

CONTENTS

	Page Number
Non Technical Summary	4
PART I - INTRODUCTION & OVERVIEW OF THE UPPER TEESDALE ROADSIDE FLORA PROJECT	
1 Introduction - The Durham Biodiversity Action Plan	7
1.1 Background to the Durham Biodiversity Action Plan	7
1.2 The Policy Context of the Durham Biodiversity Action Plan	7
2 The Upper Teesdale Roadside Flora Project	8
2.1 Introduction to the Project	8
2.2 Project Vision	9
2.3 Project Location	9
2.4 Aims of the Upper Teesdale Roadside Flora Project	9
2.5 Lady's Mantles	10
2.6 Roadside Flora - the Historical Context	12
2.7 Roadside Flora - the Socio-Economic Context	13
2.8 Current Management of Roadside Verges in Upper Teesdale	14
3 The Project Area	14
3.1 The Upper Teesdale Landscape	14
3.2 Geomorphology and Geology of the Tees Valley	15
3.3 Soils and Climate	15
3.4 Current Land Usage and Settlement	15
3.5 Broad Habitat Description and Biodiversity Issues	15
PART II - PROJECT METHODOLOGY AND CONSTRAINTS	
4 Methodology and Constraints	17
4.1 Project Methodology	17
4.2 Project Constraints	17
PART III - RESULTS	
5 Project Outputs	19
5.1 Introduction	19
5.2 General Comments & Summary of Habitats Observed During Fieldwork	19
5.2.1 Roadside Grasslands and the Upper Teesdale Context	20
5.2.2 Results Overview, Section by Section: Middleton-in-Teesdale to Bowlees	22
5.2.3 Results Overview, Section by Section: Bowlees to Forest-in-Teesdale	22

5.2.4 Results Overview, Section by Section: Forest-in-Teesdale to Langdon Beck Plantation	23
5.2.5 Results Overview, Section by Section: Langdon Beck Plantation to Ashgill Head	23
5.2.6 Results Overview, Section by Section: Ashgill Head to Crookburn Bridge	23
5.3 Biodiversity Detail and Highlights	23
5.3.1 Notable Species Present in the Project Area	24
5.4 Summary of Red and Amber Sites	25
5.5 Summary of Recorded Species other than Plants	26
5.5.1 Invertebrates	26
5.5.2 Amphibia and Reptiles	26
5.5.3 Birds	26
5.5.4 Mammals	27
PART IV - DISCUSSION AND RECOMMENDATIONS	
6 Issues affecting Roadside Verges	28
6.1 Introduction	28
6.2 The Relative Value of Red and Amber Sites in Upper Teesdale and Elsewhere	28
6.3 Current Threats to Verges in Upper Teesdale	30
7 The Importance of Upper Teesdale's Roadside Verges as a Conservation Resource	32
7.1 A Typical Upper Teesdale Roadside Verge - The Link to NVC Category MG3	32
7.2 Key Biodiversity Issues identified along Roadside Verges in Upper Teesdale	33
8 Management Recommendations	35
8.1 Recommendations for the Management of Upper Teesdale's Roadside Verges	35
8.2 Potential Benefits Following the Implementation of Recommendations	36
PART V - APPENDICES AND DATA	
Appendix 1 Vascular Plants Recorded at Red Sites During The Upper Teesdale Roadside Flora Project (May - August 2003), Site Record Cards	38
Appendix 2 Vascular Plants During The Upper Teesdale Roadside Flora Project	52
Appendix 3 Lichens	59
Appendix 4 Invertebrates	60
Appendix 5 Vertebrates: - Reptilia (Snakes and Lizards); Aves (Birds); Mammalia (Mammals)	60
Appendix 6 Species Richness in Red, Amber and Green Sites	62
Appendix 7 Project Recording Sheet	64

Glossary	66
Bibliography	69
Map Inserts	

NON-TECHNICAL SUMMARY

The value of roadside verges as a wildlife habitat has been recognised for some time; they are often the only remaining areas of semi-improved grassland still present in the modern landscape.

Some of the roads in Upper Teesdale are historic routes connecting market towns and settlements across county boundaries, which pass through agricultural land within which are areas of important upland hay meadows. These traditionally managed meadows are rich in terms of the flora they support but are declining in area. Remnants of the hay meadow vegetation can still be found along some of the roadside verges of Upper Teesdale, together with species that are rare or of local interest, of particular importance in this respect are the Lady's mantles. Given this information, the Upper Teesdale Roadside Flora Project was based on the premise that many of the roadside verges in Upper Teesdale were likely to be either currently of conservation interest or had the potential to become so.

The landscape of the North Pennines is designated as An Area of Outstanding Natural Beauty and covers an area of 1,983 square kilometres. It is one of England's last expanses of wilderness, comprising a wild landscape of undulating heather moorland and blanket peat. The western edge of this plateau ends sharply in a steep escarpment above the Eden Valley, while the Tyne, Tees, Wear, Derwent and Allen valleys drain from the plateau, forming valleys that each have their own distinctive character.

The Upper Teesdale Roadside Flora Project was undertaken by the Durham Biodiversity Partnership (with financial support from the North Pennines Area of Outstanding Natural Beauty Partnership), as part of the process of implementing the Durham Biodiversity Action Plan (DBAP). The project had a range of key biodiversity objectives, which, in summary, set out to assist in the implementation of local, regional and national Biodiversity Action Plans for key species and habitats in Durham. These include Lady's mantles, Upland Hay Meadows, Upland Acid Grassland and Transport Corridors.

The Upper Teesdale Roadside Flora project was formulated with five main aims. These were as follows:

- To encourage and facilitate the improvement of the biodiversity resource across the area of the Upper Teesdale Roadside Flora Project
- To increase the area of DBAP priority habitats (e.g. upland hay meadows), the populations of target species (e.g. Lady's mantles) and improve the quality and management of target habitats (e.g. transport corridors) within the project area.

- To recreate some of the lost grassland biodiversity capital previously present within Upper Teesdale.
- To offer support to schemes that will result in a greater understanding and appreciation of biodiversity amongst all local communities within the valley.
- To build upon the work of the Weardale Roadside Flora Project (2001) and the Teesdale Roadside Flora Project (2002), in order to create a better understanding and appreciation of the importance of roadside verges as a biodiversity resource in the context of the whole of the North Pennines AONB.

This report is constructed primarily from newly researched data in consultation with and underpinned by data from a range of organisations, including Durham County Council, English Nature, the Durham Wildlife Trust and Dr. Margaret Bradshaw. It identifies key management issues that may impact upon the floristic interest of the roadside verges in Upper Teesdale and highlights those roadside verges that might benefit from improvements in management procedures. The most important roadside verge sites in floristic terms have been mapped, as have the locations of scarce/rare Lady's mantles.

