roof: 3 ha on a yearly basis
Whitbarrow: 10 ha as a one off operation.

At Hutton Roof physical control has been carried out in years one, three and four over a larger area than originally proposed in the bid. 16 hectares were controlled by physical methods (bracken bruising) but this was not possible in the second year due to foot and mouth restrictions. The weed wipe trial mentioned in the first interim report was not a success, largely due to problems with the contractor rather than inherent problems with the technique, and therefore this was not repeated. However the physical control has been successful and the bracken is not increasing in extent.

The work at Whitbarrow (10 ha) was proposed as a single operation (see text for action 17 in bid) and was completed as programmed in year two. There has been some additional work in years three and four carried out by cattle grazing. More detail on this aspect is provided in the commentary under Action Nineteen, but careful use of water sources and mineral licks encourage the cattle to congregate in bracken areas where their weight tramples the bracken and breaks up its roots and rhizomes. This is a traditional and effective method.

The end result of the bracken control as described is somewhat different to the original proposals. The chemical reduction strategy under the FC Forestry Certification and the likely application for full organic status at Whitbarrow meant that the use of asulox (or other weed-killers) was no longer considered appropriate. Therefore physical methods of control have prevailed. This has meant that larger areas have been tackled on a more regular basis. We have therefore exceeded by area the extent of control. The physical methods of bracken control are best suited to continued treatment rather than single applications and we shall continue to control bracken over the coming years on the two sites.

The following table shows our bracken control over the four years. It should be noted that the totals can not be viewed as cumulative. Control occurs over the same bracken areas on the same sites on a year on year basis. Control of bracken by its nature, is a gradual process where the vigour and extent of the species is worn down by control methods. The table therefore shows that we have been consistent in our control (this is needed) and that we have tackled a larger area than set out in the bidding document.

Site or subsite Action Seventeen	Year One	Year Two	Year Three	Year Four	Overall Target
Whitbarrow (FE)	0	10	10	10	10 (3x10)
Hutton Roof	16	0	16	16	3 (4x3)
Totals-actual per year	16	10	26	26	13
Target area for year	3	3+10	3 +10	3+10	Hectares

Action Eighteen: Maintain new woodlands

No action was proposed for years one or two of the project. During the third and fourth years we have propagated yew, juniper and lime seedlings as mentioned in the commentary under Action Seven. The fenced regeneration areas have been regularly checked to ensure that they are deer proof and natural regeneration in the project area has been monitored. No further work was required to maintain the natural regeneration, which has been establishing successfully in many areas without our intervention.

Action Nineteen: Stock grazing

The grazing of 330 ha at Hervey (Whitbarrow) and Hutton Roof has been completed as within the project proposals. The result is the maintenance of a species-rich grassland sward.

Action Nineteen

From Plantation to Pasture. Cattle grazing on the former pine plantation at Whitbarrow.

Grassland condition assessments were carried out in the final year of the project. The initial results are encouraging although the blue moor-grass is still tussocky and in places dominant. Further detail is contained within the impacts on species and habitats section of this report.

At the Hervey Reserve (Whitbarrow) the dry weather during the summer of the fourth year meant that the cattle had to be moved back to Farrer's Allotment (Whitbarrow) earlier than anticipated. This was to prevent them causing excessive poaching around the tarn area which was their only water source.

The grazing calendars at Hutton Roof have been slightly disrupted by the foot and mouth outbreak. At Hutton Roof the grazing is carried out by owners of common rights. The owner of the land (CWT in this case) has no rights to carry out grazing themselves. Thus if a commoner chooses not to graze then the owner cannot force them to carry out this management. Following foot and mouth disease, a third of all sheep have been lost in

Cumbria. There is therefore little or no agricultural need to graze marginal grasslands. There is plenty of highly productive land available. Thus on Burton Fell and Lancelot Clark Storth (approximately 70 hectares) there has been grazing in the autumn and winter of 2001 but no stock in spring or summer. The direct intervention of Bill Grayson as detailed in the Irish report (see appendices), has improved the outlook for both of these reserves with autumn and winter grazing secured for the future.

The larger part of the Hutton Roof area, Uberash Plain (110 hectares) has been grazed in the autumn of the third and fourth years of the project.

As part of the grazing activities carried out under the LIFE project, lengths of stone boundary wall have been repaired. In year four an additional 71 m at Uberash Plain (Hutton Roof) and 30 m at Hervey Reserve (Whitbarrow) were completed, making a total of some 226 m over the four years of the project. This improves the nature of the land for stock grazing and encourages commoners to exercise their grazing rights.

The most exciting development during the third year of the project was the re-introduction of grazing at Farrer's allotment on Whitbarrow. This has been beyond all expectation and has been summarized by the catchphrase "from plantation to pasture". Here, cattle grazing has been introduced on the former pine plantation. Traditional breed cattle (Devon and Devon-cross) have been used, as these breeds are suited to efficiently utilise the low quality-high volume herbage of Whitbarrow. Initially an electric fence allowed grazing of different areas and the cattle were moved around the site. Following completion of the stock proof boundary the cattle are now free to roam over 204 hectares of grassland, pavement and woodland.

Because of the dry nature of this limestone land, drinking water has to be provided by a bowser (tanker and trough). Some feed blocks were used in April and early May to tide the cattle over until the grass provided enough nutrition.

This bowser and the feed blocks give the opportunity to carry out bracken control. The bracken is susceptible to trampling by cattle as they break up the underground rhizomes. Thus placing the water trough or feeding in areas of bracken acts as a effective control measure.

The grazing has been paid for under funds originally allocated for mechanical mowing of the grasslands. The costs relate to the maintenance of fencing, regular checking of stock, provision of water and transport costs for the stock. In view of the poor agricultural quality of grazing it is unlikely that this type of land will ever generate revenue other than through agri-support (ERDP) mechanisms. Following a change in Policy, there is now a commitment in place to support this grazing through the ERDP in future years.

As well as improving condition on a larger area than proposed for mowing, the current outcome is more natural, sustainable and will more rapidly deliver restoration of the grasslands. The results of the grazing are already evident on the ground. The sward is shorter and less tussocky. It is unlikely that species composition will change very quickly and we might be looking at a 5-10 year period to improve quality in this respect. We will continue with cattle grazing on this site beyond the end of the LIFE project.

Public awareness and dissemination of results

Summary: Over the four years we have been successful in raising public awareness of our project and in disseminating the results of our work. Broad awareness and support for the project and its conservation aims has been gained. This has been achieved by a number of different techniques. By far the most effective method had been our targeting of local communities through guided walks, local meetings, on-site interpretation and improvements to open access. We consider that the well-received Whitbarrow leaflet is the highlight of this area of work. We have also achieved a profile in the local and national newspapers although we have found this more difficult to achieve and less targeted than our work with communities. The project is well known in conservation circles through the ENACT and Biodiversity magazine articles, through our technical workshops and through informal networking. A change in focus in the fourth year of the project relates to our work with cattle grazing and our links to the Limestone Country LIFE project and visit to southern Ireland.

Action Twenty: Press and media work

The four years of work with the press and media have brought success in terms of coverage in local and occasionally national media. A push on press releases in the years two and three of the project gave us something of a media profile especially associated with the land purchase and introduction of cattle grazing. We consider that in terms of returns that this is not an especially effective medium for selling our messages. We have been far more effective in our guided walks and local access works, and are confident that with these our message really gets across. As we do not have any in-house media expertise we have occasionally used City Press consultants to produce press releases. This method is expensive and dilutes or dumbs-down the conservation message to a bare minimum, reducing its effectiveness. In summary the local and national press raise awareness but do not sufficiently disseminate our results and aims. Press and media has been an integral part of our work but only coupled with other strands of awareness and dissemination.

Action Twenty-one: Project Launch and Events

Action Twenty-One

The second technical workshop looking at coppice coups, Gait Barrows

The project was formally launched in the second year of the project with an event at Levens village (one of the communities close to Whitbarrow). The event attracted considerable media interest and was attended by Harry Griffin who has been so complimentary of our works in his column in the national Guardian newspaper.

Two technical workshops were held. The first, in November 2000, was a regional training event with FC staff and staff responsible for implementing the actual works. The second was held on 20-21 June 2001and was attended by more than 20 participants, including representatives from the Sailsbury Plain and Yorkshire Limestone Country LIFE projects and two representatives from Ireland who have been working on cattle grazing in the Burren. As mentioned elsewhere the focus of discussion was on grazing of limestone sites as a restoration tool although the scale of works at Whitbarrow was impressed on all.

At the second workshop there was agreement that a visit to southern Ireland, in partnership with the Limestone Country project, would further our understanding and dissemination of cattle grazing on limestone habitats. This was conducted along the lines of the LIFE co-op measures and a full report of the visit and its findings are appended to this report. As recommended by the Commission we have produced this as a stand alone report to aid with effective dissemination of the findings.

In April 2003 we enjoyed a day visit from Suzanne Pauli of the European Commission who looked at some of our progress and achievements to date. We appreciated her thoughts on the continuity of the project.

A LIFE training workshop on management for the Duke of Burgundy butterfly was held at Gait Barrows on May 23 2003. This was a demonstration event to show the optimal management of limestone woodland sites for the butterfly. It was run in partnership with Butterfly Conservation (an NGO with the remit of conserving butterfly populations) and was attended by 25 people.

Action Twenty-two: Public meetings and guided walks

This aspect of the project has been one of the most successful. The project has been high profile and numerous groups, bodies and interested individuals have wanted to visit the sites. This is especially relevant to Whitbarrow where the scale of change and its prominence in the landscape has attracted considerable attention.

Some twenty-five guided walks have been led during the four years of the project. These varied in size between several people and groups of more than 100.

Three of these involved a large numbers of participants. The Silver Jubilee celebrations at Gait Barrows discussed the recent contributions of the LIFE project with 120 guests. The Royal Forestry Society and Association of American Foresters visited Whitbarrow and was attended by over 100 members. The British Ecology Society also visited Whitbarrow as part of their summer conference with over 80 visitors. Overall, close to 500 visitors have been guided around the project sites to see the work in progress. We have thus got our message across to a considerable number of the interested public and from the feedback received have been successful in increasing support and awareness of our plans.

Action Twenty-Two

Guided walks have been an integral part of our publicity and dissemination work

In the fourth year of the project about 25 people from the local Natural History Society visited Underlaid Wood for a guided walk (14 April 2004). The John Muir Trust had their AGM visit to the Hervey Reserve and Farrer's Allotment (Whitbarrow) on 17 May 2004. This was attended by about 30 people and was very well received. A further 45 students (from Lancaster University and Newton Rigg College) visited the project in January and February 2004.