In total the survey encompassed approximately 45 km of roadside verge between Middleton-in-Teesdale and Crookburn Bridge (at the Durham/Cumbrian border). Many of the roadside grasslands in the Upper Teesdale Roadside Flora Project area, particularly downstream of the High Force Hotel, were found to comprise either 'improved or semi-improved' grassland and consequently were found to be of only limited botanical value. The survey identified 23 high quality or 'red' sites on roadside verges, with a total length of 4.14 km. The total length of 'amber' (second tier) sites identified for the entire project area was 3.09 km, of which 1.03 km were classified as being of 'upper amber' quality.

The subjective judgement of site surveyors working on all four surveys, was that the species diversity in the Derwent valley, Upper Teesdale and (lower) Teesdale red sites was broadly the same, being higher than that encountered on similar sites in Weardale. This is borne out by the average number of species recorded on red sites, which was 49.48 per site in Upper Teesdale, 49.43 per site in the Derwent valley, 49.05 per site in (lower) Teesdale, and 43.94 per site in Weardale.

Furthermore, the length of all red verges, expressed as a percentage of the total length of surveyed verges in Upper Teesdale in 2003 was 9.2%, compared with Weardale (2001), 5.45%, the Derwent Valley (2003), 4.3% and (lower) Teesdale (2002), 1.9%. The equivalent figure for

amber sites in Upper Teesdale in 2003 was 9.2%, contrasting with Weardale (2001), 17.1%, the Derwent Valley (2003), 13.6% and (lower) Teesdale (2002), 3.1%.

The report attempts to illustrate how the botanical composition of the roadside verges is representative of the valley's wider vegetation, as well as its land use and ecological history. In addition, the report makes a number of recommendations, which are designed to show how the favourable condition of the best roadside verges might be achieved, maintained and their value promoted to a wider audience.

PART I - INTRODUCTION & OVERVIEW OF THE UPPER TEESDALE ROADSIDE FLORA PROJECT

1. Introduction - The Durham Biodiversity Action Plan

1.1 Background to the Durham Biodiversity Action Plan

'Biodiversity' simply means the variety of life. The biodiversity action planning process was initiated in 1992, when the UK Government became a signatory to the International Convention on Biological Diversity at the 'Earth Summit' in Rio de Janeiro. In response to this commitment, the UK Government published 'Biodiversity: The UK Action Plan' in January 1994. This document recognised that for effective action to be taken, national targets needed to be translated to the local level. 'Action for Wildlife', the local Biodiversity Action Plan (BAP) for Durham, promotes the regionally relevant actions laid out in the United Kingdom's Biodiversity Action Plan.

Stephen Hughes MEP launched 'Action for Wildlife - the Durham Biodiversity Plan' (DBAP), on 29 January 1999. The DBAP is managed by a steering group comprising representatives from: the City of Sunderland, Darlington Borough, Durham County Council, Gateshead Council, South Tyneside Council, Durham Local Agenda (Action) 21, English Nature, Environment Agency, DEFRA, Northumbrian Water Ltd, RSPB, Tyne Tees FWAG and Durham Wildlife Trust.

The Plan covers County Durham and the unitary authorities of the City of Sunderland, Darlington, Gateshead and South Tyneside. The main objective of the DBAP is to ensure that the biodiversity of these areas is maintained, enhanced or re-established.

The Upper Teesdale Roadside Flora Project fulfils a range of key biodiversity objectives, which, in turn, assist in meeting local, regional and national Biodiversity Action Plan targets for key species and habitats in Durham. The Upper Teesdale Roadside Flora Project contributes towards the delivery of the following Durham Biodiversity Action Plan targets:

- (i) Species Action Plan for 'Lady's mantles' - Targets 1, 2: Actions 1, 4, 5, 9
- (ii) Habitat Action Plan for 'Upland Hay Meadows' - Targets 1, 2: Actions 2, 3, 5, 6, 7
- (iii) Habitat Action Plan for 'Transport Corridors' - Targets 1, 2: Actions 2, 3, 5, 7

1.2 The Policy Context of the Durham Biodiversity Action Plan

For further details about the Policy context of the Durham Biodiversity Action Plan, see the relevant Chapters in the *Weardale Roadside Flora Project* (Street, 2002) and the *Teesdale Roadside Flora Project* (Bowey and Street, 2003).

2. The Upper Teesdale Roadside Flora Project

2.1 Introduction to the Project

The Upper Teesdale Roadside Flora Project (2003) was developed as a complementary project to the work previously undertaken by the Durham Biodiversity Partnership on roadside verges in Weardale during 2001 and Teesdale (Barnard Castle to Middleton-in-Teesdale) during 2002 (as well as additional work done in the Derwent valley during 2003). In this context, the project sets out to meet many of the same objectives and to extend the recommendations of good practice in verge side management where appropriate, to the delineated project area within Upper Teesdale. Consequently, the vision and specific biodiversity objectives of the project are largely similar to those for the Weardale Roadside Flora Project and the Teesdale Roadside Flora Project, although the geographical focus of the project is different.

For more detailed background information on the roadside verges survey, see section 2.1 of the *Teesdale Roadside Flora Project* (2003).

The main road in Upper Teesdale, i.e. the B6277, between Middleton-in-Teesdale, High Force, Langdon Beck and then out of the County into Cumbria, is an historic route which has been important for the distribution of local agricultural products for many centuries, particularly for movement of goods between some of the dale's key market communities, i.e. Barnard Castle, Middleton-in-Teesdale and Alston (Cumbria).

The landscape of Upper Teesdale is of particular note for its hay meadows. The best of these are located in the upper dale, particularly between Bowlees/Ettersgill and Harwood. Over centuries, traditional management has created meadows that are rich in plant species, including a number that are rare and/or localised, such as the Lady's mantles *Alchemilla acutiloba* and *Alchemilla monticola*. In some locations, small amounts of this habitat, and some of the rare species, can be found in the dale's roadside verges. There is only limited data available on past changes in the area of upland hay meadow nationally, but it is thought that there has been a more than 45% decrease since 1945.

It was in the context of this overall national picture that the Weardale Roadside Flora Project was conducted in 2001, with that work being further developed during the Teesdale Roadside Flora Project in 2002 and work undertaken in 2003 in both the Derwent Valley and Upper Teesdale. The value of the traditional upland farmed landscape in the dales of western Durham, in terms of nature conservation, cultural associations, landscape character and aesthetic appeal is well recognised and evidenced by the multiple designations (ESA, AONB, NNR, SAC) that pertain to

the area. With some species-rich areas of grass verge still present adjacent to roadsides and the potential for improvement in other areas, it was considered that the identification and preservation of even small fragments of species-rich grassland or areas with rare species would be a worthwhile undertaking.

The survey work in Upper Teesdale was made possible by grant aid support through the North Pennines AONB Partnership. The Durham Biodiversity Partnership gratefully acknowledges its support and generosity.