A national moth evening was held at Gait Barrows on 12 April. This was well attended and the benefits of the LIFE works explained. Moth trapping was carried out. When compared to the national results (recording was carried out all over England on that date) Gait Barrows was the richest site in the country.

Action Twenty-three: Technical Articles and Presentations

There has been a number of technical articles and presentations throughout the project. The ENACT article was well received and serves as a useful summary of how we are undertaking the works. There has also been a summary article in Defra's Biodiversity News and production of a LIFE project leaflet, which provides a good overview. We have included a considerable amount of technical information in our Whitbarrow access leaflet.

The most important of our presentations were at the three technical workshops (mentioned in Action 22) covering the full range of activities within the project.

A series of 10 lectures were conducted (mostly to audiences within the County) over the project period. These lectures were primarily about limestone habitats but also covered the objectives and results of the LIFE project and acknowledged the European Commission funding.

The majority of the visits detailed in Action 22 above, entailed presentations of a technical rather than general nature. These included university students, forestry and natural history societies and those from professional conservation backgrounds. A considerable amount of technical information has been disseminated in this manner.

Action Twenty-four: On-site interpretation and access improvements

The blue threshold signs (as pictured below) were erected on all five project sites. These show the LIFE logo and acknowledge that the restoration management works being carried out on the site are funded by the European Commission.

Action Twenty-Four

Examples of on site signs and interpretation.

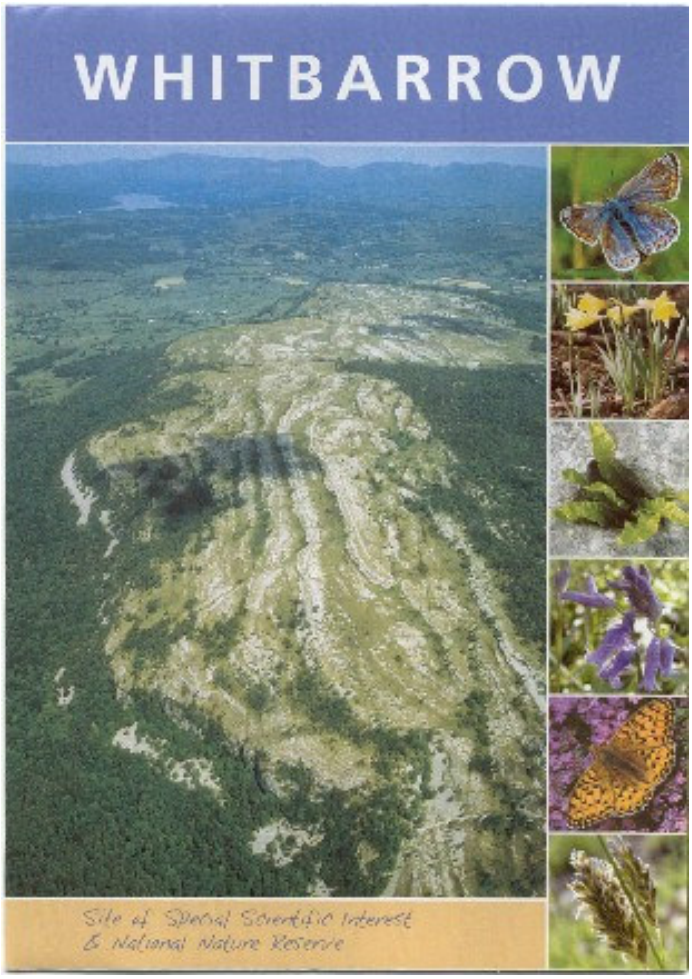
Our experience is that this element of work is essential in gaining awareness from the general public

Access for the general public has been considerably improved at Whitbarrow where 204 hectares of previously private land is now open to the general public. This is due to the land purchase element of the LIFE project. The general public has an improved opportunity for quiet enjoyment and to view the results of the restoration works.

Work on securing public access to Dalton Crags will continue beyond the end of the LIFE project. This will be funded by the ALSF (see detail under Action 3 and the section on continuity). The ALSF project will also fund production of a Hutton Roof and Farleton Knott leaflet in a similar style to the Whitbarrow one detailed below. This is scheduled for production before the end of 2003.

The overview LIFE leaflet produced in the third year of the project remains a good tool to get across a summary of our project. The focus and language is well suited to the interested visitor or local resident and this makes them handy for distribution on guided walks or at lectures. These leaflets have been circulated to numerous local outlets such as libraries, visitor centres, partner organisations, etc.

A Whitbarrow leaflet has been completed. This covers the whole of the candidate Special Area of Conservation, including all the LIFE project sites. It also draws attention to the new access opportunities on 204 hectares of Farrer's Allotment and explains the radical restoration that has been undertaken on this site. It paints a picture of the type of management applied to the different habitats and sites within our project. The leaflet is high quality, accessible and popular especially in the surrounding local villages. We are proud of the leaflet and it is appended to this report.



Action Twenty Four

Good progress with production of the Whitbarrow leaflet in the final year of the project.

On site interpretation has been maintained at Gait Barrows and Hawes Water and at two areas of Hutton Roof. Examples of interpretation were supplied with the third interim report. Temporary interpretation has been used on sites when operations were taking place such as coppicing, conifer clearance or other works.

Action Twenty-five: Limestone Pavement Action Group

The objectives of the LPAG are to carry out an education programme to reduce damage to limestone pavements and to improve their management. The actions of the LPAG are thus complementary to those of this project.

Due to uncertainties in funding (the post is voluntary sector) the LPAG post was vacant for 18 months. This has now been resolved and a project officer has been in post for all of 2003. This project has not however offered any funding to this post as it has been funded through a landfill tax project.

The Action Group has been assisting us with dissemination of information as it acts as a focus for inquiries and for media work. The new LPAG website (ww.limestone-pavements.org.uk) will have a section covering restoration projects where this report and the Irish report will be available. It is likely that this role will continue and that the LPAG will help us forge better links with education and the general public

Progress with overall project management

There has been maintained progress with overall project management. The management structure required to oversee the project is secure. Partners were aware of their responsibility, yearly targets and budgets and regular meetings of the whole group were held. A smaller executive group (Forest Enterprise, Cumbria Wildlife Trust and English Nature) met on a more regular basis every 3 or 4 months.

Experiences gained which will be of use to others

The experiences which are likely to be of interest to others in the conservation sector can be summarised as follows:

- Careful application of forestry techniques can sensitively remove conifer and non-native plantation from limestone grassland and limestone pavement.
- Residue management is the key issue to address on open habitats and again forestry techniques can be adapted to promote rapid recovery of natural habitats.
- The current downturn in the timber market means that this type of work has to be carried out as a cost exercise.
- Removal of non-native species from within woodland habitats is considerably more straightforward as difficult residue management is not required.
- Low density underplanting can be expensive to remove, as each tree has to be searched for and then felled.
- Limestone woodland habitats show a rapid and positive response to coppice, thinning and other woodland works when coupled with careful deer management measures.
- Careful combinations of thinning, clearance and coppice management can create sites of exceptional value for invertebrates especially lepidoptera.
- Low intensity grazing by cattle is the ideal management technique for open limestone habitats and a powerful restoration tool
- Issues relating to use of cattle are comparable in Yorkshire, Cumbria and Ireland and are described in our detailed report on the exchange trip.

We have previously stated our perception, in interim reports, that the main experiences that would be of interest to others would be the pine plantation clearance work on Whitbarrow and Dalton Crags. This radical, landscape scale action and the rapidity of restoration make an immediate impact on any visitor. This deforestation work carried out by this project is part of a growing experience in the UK conservation scene. The Border Mires, Salisbury Plain and New Forest projects are all carrying out similar works, each tailored locally to promote rapid recovery of the natural habitat. Overall there is an increased confidence, led by the work of the LIFE projects, that large-scale restoration can be tackled head on and can succeed. Our deforestation work therefore fits this pattern and is perhaps held up as a best practice example because of its size and its prominence in the landscape.

Experiences of use to others

The Fibrepac brash bailing technique.
A good example of the increasing confidence in the use of forestry techniques for nature conservation restoration.

The application of these specialist techniques is always going to be limited by the small area of land with conifers or scrub on semi-natural habitats. However the progress with cattle grazing as a restoration tool is far more universally applicable. Our experience can be applied to the managers of limestone grassland as a whole, which covers large areas in England and elsewhere in Europe.

Our opinion on what would be of most use to others has therefore changed and we now consider that cattle grazing is the most relevant and topical issue we are facing. There is an increasing focus on cattle grazing (as opposed to sheep grazing) as being the optimum tool for limestone habitat management and restoration, and a hunger in conservation circles to share experiences and information. It is partly for this reason (and ease of dissemination) that we have completed the Irish report on cattle grazing in so much detail. This report should be seen as an appendix to this section of the final report.

Our change in opinion and focus is of interest in itself. Initially the difficult and expensive conifer and non-native removal dominated our thinking and our aspirations. By the fourth year of the project, these difficulties were behind us and our focus was firmly on the longer-term management and cattle grazing of the sites. As such we have progressed in our focus and in our own perception as to what will be of use to others.

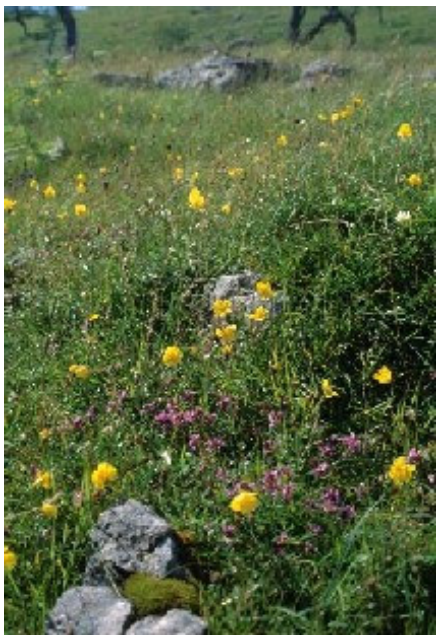
A further experience of note relates to dedicating a project officer to manage major externally funded restoration projects. Although the partnership approach brought benefits and diversity of approach it was too demanding on individuals within the partner organisations. A project officer would not have added significantly to project costs but would have made management more effective. We would recommend that any future applications of this size should have dedicated project officers as a pre-requisite.