2.2 Project Vision

The vision of the Upper Teesdale Roadside Flora Project is:

"The best roadside grassland verges in Upper Teesdale will be viewed as an asset in terms of the diversity of wildlife they support and their aesthetic appeal. They will ultimately be perceived as an integral part of the wider landscape, to be enjoyed and highly valued by local communities and visitors alike"

2.3 Project Location

The Upper Teesdale Roadside Flora Project was located in Upper Teesdale, between Middleton-in-Teesdale and the County boundary at Crookburn Bridge. During the project, 45 km of roadside verges were surveyed, all of these being alongside the B6277.

2.4 Aims of the Upper Teesdale Roadside Flora Project

The general aim of the Upper Teesdale Roadside Flora Project is as follows:

"To secure permanent protection and improved management for the most floristically diverse and typical of Upper Teesdale's grassland roadside verges"

Within this overall aim, the Upper Teesdale Roadside Flora Project had a number of key biodiversity aims:

- To encourage and facilitate the improvement of the biodiversity resource across the area of the Upper Teesdale Roadside Flora Project

- To increase the area of DBAP priority habitats (e.g. upland hay meadows), the populations of target species (e.g. Lady's mantles) and improve the quality and management of target habitats (e.g. transport corridors) within the project area.
- To recreate some of the lost grassland biodiversity capital previously present within Upper Teesdale.
- To offer support to schemes that will result in a greater understanding and appreciation of biodiversity amongst all local communities within the valley.
- To build upon the work of the Weardale Roadside Flora Project (2001) and the Teesdale Roadside Flora Project (2002), in order to create a better understanding and appreciation of the importance of roadside verges as a biodiversity resource in the context of the whole of the North Pennines AONB.

It is anticipated that the outputs from the project will help to raise awareness of nature conservation issues in the Upper Teesdale area particularly as they relate to upland hay meadows and roadside verges and inform any proposals for improving the quality of roadside habitats more generally. This should assist in protecting and extending the floristic interest of the grassland swards at selected key sites by protection and/or active management.

The primary purpose of the survey was to identify roadsides of high botanical interest. These included those areas beyond the immediate road verges with the greatest floristic diversity, the most representative suite of 'hay meadow' species or features of special interest/importance, such as populations of the nationally scarce Lady's mantle species, *Alchemilla acutiloba* and *Alchemilla monticola*. These were identified and mapped to ensure their protection against future damage from engineering works or inappropriate verge side management regimes.

It is hoped that the information detailed in this report will help secure the long-term floristic interest and greater awareness of a number of Upper Teesdale's most botanically diverse roadsides. This should provide a number of benefits for local communities, not least the maintenance of the visual quality of the dale's flower-rich roadsides for the foreseeable future.

2.5 Lady's Mantles

Lady's mantles "flourish in Teesdale, in habitats formed by and largely dependant on man for their continuing state" (Bradshaw, 1962). Lady's mantles (*Alchemilla* species) are a group of closely related plants that are extremely difficult to distinguish from one another, except by experts. This is, in large part, because they are able to reproduce asexually by the production of viable seed without the need for pollination. This is known as apomixis and has given rise to several different

forms, all of which are very similar in appearance. The plants have attractive, fan-like leaves and large numbers of small yellow-green flowers. The leaves were reputed to fold up at night and catch dew on their soft hairs. Plant dew was highly prized by early herbalists and *Alchemilla* was prescribed for wounds (to stop bleeding), infertility and impotence. The alchemists also required the 'purest dew' in their attempts at turning base metals into gold. This led to the name *Alchemilla* or "little alchemist". In the Middle Ages, the herb was given the English name 'Our Lady's Mantle'. This has been abbreviated to give rise to their current name - Lady's mantle.

There are thirteen species of Lady's mantle in the UK of which three are widespread, though most of these are scarce in the south and east. The greatest diversity of *Alchemilla* species occurs in the North Pennines. Nine species grow in the Durham area, of which six are rare. Three are listed in the Red Data Book: *Alchemilla acutiloba*, *A. monticola* and *A. subcrenata*, and two further species are nationally scarce: *A. glomerulans* and *A. wichurae*. Bradshaw (1962) undertook an extensive survey of five of the six rare species present in the meadows and pastures of Upper Teesdale.

The Red Data Book species *Alchemilla acutiloba* is almost entirely confined to Weardale and Upper Teesdale. It was much more abundant and widespread in Weardale but can be found in a number of locations in Upper Teesdale. It is a plant of traditionally managed hay meadows where cutting is delayed until after the seed has set and was once abundant in some lengths of road verge, where the sward has not been significantly 'improved' by re-seeding or heavy fertiliser applications. In the UK *Alchemilla monticola* is almost entirely restricted to Upper Teesdale and is found principally in old hay meadows, where it was once abundant, but it is also found in some roadside locations. The other scarce Lady's mantle species in Upper Teesdale, i.e. *Alchemilla wichurae*, *A. subcrenata* and *Alchemilla glomerulans*, are mainly confined to the upper dale, principally in hay meadows.

Three species of Lady's mantle *Alchemilla monticola*, *A. acutiloba* and *A. subcrenata* are identified in the regional biodiversity audit (Brodin, 2001), as being of particular importance in the context of the region. The main threats highlighted for these species is a cessation to traditional management techniques on hay meadows, agricultural improvements to grassland sites and unsympathetic cutting regimes on roadside verges.

Alchemillas are declining across their range. Their ability to colonise new sites is limited, as fewer and fewer suitable sites are currently available for colonisation. Threats to *Alchemillas* growing on roadside verges include road realignment, minor road straightening and the dumping of earth on verges. Nutrient-rich run-off, along with the over-zealous cutting of road verges has resulted in a

less rich verge flora, while the strengthening and widening of farm tracks and excessive cutting around farm access roads has also resulted in plants being lost.

Such concerns have been echoed by a substantial re-survey (unpub. Bradshaw, 2003) of the sites in Teesdale and Weardale originally visited in the 1950s (Bradshaw, 1962). An incomplete 'draft' of the re-survey indicates that "in 45 years the status of the five species of the *Alchemilla vulgaris* aggregate has changed from being apparently stable, though in some cases rare, to critical, even in the most abundant species *A. monticola* and *A. acutiloba*".

The most severe decline has occurred on roadside verges, where there are no longer stretches of verge in which *A. acutiloba* and *A. monticola* were once frequent. Indeed, *A. acutiloba* has disappeared from 2.85 km of roadside verge in Teesdale and 2.05 km in Weardale, while *A. monticola* has been lost from 4.75 km in Teesdale. Overall, for *A. acutiloba*, there has been a decrease of 59% in Weardale and 35% in Teesdale, while *A. monticola* has declined by 81% in Teesdale.

Historically, the Durham Lady's mantles and plants such as globeflower (*Trollius europaeus*), wood crane's-bill (*Geranium sylvaticum*) and melancholy thistle (*Cirsium heterophyllum*) would have been in the tall-herb flora of the open woodlands and sub-alpine pastures from which the meadows were created. Further consideration of the significance of the historical ecology of Upper Teesdale can be found in the following section.

2.6 Roadside Flora - The Historical Context

This section attempts to illustrate how the history of Upper Teesdale, in terms of its settlement, ecology and development, reveals how vegetation types and habitats have developed and how these relate to the current biodiversity of the roadside verges.

The history of the Upper Teesdale area reveals that hay meadows, Lady's mantles and transport corridors have all played an important role in the development of the landscape that is seen today. In order to understand how hay meadows and Lady's mantles are part of the historical biodiversity of Upper Teesdale, it is necessary to go back in time to 3000 BC. It is assumed that meadow habitats suitable for *Alchemilla* spp. would have been present at this time (Bradshaw, 1962).

From the eleventh century onwards, large areas of the Pennine dales, including Upper Teesdale continued in a near-natural state. Today, the striking similarity between the hay meadows and the ground flora of the North Pennines ash woodlands is of note. It is considered likely that the hay

meadows derive from the clearance of such woodlands and have been maintained since by regular cutting and grazing.

During the seventeenth and eighteenth centuries, there was a great increase in lead mining in Upper Teesdale and consequently in settlement, employment and the enclosure and management of previously uncultivated ground. The miners, who were also part-time farmers, built their holdings as near to the mines as possible. Consequently meadows were maintained well above the normal limits of cultivation. In 1810, the presence of good quality upland meadows, which were on good soils and well dunged, was noted. This was apparently the same management regime that was continued till the 1960s in hay meadows, where high densities of *Alchemilla* spp occurred (Bradshaw, 1962) west of Barnard Castle.

At the same time as the Industrial Revolution, there was a great expansion of agriculture in Upper Teesdale. Much of this land went out of cultivation during the agricultural depression in the 1870s and presumably reverted to grass, with *Alchemillas* (Bradshaw, 1962).

The development of roads and railways led to the establishment of man-made habitats for wildlife including railway and roadside verges. Subsequently these may have been more important than the presence of meadows in the current distribution of some *Alchemillas*. For example, in Weardale higher frequencies of *Alchemilla acutiloba* around Wearhead may have developed when Burnhope Reservoir was opened in 1936.

At present, *Alchemilla acutiloba* may be more frequent on some roadside verges than in meadows. It may be that, despite considerable decline in this habitat, the verges provide some of the most favourable conditions for this plant as today, traditionally managed hay meadows are much reduced in frequency, only relatively small areas remain.

2.7 Roadside Flora - The Socio-Economic Context

As well as being rich in biodiversity, many of Upper Teesdale's most floristically diverse roadside verges are an attractive visual amenity for local people and visitors to the dale. The best of them provide an appropriate and appealing visual context for the dales' settlements, such as Newbiggin, Langdon Beck and Forest-in-Teesdale. The most floristically rich roadside verges remain as a broken linear remnant of a once much more widespread landscape feature, the dales' upland hay meadows. As remnants of this formerly much more widespread resource, the verges are also important in a historical context.

The Upper Teesdale verges and their flora are the product of, or a refuge from, not just specific agricultural management but also the wider socio-economic context. A context, which has dictated that, for the purposes of easier and faster vehicular movement, roads in the dale required re-aligning and straightening. Consequently the best suite of floristically-rich verge sides tend to be clustered in those areas that have not been impacted upon by extensive road engineering or, conversely, where the engineering works have facilitated the reversion of the verge side vegetation to its more 'natural' composition.

2.8 Current Management of the Roadside Verges in Upper Teesdale

Most verges, and their management, are the responsibility of the County Council Highways Department (Durham County Council) and are managed via contractors. The management of verges is contracted out. The Highways Authority has legal rights over the verge and powers to enable them to provide drainage, lay-bys, signposts and footpaths.

For more detail about the management of roadside verges and the Highway Authority's "Policy for the Management of Roadside Verges", see section 2.8 of the *Teesdale Roadside Flora Project* (2003).

3. The Project Area

The Upper Teesdale Roadside Flora Project was entirely located in Upper Teesdale, along the B6277 between Middleton-in-Teesdale and Crookburn Bridge (the Cumbrian/Durham border). The project area commenced at the conclusion of the 30 mile an hour speed restriction at Middleton-in-Teesdale and proceeded westwards along the B6277 through Newbiggin, Bowlees, High Force, Forest-in-Teesdale, Langdon Beck, Harwood and finishing at the County boundary.

The whole of the project area is covered on Ordnance Survey 1:25 000 Explorer Map OL31, as well as 1:50 000, Landranger Maps 91 & 92. Also see the map inserts at the rear of this report.

3.1 The Upper Teesdale Landscape

Teesdale, the upper portion of the valley of the River Tees, is situated in northeast England, in the county of Durham. The River Tees rises on the highest summits of the Pennine hills and makes its way to the North Sea at Teesmouth, some 110 km to the east along the river's course, in a valley system that has a roughly west to east orientation.

A distinctive landscape feature of the project area around Forest-in-Teesdale are the of the 'brooding fells' of Holwick Fell, Cronkley Fell, Mickle Fell and Widdybank Fell, which are visible on the skyline from many points of the dale.

For a more detailed description of the Upper Teesdale landscape see the *Teesdale Roadside Flora Project* (2003).

3.2 Geomorphology and Geology of the Tees Valley

For a detailed description landscape of the physical features of Upper Teesdale - the geomorphology and underlying geology of the valley – please refer to the *Teesdale Roadside Flora Project* (2003).

3.3 Soils and Climate

For more information on the soils and climate of Upper see the relevant section of the *Teesdale Roadside Flora Project* (2003).

3.4 Current Land Usage and Settlement

Section 3.4 of the *Teesdale Roadside Flora Project* (2003) contains a detailed description of the Current Land Usage and Settlement pattern of the upper dale.

3.5 Broad Habitat Description and Biodiversity Issues

“The flora of upper Teesdale is (probably) more widely known [by botanists] than that of any other area in Britain, and yet perhaps only a few thousands who visit the dale each year realise the extent to which the vegetation and flora contribute to the essence of its character”

(Bradshaw , 2003, in *‘The Natural History of Upper Teesdale’*).

It is the vegetational elements of the landscape that ultimately dictate the biodiversity content of an area, by determining the presence or absence of certain habitats. This section gives an overview of the main habitats present alongside the roads of Upper Teesdale.