Impacts on the species and habitats targeted

The project has had a major and positive influence on the targeted habitats and species. However as discussed in earlier interim reports we should not really expect the impact on

species and habitats to be visible over the tiny timescale of a four year project. The following habitat-by-habitat analysis stems from a summer 2003 visit to all of the project sub-sites to consider condition assessments and change stimulated by the LIFE works. A summary of this data is provided in Table Two.

The **limestone grassland** is the habitat that has seen the most radical change. The pine removal at Whitbarrow and the re-introduction of cattle grazing is perhaps the most notable example but there are many more fragmented areas at Underlaid Wood, and Dalton Crags that will benefit from removal of non-native species and scrub. There are also the large open areas at Hervey and Uberash where grazing management has continued throughout the project. At Dalton and Underlaid the objective has been to maintain the grassland as open habitat- to prevent complete loss of grassland. This restored grassland is likely to be tussocky and dominated by *Sesleria albicans* with a low density of other species but this is a significant improvement on gradual damage due to shade and needle fall leading to complete loss.



Impact on species and habitats

Limestone grassland has seen a radical change in its fortunes as a result of the LIFE project.

At the outset of the project there was a danger that the restoration of grassland formerly under plantation would not work. The residue left over after tree removal (side branches, tops, bark etc) could enrich the thin soils found on the sites and progress vegetation towards a more mesotrophic grassland or even bracken or blackthorn scrub. There was also potential that the physical presence of residue could prevent grassland sward becoming established. Careful management of residue has averted these dangers and the brash bailing or collection, coupled with removal from site has been a huge step forward in restoration of open habitats.

The grazed areas will take some time to regain their overall species density but here *Sesleria* will be less dominant and less tussocky. Initial indications are that these areas have not lost their species diversity, the interesting species are all there but it is the species density that has been lost. A re-examination of these grasslands in July 2003 showed us that the monitoring techniques we were using (NVC baseline survey comparisons and English Nature condition assessment methodology) are both too coarse to detect changes over the past two years. The cattle grazed grassland at Whitbarrow certainly looks less tussocky and rank than at the start of the project but we have no way of objectively measuring change.

The change we can monitor however is the change in condition linked to management prognosis. This is an approach established by the Joint Nature Conservation Committee and adopted by the Conservation Agencies in UK. In simple terms a limestone grassland with a conifer plantation on it is doomed to decline whereas if the plantation is removed and the correct restorative management put in place then it will be in a recovering phase. Some of the actual changes in species present may take a while to occur but the only obstacle is time. Table Two in this report shows the changes brought about by the implementation of this project. In summary, the grasslands at Hutton Roof and Hervey have been maintained by stable management and the grasslands at Farrer's allotment have changed from a declining condition to an improving one.

Limestone pavement areas on all sites have improved in condition during the project period. At Whitbarrow, pine removal has exposed several pavements that have been impoverished by 30 years beneath a plantation. Recovery of these areas will be slow but a visual assessment in the final year of the project saw a flush of pavement species such as maidenhair spleenwort, harts-tongue fern and herb-Robert. Other pavements at Whitbarrow, Underlaid Wood, Dalton Crags and Marble Quarry have benefited from removal of marginal non-native plantations. These were casting dense shade and again dropping needles. There has been an increase of bracken on some of these pavements, possibly as a result of the shade and enrichment. These pavements should fully recover and regain their botanical interest over a longer period. The bottom line is that they will not be subject to further deterioration. At Gait Barrows removal of pine from the central and eastern pavements will prevent localised deterioration by needle fall and shade but more importantly will reduce the amount of self-seeding pine that would lead to increased problems in the future. Work at Hutton Roof Crags and Gait Barrows has targeted scrub removal from open pavements. Woody species have a natural place on pavements and we wish to see a certain cover. However in some cases increase in ash, hazel and sycamore can lead to canopy closure and a loss of the characteristic species of the open pavement habitat.

Looking at condition assessments on the 9 project sub sites where pavement occurs (see Table One), limestone pavement has changed from a declining status to improving or favourable condition on 6 sites and has been maintained in favourable condition on the remaining 3 sites. This is an excellent result for pavements and for the project.

The **juniper scrub** habitats within the project area are extremely restricted in extent-often amounting to a few bushes per site. These juniper are vulnerable to shading by a broad-leaved canopy. The removal of non-native plantations and scrub has opened up the canopy above the juniper, but there may be the need for further work where the juniper lie beneath natural broad-leaved woodland. The re-establishment of woodland should give opportunities to establish young juniper on some of the sites, as this is not happening naturally. At the project outset there were 5 sub sites where juniper was declining. Juniper is now recovering on four of these. On the fifth site (Wakebarrow) there is an un-surveyed population of juniper that appears from observation to still be declining under a wooded canopy. Further survey work is required to quantify the extent of the issue.

With respect to the **Marl Lake**, the installation of a concrete bund at Little Hawes Water has re-established natural hydrology on this site. This is clearly increasing the area of wetland and allows re-establishment of tall fen vegetation. The additional plastic damming has also increased the area of tall fen vegetation. Our project objectives have therefore been met (and

perhaps exceeded) but the site is still not in ideal condition. There are water quality issues affecting the site. These are presently being investigated and are thought to arise from either agricultural pollution from within the catchment or from inadequate sewerage provisions in nearby residential houses. The site is therefore still unfavourable but the hydrological problems are no longer an issue. The water quality issues are external and not-linked to those addressed by the project

The speed of response of the **yew and lime woodland communities** to our works depends on whether we are removing non-native trees or re-introducing coppice management.
The density of planted non-native species varied across the project area and in some areas there was considerable degradation of the woodland communities whilst in others the impact was restricted to a few local problems. At sites such as Underlaid Wood, Marble Quarry and Dalton Crags the proportion of non-native species was very high. These sites have seen radical turnarounds in their fortunes and now look very different than at the start of the project. Thus the woodland condition assessment for these three sites reflects a change from unfavourable declining to improving. We must expect the recovery of the woodland with its inherent tree regeneration to be a slow process.

This is in contrast with the rapid and spectacular results of the coppice and scrub removal programme. This management (on 8 sub sites) has delivered an improved age structure and allowed cyclic regeneration of ground flora. The speed at which the woodland habitat responds to winter coppice work is spectacular. With the coppicing, the trees are cleared in winter and the following spring sees a marked flush in ground flora such as primroses and violets. These are used by the butterflies for egg laying that summer. The project sites now have a network of open habitats within them and themselves form a network of sites within the context of the whole project area. In terms of condition assessments, four sites (Underlaid, Farrer's, Durham Bridge and LDNPA Whitbarrow) have changed from unfavourable to favourable.

Associated with woodland works are the linked changes in the **invertebrate populations**. The general trend in butterfly populations at Gait Barrows (where yearly monitoring occurs) is upwards, with marked increases in High Brown Fritillary and Pearl Bordered Fritillary. The population of High Brown Fritillary in the summer of 2003 was four times higher than before the project began. We accept that other factors such as weather do have an influence but the general upward trend is linked directly to the improved management the LIFE project has delivered.

Impact on species and habitats

Invertebrates (such as this high brown fritillary) have responded rapidly to the improved woodland management

The impact on the butterfly population has been especially marked with the coppice coupes and cleared areas being immediately used for egg laying. A single comment on the impact of the project has given us great encouragement. This was made by Martin Warren of Butterfly Conservation (an NGO with the remit of conserving butterfly populations). His comment was that "the LIFE project had the potential to double the UK population of High Brown Fritillary butterfly".

The deer control work at Gait Barrows and in the surrounding area has had a positive effect on the habitats required by *Vertigo angustior*, the narrow mouthed whorl snail. The deer browsing was previously having a negative impact on the yew foliage that provided shelter for the mossy pavement tops required by the snail. There is no reliable population data for this tiny snail at Gait Barrows but its population will run into tens of thousands. We can not say that the project has had a positive impact on the population but it certainly has eliminated a significant threat to the habitat which could have had a serious impact on the snails.

Socio-economic context of the project

We have previously detailed the considerable support for the work of the LIFE project from within the nature conservation organisations and from the wider community. This support has continued throughout the final year of the project.

We have also been considering the economic future of the project once the LIFE funding has finished. One change in implementation of the Rural Development Regulations, in September 2002 now means that National Nature Reserves, not owned and managed by English Nature, will be eligible for agri-environment support. This change in interpretation of the Regulation means that the future of grazing of these sites is more secure. The nature and quality of the grazing means that some form of support will probably always be necessary to obtain optimal management of this type of grassland.

Socio-economic context

The low value of timber means that it costs more to remove timber than its current market value.

The coppicing and woodland management are likewise marginal in their economics. The timber market is depressed and variable although there has recently been some demand for beech chips for garden use. We hoped that the improvement in quality of timber following the project might make coppicing or other woodland operations break even. Feedback from coppice merchants suggests that the thin soils on our site might be a limiting factor to the financial return we could expect to receive. It is possible that we have to view this type of management as having conservation products rather than silvicultural ones.

On the positive side the LIFE project has funded a whole raft of non-recurring habitat restoration. The results of this programme of works are that the sites are in better condition and need a small, but annual, input to continue with the restoration programme. This is less daunting and, when split between the partners, more realistic than before the project began.

In the final year of the project the socio-economic context has become more uncertain rather than clearer. The timber market continues in its decline and the likely changes in the Common Agricultural Policy (CAP) mean that the economics of stock grazing are not clear. In terms of woodland work and revenue from timber it is clear that we shall become more opportunistic, responding to demand for certain products and releasing timber stand for sale only when there is market demand. We are already combining low value timber with higher value crops to ensure that whole areas are cleared and this practice will need to be maintained. This makes phased and programmed restoration of woodlands increasingly difficult to plan and fund. It seems that increasing financial support will be required for woodland works and the dream of financial self-sufficiency in woodlands is some way off.

With respect to grazing, the position in England is a state of flux. The agri-environment schemes are currently under review and there has recently been a reform of the Common Agriculture Policy (CAP), which will undoubtedly influence the economics of stock farming. This issue is addressed in some detail in the report of the Irish visit but in summary there are both potential gains and improvements and potential losses or problems. There is a likely boost to the sheep market and a forecasted decline in suckler cattle. This is not a good outlook for our habitats, which remain intricately linked to the economics of stock grazing.

Continuity of the Project

The nature of our project is that there are some elements that are completed which we do not need to continue with, and others that need a longer-term commitment. The non-recurring biotope management (such as removal of non natives and scrub or the restoration of a natural water table) are now over and we do not need to return to them other than to disseminate information and good news on their success. Other elements of recurring management such as grazing or coppicing do need our continued inputs if we are to build on the success of the project.