The broadly dominant, semi-natural habitat types present in the dale are grasslands of various types, with some ancient semi-natural and some plantation woodland. The grasslands in Upper Teesdale are, by and large, mesotrophic with some calcareous influences in the upper dale, the most famous of the latter having developed on the renowned Upper Teesdale 'sugar' limestone. There are few (if any) examples of unaltered, natural grasslands within the Project area. In most

parts of the catchment, the dominant grassland usage is for sheep or cattle grazing, with silage production and, higher up the dale, hay cropping is also significant. The most commonly occurring type of unimproved grassland occurring in Upper Teesdale is acid grassland although mesotrophic and calcareous grassland are also represented at these higher altitudes.

Some of the roadside meadows, and a number of the roadside verges in the dale have an abundance of flowering plants and exhibit a characteristic sequence of colour-shading through the year, which starts with a brilliant yellow blaze of dandelions in the early spring. This is followed by the creamy-white, aniseed-scented flowers of the sweet cicely, whose umbels can be seen growing along roads, riverbanks and stream sides. Herb-rich meadows are still well represented in parts of the dale, especially considering the extent of loss of this habitat elsewhere in the UK, though even here there have been very considerable losses in both the area and quality of habitat over the last 50 years. Locally these grasslands are known as “herbie meadows”, a colloquialism that is indicative of the abundance of wildflowers to be found amongst the usually more abundant grass species. Other colourful herbs to be found in these situations include pignut, wood crane's-bill, sorrel (or 'soury dock') with the yellow flowers of autumn hawkbit prominent later in the summer. Scattered amongst the more widespread herbs can be found: patches of bistort; the damp loving ragged robin; marsh valerian; kingcup (marsh-marigold), and melancholy thistle's purple 'shaving brush heads'.

In the lower project area (Middleton-in-Teesdale to High Force), hedgerows are a significant biodiversity feature. But above High Force, roadside hedgerows quickly diminish and are effectively non-existent as Forest-in-Teesdale is reached. Where present, these hedges are species-poor but quite often in a better state of maintenance than in other parts of County Durham. Most hedgerows in the area comprise only one or two woody species per 30 m of hedge. The dominant hedge shrub is hawthorn, though hazel, blackthorn, elder and dog rose (in decreasing order of frequency) are all widespread. Hedgerow trees are not uncommon with the most commonly encountered species being ash, followed by oak and sycamore. Woodlands in the dale are of a largely recent plantation type and these comprise largely conifers. The most significant 'woodland/scrub' habitat in this part of the dale, is the nationally renowned 'juniper forest', the principal area of which is located between Holwick Scar and Forest-in-Teesdale, on the south side of the Tees.

PART II - PROJECT METHODOLOGY AND CONSTRAINTS

4 Methodology and Constraints

4.1 Project Methodology

In order to place the collected data into an appropriate context, a general literature search was undertaken and a consultation process undertaken with the following organisations and individuals: Durham County Council, English Nature, Durham Wildlife Trust, Dr Margaret Bradshaw and Chris McCarty (EN Site Manager for Moorhouse and Upper Teesdale National Nature Reserve).

Prior to commencing work in the field, staff from Durham County Council were consulted, including the Senior Conservation Officer and a Senior Landscape Architect from the Landscape Section of the Environment & Technical Services Department.

The Upper Teesdale Roadside Flora Project commenced in May 2003, fieldwork continuing through into early August on sites at the highest altitude. The first part of the project was field-based and aimed to collect sufficient data to enable the most valuable verges, in terms of nature conservation, to be identified, classified and located on provisional maps.

For a detailed description of the Project Methodology please refer to section 4.1 of the *Teesdale Roadside Flora Project Report (2003)*.

Approximately 45 km of roadside verge was assessed during the initial part of the project. This was followed by a 'walk-over survey', which was undertaken on the areas of roadside vegetation that had not been initially eliminated. This covered 35 km of roadside verge in total. The positions of all red and amber sites were noted using 8-figure grid references.

For more detail on red site survey approach and red site definition, see Section 4.1 of the *Teesdale Roadside Flora Project Report (2003)*.

4.2 Project Constraints

Project constraints were identified. The most significant of these were time and safety. During the survey period, safety of the fieldworkers was the greatest concern. The B6277 is a key local route across the Pennines into Cumbria. The road is relatively busy and used by some large lorries and many agricultural vehicles, as well as cars and many motorbikes. In some areas, the roadside

verge is predominantly narrow and it was not always possible to carry out survey work on these because of the proximity of large, fast moving vehicles. To reduce the risks posed by the presence of the traffic, the surveyors always worked in pairs and wore fluorescent jackets.

As it was not possible to obtain a reliable mobile phone signal in much of Upper Teesdale, all staff involved in fieldwork 'logged out' when they left for field based operations and then logged back in when they returned to the Durham Biodiversity Partnership's office base at Rainton Meadows, Houghton-le-Spring, or 'signed off' for the day (using land-line connections at Middleton-in – Teesdale).

As in all such surveys, the actual time available for survey work was limited by the length of the growing season and the flowering times of the plants themselves which, in turn, had implications for the ease of their identification. On occasion, it was possible to have two teams (of at least two people) in the field, surveying simultaneously.

PART III - RESULTS

5 Project Outputs

5.1 Introduction

The maps, which accompany this report, clearly show the locations and extent of the red and amber sites identified during the survey. Verges within the project area and which are not marked as red or amber should be considered to be green (i.e. of low biodiversity status). The locations of scarce/rare Lady's mantles and other notable species that occurred outside red or amber sites were also noted during the field survey.

The results section of the report summarises the habitats observed and lists species recorded that were rare or of local interest as well as the presence of biodiversity priorities in the project area (i.e. species and habitats which are of direct relevance to the DBAP). Species of plant recorded at red sites are listed, according to site, in Appendix 1.

The sections which follow (Sections 6-8), includes discussion of/and broad management recommendations for the verges in the project area. The implementation of these recommendations will assist the Highways Authority to manage the verges in a manner that is beneficial in terms of their conservation value, whilst not being detrimental in terms of road safety or function.

Survey work, undertaken as part of this project, revealed certain anomalies between how current grass-cutting procedures are implemented and the guidelines recommended in the 'Policy for the Management of Roadside Verges'. Consequently, this impacted on the biodiversity value of particular verges in the dale.

5.2 General Comments & Summary of Habitats as Observed During Fieldwork

As was observed in the work undertaken in Weardale during 2001 and (lower) Teesdale in 2002, the roadside verges which the project identified as being of the highest value, in terms of their botanical composition were largely those which extended for some distance beyond the immediate roadside verge (i.e. wider than *circa*. 1.2 m). The crucial issues, in this respect, seem to relate to the grassland's distance from the negative influence of salt spray, passing traffic and summer verge management (i.e. grass-cutting).

In, general, the grass cutting regime observed during the 2003 survey period in Upper Teesdale complied with the Durham County Council “Policy for the Management of Roadside Verges” (1995), regarding maintenance of sight lines and access to utility services. In some instances, however, non-compliance with the stated policy impacted heavily on certain Upper Teesdale verges. For example, at Red Site 1 (east of the Ettersgill road junction), two flail widths were cut (twice the required width of 1.2 m). Such excessive cutting (plus the timing of the cutting) may have prevented the locally rare frog orchid *Coeloglossum viride* from setting seed. Moreover, other activities, such as highway maintenance were noted to be having a somewhat detrimental impact. For example, a kerbing, completed only weeks before the current survey was undertaken, damaged important roadside flora at Red Site 21 (below Rough Rigg – NZ 82033423). Also evident, was a tarmac spoil heap that had resulted in the possible destruction of a colony of common twayblade *Listera ovata* adjacent to Red Site 22 (above Rough Rigg – NZ 8193535).

One feature of the verges within the Upper Teesdale Roadside Flora project envelope was the relatively high number of plants recorded that could be considered ‘garden escapes’, particularly in the section nearest to Middleton-in-Teesdale. These included flowering plants such as perennial cornflower *Centaurea cyanus*, Welsh poppy *Meconopsis cambrica* and the Lady’s mantle *Alchemilla mollis*, as well as shrubs such as lilac *Syringa vulgaris*. Although, both welsh poppy and perennial cornflower were also recorded above Harwood-in-Teesdale, in the higher reaches of the dale.

In general terms, Upper Teesdale’s roadside verges comprised grasslands that indicate their origins as mesotrophic hay meadow-type swards. Exceptions included some areas that clearly showed an acidic grassland influence. In the main, the upper dale’s roadside grasslands are less degraded in terms of species complement and ‘typicality’ than are those between Barnard Castle and Middleton-in-Teesdale (see *Teesdale Roadside Flora Project*, 2002). In most locations this degradation seems to have resulted principally from road engineering works and/or a lack of appropriate management. Consequently, in such areas, where floristic interest remains this tends to be represented by the taller, more robust herb species, such as the *Umbelliferae*, crane’s-bills and in yet more degraded, nutrient-enriched grasslands, docks, thistles and rosebay willowherb *Chamaenerion angustifolium*. In the least diverse situations, robust grasses such as cock’s-foot *Dactylis glomerata* dominate to the exclusion of all but a few herb species e.g. stinging nettle *Urtica dioica*.

5.2.1 Roadside Grasslands & the Upper Teesdale Context

Many of the roadside grasslands in the Upper Teesdale Roadside Flora Project area comprise either ‘improved or semi-improved’ grassland and consequently they are of only limited botanical

value, although a number of these do retain considerable elements of a herb-rich sward. The 'improvement' of these verges has come about principally as a result of persistent damage, such as over-riding, or as part of the restoration of verges after engineering works. Nutrient enrichment of verge swards has occurred over time, through the leaching of nutrients and the drift of sprayed inputs has accumulated as a result of the agricultural improvement of pasture and hay meadows on the 'agricultural side of the wall'.

At one time, large proportions of these roadside verges would have been herb-rich but many have been damaged, altered or 'improved' in a variety of ways. For example, many of the verges, on both sides of the B6277, between Middleton-in-Teesdale and High Force have been extensively modified (mainly in the last forty years), as a result of kerbing schemes, road widening and straightening works. Higher up the dale, these effects are less evident but still make a negative impact (see Section 5.2).

One aspect of the Upper Teesdale survey of 2003 that contrasted with the results of the work undertaken lower down the dale in 2002 was the range and number of orchid species recorded. Lower down the dale orchids were deemed in 'short supply' in roadside habitats yet in the survey area above Bowlees, seven colonies of early-purple orchid *Orchis mascula*, two colonies of frog orchid and six sites with fragrant orchid *Gymnadenia conopsea* were all identified. In addition, common twayblade was noted in at least thirteen roadside locations, while northern marsh orchid *Dactylorhiza purpurella* and common spotted orchid *Dactylorhiza fuchsii* were widespread.

The following interesting species occurred quite extensively on a number of the roadside verges in the project area, notably on red or upper amber sites, but not exclusively so: wood crane's-bill *Geranium sylvaticum*, meadow crane's-bill *Geranium pratense*, pignut *Conopodium majus*, cowslip *Primula veris*, black knapweed *Centaurea nigra* common bird's-foot-trefoil *Lotus corniculatus* and two species of the more widespread species of Lady's mantles *Alchemilla glabra* and *A. xanthochlora*.

The survey revealed a number of very good roadside verges in terms of their floristic interest. Some of the best examples included:

- The very large verge located close to the Langdon Beck Bridge, on the east side of the B6277, south east of the Langdon Beck Hotel. This site held four species of *Alchemilla* (including *A. acutiloba* and *A. monticola*), four species of orchid (fragrant, early-purple, common twayblade and northern marsh) and had a total of 73 species documented for the verge.

- The kerbed verge, east of Ettersgill (on the north side), which boasted a colony of frog orchids, accompanied by fragrant orchids, early-purple orchids as well as hundreds of common twayblade, and a range of more common species.
- The large verge adjacent to Langdon Beck Plantation. This site was both long and broad, with a wide range of hay meadow and wet grassland species. These included globeflower *Trollius europaeus*, sneezewort *Achillea ptarmica* and abundant ragged robin *Lychnis flos-cuculi* (64 species recorded).
- The steep, largely rocky verge opposite Bowes Close. This site had *Alchemilla monitcola*, common rock-rose *Helianthemum nummularium* and alpine bistort *Persicaria vivipara* as well as a range of other typical upland species (58 species recorded in total).
- The verge south east of Pease's Cottage. This had a range of habitats present including upland hay meadow, acid grassland and acid bog-type flushes. This site held a wide range of representative hay meadow species, good numbers of common butterwort *Pinguicula vulgaris* in the acidic flushes with large amounts of common yellow sedge *Carex demissa*, and close by fragrant orchids.

5.2.2 Results Overview, Section by Section – Middleton-in-Teesdale to Bowlees

This section comprised the least botanically interesting suite of roadside verges in the Upper Teesdale survey area. No red sites were identified in this section of the project envelope – although there were three upper amber and a few lower amber sites. This area was most severely impacted upon by previous road engineering and kerbing schemes, as well as the impact of inappropriate planting (or 'escapes') from local gardens.

5.2.3 Results Overview, Section by Section - Bowlees to Forest-in-Teesdale

The verges in this section exhibited a variable, but largely high floristic interest. Characteristic species such as the crane's-bills and melancholy thistle *Cirsium heterophyllum*, were widespread and, in some places, abundant. The best sites were very good indeed, with one or two of these being outstanding; especially those situated to the west and east of the turn-off for Ettersgill. Three red sites were identified and these held a wide range of species including frog orchids, early-purple orchid (three colonies were identified), fragrant orchid, one verge had a small number of juniper plants *Juniperus communis* and another, a remnant of quarrying, a large amount of common rock-rose.