Successful completion of the LIFE project has given us the confidence to apply for other funding streams and a track record of delivery to base these applications on.

As mentioned in the section above, key changes in the Rural Development Regulations have resulted in better availability of funding for grazing on National Nature Reserves. The change means that the future of grazing of the two Whitbarrow sites is more secure. This approach is coupled with partnership working with the Limestone Country LIFE project and sharing responsibility for grazing cattle. Cattle will summer on Ingleborough and spend autumn and winter on sites within our project area (see details in appendix). This secures grazing on parts of Hutton Roof, Gait Barrows and the Hervey reserve at Whitbarrow. The involvement of Bill Grayson, an independent grazier in both LIFE projects was a key part of securing this. Simple techniques for bracken control have been established on these sites as an inherent part of grazing and these too will continue.

The woodland works are harder to find funding for. Coppicing is an important but expensive element of habitat management covered by this LIFE project. We have been successful in securing grants to cover future works on the CWT reserves. £4000 has been secured from Powergen for coppicing work at Lancelot Clarke Storth (Hutton Roof) during 2004. Another £4000 will be forthcoming from the Landfill Tax for coppicing at Howe Ridding Wood (Whitbarrow). Deer management is an important part of the woodland work and can be continued out of core funding budgets for Forest Enterprise and English Nature. The picture is thus not complete but we are determined to find funding to continue at the level of activity we have established.

The original project proposal had included purchase of land at Dalton Crags on Hutton Roof. Due to unwillingness of the vendor this has not been progressed as agreed with the European Commission. However we have found an alternative way forward on this aspect. A bid to the Aggregates Levy Sustainability Fund (ALSF) was successful in obtaining some £120k of funding, a proportion of which included the purchase of the Dalton Crags Area. The LIFE project group are working closely with the managers of the ALSF project and assisted in putting together their project application. It is also through this project that the Hutton Roof leaflet will be completed, very much in the style of the existing Whitbarrow work.

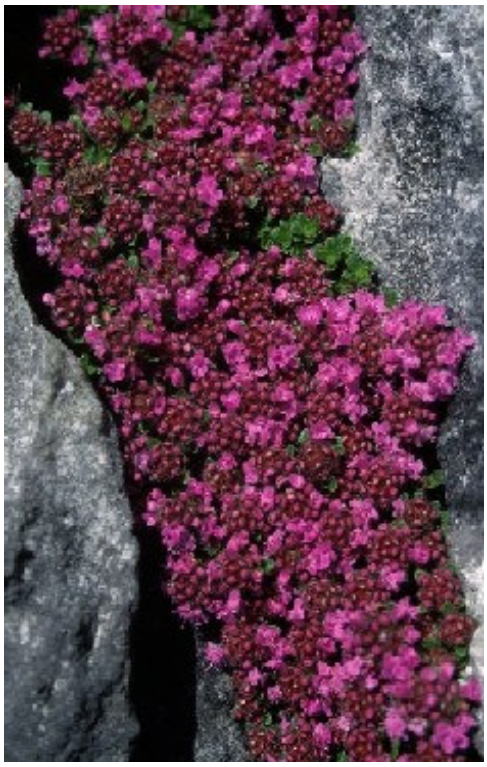
The sites within the project area are part of the Morecambe Bay Pavements cSAC, part of the Natura series of sites. They are therefore of highest priority and will always receive attention from the conservation agencies and voluntary sector. We do however need to apply the same standards of restoration and management to the same habitats outside the protected sites. This has been progressing but at a slower pace and to a lesser extent. It will be a considerable funding challenge to secure this element.

The work associated with dissemination will also continue. We now have a number of high quality demonstration sites and a good level of interest in local communities and other conservation bodies. The work associated with cattle grazing is set to increase and we already have good links with the Limestone Country project and with active individuals in southern Ireland. The findings of the Irish visit are presented in a stand-alone report appended to this report. We shall continue to be active in this area of work for the foreseeable future.

Overview and Concluding Comments

A shift in focus for the project

At the outset of the project the rationale for working together was to obtain funding to address a number of major obstacles to successful conservation of limestone sites around Morecambe Bay. These obstacles were firmly in the non-recurring biotope management side of our bid and revolved around removal of conifers, management of residue, clearance of scrub, deer fencing and restoration of natural hydrology. The obstacles loomed large on our horizons, and we asked how could we ever overcome them, how could we ever afford it. Our horizons were restricted because we were focussed entirely on these single obstacles.



Thyme thriving in a limestone pavement grike. The future for these habitats and their species is more secure following successful completion of the project.

These obstacles feature very prominently in our bid and in our first two years work and reporting but in the third year things were changing and suddenly there were new horizons that related to the longer term goals and not to the capital obstacles we had faced. As we progressed the obstacles were slowly broken down and no longer featured so prominently in our thinking. Our new horizons were related to long-term management, to cattle grazing and active management of woodlands.

By delivering the project we have moved on in our delivery and in our objectives for the sites. We have not solved all our problems and there are still challenges to rise to but the difficult and expensive work which requires a large input of staff time and money (the obstacles) are now gone.

We clearly still need to deliver a challenging programme of works on these sites in future years. This will revolve around cattle grazing for the grasslands and pavements and coppice cycles coupled with continuing deer control for the woodland habitats. Perhaps one of the larger challenges will be to clarify how to manage intricate mosaics of pavement, grassland and woodland habitats, which typify some of the lowland sites.