5.2.4 Results Overview, Section by Section - Forest-in-Teesdale to Langdon Beck Plantation

This section was very rich, especially in the Langdon Beck area, where five of the six red sites identified in this section, were clustered. By and large these sites exhibited upland hay meadow characteristics, with a range of species present, including: globeflower, common twayblade (which was found in four of the six red sites, sometimes in quite high numbers), four species of Lady's mantles including two of the rare species, with *A. monticola* being well represented on either side of the Langdon Beck itself. One of the issues that was pertinent to this area was the storage of recently-felled timber on the roadside verge close to Langdon Beck Plantation. This was impacting directly on a herb-rich sward and it is unknown whether this activity was formally sanctioned or not.

5.2.5 Results Overview, Section by Section - Langdon Beck Plantation to Ashgill Head

Undoubtedly the most important area of verges in the surveyed area. This encompassed a long section of road, with some very high biodiversity interest, a good cluster of varied sites and one red site that stretched almost 0.8 km along the north verge from the junction of the B6277 and St.John's Chapel road, almost to the turn-off for Greenhills. The variety and number of red sites in this section was particularly noteworthy. Red sites numbered fourteen and these ranged in habitat form, from classic hay meadow swards, to open rocky habitats with some alpine species, bog communities and acid grasslands that were rich in sedges. Despite the wild upland nature of the landscape in this area, at least two red sites had incurred recent damage as a result of a recently implemented kerbing and re-seeding scheme.

5.2.6 Results Overview, Section by Section - Ashgill Head to Crookburn Bridge

A long section of largely unenclosed land, in which many of the verges were severely impacted upon by sheep grazing and were, consequently, of poor biodiversity value. No red or amber sites were recorded along this section.

5.3 Biodiversity Detail and Highlights

Highlights of the Upper Teesdale survey (2003) included the presence of five species of Lady's mantles including the Red Data Book species *Alchemilla acutiloba* *A. monticola*.

Locations of rare Lady's mantles outside of red sites:

- *Alchemilla acutiloba* – noted at two sites: one south of Langdon Beck Bridge (NY 855309) and one at the Greenhills road junction (NY 841319)
- *Alchemilla monticola* – noted at four sites: one at Breckholm (NY 938257), one adjacent to High Force Quarry (NY 880288), one south of Langdon Beck Bridge (NY 855309) and one adjacent to Langdon Beck Hotel (NY 853313).

Six different orchid species were noted in the verges of Upper Teesdale. These were: common twayblade, early-purple orchid, frog orchid, fragrant orchid, common spotted orchid *i* and northern marsh orchid.

5.3.1 Notable Species Present in the Project Area

A total of 246 species of vascular plants were recorded along the roadside verges of the project envelope (see Appendix 2 for full details).

Species identified during the survey that are of particular note for their interest, rarity and/or localised distribution include:

Alchemilla acutiloba - a rare Lady's mantle

Alchemilla monticola - a rare Lady's mantle

Alpine bistort (*Persicaria vivipara*)

Sea plantain (*Plantago maritima*)

Common twayblade (*Listera ovata*)

Early-purple orchid (*Orchis mascula*)

Frog orchid (*Coeloglossum viride*)

Fragrant orchid (*Gymnadenia conopsea*)

Burnet-saxifrage (*Pimpinella saxifraga*)

Crowberry (*Empetrum nigrum*)

Small scabious (*Scabiosa columbaria*)

Common butterwort (*Pinguicula vulgaris*)

5.4 Summary of Red and Amber Sites

The following figures refer to the total number and length of red sites identified in the project area.

Total number of red sites: 23

Total length of red sites = 4.14 km

Total length of amber sites identified for the entire project area: 3.09 km, of which 1.03 km was classified as being 'upper amber'.

The location of all identified red and amber sites can be seen in the map section at the end of this report.

TABLE 1

LOCATIONS OF "RED SITES" IDENTIFIED DURING THE UPPER TEESDALE ROADSIDE FLORA PROJECT (MAY TO AUGUST 2003)

SITE NUMBER	LOCATION / SITE NAME (NUMBER OF SPECIES RECORDED)	SITE GRID REFERENCE
1	B6277 (west of East Friar House access road) – north verge (57)	NY 89472837 - NY 89772831
2	B6277 (west of Ettersgill road junction) – north verge (above retaining wall) (63)	NY 89102842 - NY 89302843
3	B6277 (west of High Force Quarry) – north verge (above retaining wall) (55)	NY 87722903 - NY 87752901
4	B6277 (west of Hanging Shaw picnic site) – north verge (35)	NY 86612988 - NY 86652986
5	B6277 (south of Langdon Beck Bridge) – east verge (73)	NY 85413115 - NY 85453099
6	B6277 (south of Langdon Beck Bridge) – west verge (49)	NY 85383103 - NY 85423100
7	B6277 (north of Langdon Beck Bridge) – east verge (56)	NY 85303140 - NY 85353131
8	B6277 (north of Langdon Beck Bridge) – west verge (48)	NY 85353139 - NY 85383132
9	B6277 (east of St. John's Chapel road junction) – south verge (65)	NY 84903167 - NY 85263143
10	B6277 (west of St. John's Chapel road junction) – north verge (52)	NY 84393189 - NY 84893170
11	B6277 (east of Greenhills road junction) – north verge (34)	NY 84263191 - NY 84383189
12	B6277 (adjacent to Greenhills road junction) – north verge (38)	NY 83483205 - NY 84143194
13*	B6277 (Bowes Close) – north east verge (23)	NY 83473251 - NY 83503247
14	B6277 (north west of Bowes Close) – north east verge (58)	NY 83323266 - NY 83463252
15	B6277 (north west of Red Site 14, btw. Lingy Hill and Bowes Close) – north east verge (57)	NY 83183278 - NY 83283268
16	B6277 (south east of Lingy Hill) – north east verge (67)	NY 83033294 - NY 83123281

17	B6277 (south east of Peases Cottage) – north east verge (67)	NY 82833312 - NY 83013298
18	B6277 (north west of Peases Cottage) – north east verge (60)	NY 82493364 - NY 82673328
19	B6277 (south east of Hill Top) – north east verge (45)	NY 82433374 - NY 82473368
20	B6277 (north of Hill Top) - east verge (30)	NY 82233408 - NY 82343390
21	B6277 (east of Rough Rigg) – north verge (33)	NY 82033423 - NY 82173423
22	B6277 (north west of Rough Rigg) – north east verge (21)	NY 81933535 - NY 81953434
23	B6277 (south east of Ashgill Head) – north east verge (54)	NY 80923541 - NY 81013529
	Average number of species per red site: 49.57	

* Red site 13, which was small in size, also held a colony of *A. monticola*

5.5 Summary of Recorded Species Other Than Plants

5.5.1 Invertebrates

A range of invertebrates was recorded during the survey work. For a full species list see Appendix 4.