What have we delivered over four years?

Over the four years of the project we have delivered a programme of restoration works that have stopped the deterioration of the habitats within the Morecambe Bay Pavements candidate Special Area of Conservation (cSAC). We have had significant impacts on 14 sub-sites of 6 Sites of Special Scientific Interest covering more than 1000 hectares of the cSAC.

The section above looks closely at our impacts on habitats and species in some detail. It also describes how we have shifted the condition of these habitats out of a declining category and into a recovering phase. There will be future work required but we have resolved the elements that are most technically difficult and costly to address. Therefore, any future works will be small in scale and cost compared to what has been achieved through this project.

As detailed in the continuity section above we have made good progress with carrying forward the actions of the project beyond the four years. There are several successful grant applications that will ensure continuity and extend the type of work we have pioneered beyond the project area.

Demonstration sites and public involvement

Over the four years of the project we have made a major effort to disseminate our experiences and to use the different project areas as demonstration sites. This process has been formal and informal and will continue to occur beyond the end of the project. The suite of sites now has great potential for demonstration of both techniques and results and for the continuing improvement in ecological condition.

The works at Whitbarrow and Dalton Crags (part of Hutton Roof) are prominent in the landscape and will undoubtedly continue to be high profile. They serve as a demonstration of careful application of forestry harvesting and residue management and are a testament to the ingenuity of the forestry sector in large-scale restoration projects. They demonstrate in spectacular fashion the benefits of conifer crops removal on semi-natural open habitats.

The Future

We expect a continuing focus on grazing of traditional cattle and links to the Limestone Country Project.

Whitbarrow and Hutton Roof are also the focus for our continuing work on cattle grazing of limestone sites. We now have examples of sites that have been grazed continually over a four year period (or longer in some cases) and sites where cattle grazing has just started. We are also sharing cattle from the Limestone Country LIFE project, the details of this arrangement are appended to the report. Our profile with respect to cattle grazing and use of cattle as a restoration tool seems set to increase and the production of the report from Ireland as a stand alone document is part of best practice information sharing.

The intensive works at Gait Barrows have produced an outstanding demonstration site to show the benefits of increased woodland management. The 2003 training day on the Duke of Burgundy butterfly, run in partnership with Butterfly Conservation is a good example of the potential of the site. The rapid results of coppicing means that the benefits of the LIFE works are already there to be seen and that we do not have to wait 20 years before using this as a demonstration site.

In contrast to the recently completed Border Mires LIFE project, our costs and techniques will be of limited interest. These are so tailored to individual site conditions and circumstances that they can not be universally applied. In any case there is increasing confidence in conservation circles, led by the work of the LIFE projects, that forestry techniques can be adapted to promote rapid recovery of the natural habitat.

We consider that we have been able to secure a good profile for the project with the general public in the surrounding communities. Our project sites are surrounded by small villages and hamlets and it is inevitable that the prominent works would attract interest. We have used local meetings, threshold signs, on-site interpretation, presentations, guided walks and leaflets as tools to inform, but perhaps the most powerful technique has been through improved public access to our project sites. The land purchase at Whitbarrow coupled with the new leaflet is a major success. At Dalton Crags we have not been so successful with public access but as detailed in the continuity section there are fresh attempts to resolve this and there are new funds secured for a Hutton Roof leaflet.

Although the project work is completed the dissemination and demonstration work is not. This area of work will remain important to us although its nature will change as we focus more on the long-term maintenance of the sites.

Conclusions and Acknowledgements

Over the four years of the LIFE funded project we have designed and implemented a major programme to restore more than 1000 hectares of limestone habitats in Cumbria and Lancashire.

The objectives of the project, as detailed on pages 4 and 5 of this report, have been fully met or in some cases exceeded. The impacts of our programme can be seen in the impacts on the habitats and species targeted. In some cases (such as grassland restoration) we expect that the results will not be fully seen for 5 or 10 years. With other habitats (such as coppiced woodland) the results are more or less immediate.

The success of the project can also be judged by looking at our shift in focus away from short-term capital-intensive problems towards longer-term management aims.

There has been considerable interest in our actions from local communities and from others involved with the management of similar habitats elsewhere. The completed project delivers a set of sites, which will make ideal demonstration areas both for our actions and how the habitats and species respond to specific management. We predict that cattle grazing will continue to attract the most attention and wish to maintain our links with the Limestone Country project and southern Ireland.

Despite economic uncertainties in both the agricultural and forestry sectors the continuity of the project is assured. This relates partly to other grants that we have successfully applied for and partly to a general commitment to continue with optimal management of these habitats. Finding the funds to maintain our level of work in the woodlands may be challenging. Work on dissemination of our results and findings will obviously continue.

We consider that we have been highly successful in our project. We have remained focussed, delivered effective project management, problem solved well and achieved good value for money. We have used the LIFE-Nature grant to good effect and made a genuine change to the condition and future of these stunning limestone habitats.

At the end of this project, the partners would like to express their acknowledgements and thanks to the European Commission, which through the LIFE-Nature funding have facilitated so much change on the Morecambe Bay Pavements cSAC. We would also like to thank individuals from the Commission and from Ecosystems Ltd who have helped and guided our progress.

The project partners
September 2003