5.5.2 Amphibia and Reptiles

Limited information on herptiles (reptiles and amphibia) accrued as a result of the survey. A full species list of those recorded is located in Appendix 5, with specific details highlighted below.

1. Common (viviparous) lizard –noted at a small number of sites.
2. Common amphibians - common frog and common toad was noted a few sites.
3. Palmate newt

5.5.3 Birds

A range of birds was noted utilising the roadsides during the survey period. These included linnet and yellowhammer (in the lower part of the upper dale). A number of the species e.g. willow warbler were principally associating with hedgerows and scrub adjacent to grassland habitats. Kestrels were observed using roadside verges for hunting, buzzard were noted on a number of occasions, including foraging on roadkills and, on one occasion, a juvenile peregrine, mobbed by kestrels, was observed. Undoubtedly, the saddest observation of the survey period was the adult

male merlin found as a road casualty in the upper part of the survey area. For a full species list, see Appendix 5.

5.5.4 Mammals

A number of mammal species were recorded during the survey period.

1. Rabbit - numerous corpses were noted along the road verges.
2. Small mammals - a range of common species were present in most grasslands across the project area. For the full species list see Appendix 5.

PART IV - DISCUSSION AND RECOMMENDATIONS

6. Issues Affecting Roadside Verges

6.1 Introduction

The results of the survey work carried out in Upper Teesdale and the Derwent valley in 2003, and the experience of work on the roadside verges of Weardale (2001) and (lower) Teesdale in 2002 form the basis of the recommendations for the management of this portion of the dale's roadside verges. In order to understand why it is important to enhance them, it is necessary to appreciate why roadside verges in general are of conservation value and the threats they currently face.

With reference to the roadside verges of Upper Teesdale in particular, the survey results demonstrate the current high botanical value of some areas (the red sites) and the potential of other areas, with appropriate management, to be of similar value (amber sites, especially those designated as upper amber). Protection and enhancement of the roadside verges in Upper Teesdale provides an opportunity to recreate small areas of habitat that have been present for centuries and are thought to be linked to the ground flora of the dales original climax vegetation type, upland ash woodland.

The recommendations made for managing the roadside verges in Upper Teesdale might be achieved using a twofold approach. This involves firstly, raising public awareness of their existence and biodiversity importance and secondly, the implementation of more appropriate verge side management for the best sites.

6.2 The Relative Value of Red and Amber Sites in Upper Teesdale and Elsewhere

It is worth making some comparison between the verges surveyed in Weardale, Teesdale and the Derwent valley. A simple analysis of the lengths of red and amber verges identified during the four surveys indicates that there are some considerable differences between the roadside floristic riches to be found in each of the dales.

In simple terms (see Table and figures below), there was a much larger 'red' resource (length of species-rich vergeside) in Weardale and Upper Teesdale when compared with the Derwent valley and (lower) Teesdale. This disparity was even more evident for those verges classified as amber, with almost eight times the length of amber verge identified in Weardale compared with that of (lower) Teesdale. Weardale had also nearly six times the length of amber verge when compared to that identified in Upper Teesdale, and just over three times that identified in the Derwent valley.

The subjective judgement of site surveyors working on all four surveys, was that the species diversity in the Upper Teesdale, (lower) Teesdale and the Derwent valley red sites was broadly the same, being higher than that encountered on similar sites in Weardale.

This is borne out by the average number of species recorded on red sites, which was 49.57 per site in Upper Teesdale, 49.43 per site in the Derwent valley, 49.05 per site in (lower) Teesdale, and 43.94 per site in Weardale.

The 'none-red' roadside verges in the Derwent valley were deemed by surveyors, 'more interesting' for their biodiversity value than perhaps any other verges surveyed between 2001 and 2003. The Derwent valley held the greatest number of amber sites (58) of all four survey areas, when compared with Upper Teesdale (39), Weardale (37) and (lower) Teesdale (29). It also held the highest number of upper amber sites (20), contrasting with (lower) and Upper Teesdale (both 13) and Weardale (3).

Table 2

	WEARDALE	(lower) TEESDALE	UPPER TEESDALE	DERWENT VALLEY
Total length of verge survey area (km)	100	70	45	40
Total number of species recorded in survey area	216	240	246	225
Average number of species per Red site	43.94	49.05	49.57	49.43
Total number of Red sites	19	19	23	16
Total number of Upper Amber sites	3	13	13	20
Total number of Lower Amber sites	34	16	26	38
Total length of Red sites (km)	5.45	1.33	4.14	1.69
Total length of Amber sites (km)	17.1	2.15	3.09	5.46
Total length of Upper Amber sites (km)	2.8	1.43	1.03	1.78
Total length of Lower Amber sites (km)	14.3	0.72	2.06	3.68
Length of Red verges as % of survey area	5.45	1.9	9.2	4.3
Length of Amber verges as % of survey area	17.1	3.1	6.9	13.6

In the Derwent valley, the total length of red verges, expressed as a percentage of the total length of surveyed verges, was 4.3%. In contrast, for amber sites, 3.6% of the total length of verge surveyed was classified as amber, with 4.5% of the total length being classified as Upper Amber (i.e. 33% of the identified 'amber resource' was classified as 'upper').

In Weardale, the total length of red verges, expressed as a percentage of the total length of surveyed verges, was 5.5%. This compares with amber sites, where 17.1% of the total length of verge surveyed was classified as amber, with 2.8% of the total length being classified as Upper Amber (i.e. 16.4% of the identified 'amber resource' was classified as 'upper').

In Upper Teesdale, the total length of red verges, expressed as a percentage of the total length of surveyed verges, was 9.2%, considerably higher than any other area surveyed between 2001 and 2003. Whereas, for amber sites, 6.9% of the total length of verge surveyed was classified as amber, with 2.5% of the total length being classified as Upper Amber (i.e. 33.3% of the identified 'amber resource' was classified as 'upper').

In (lower) Teesdale, the total length of red verges, expressed as a percentage of the total length of surveyed verges, was 1.9%. This contrasts with amber sites, where 3.1% of the total length of verge surveyed was classified as amber, with 2.0% of the total length being classified as Upper Amber (i.e. 66.5% of the identified 'amber resource' was classified as 'upper').

6.3 Current Threats To Roadside Verges In Upper Teesdale

In common with roadside verges in many areas of the UK, the verges of Upper Teesdale together with the plant and animal life they support, face a number of threats. These can be divided into those that are due to external influences, natural processes and those which arise from current management techniques. In ecological terms, roadside verges are examples of habitats that are narrow and linear in nature and are, therefore, heavily influenced by so-called 'edge effects'. They are particularly vulnerable to the factors listed below:

- Leaching of nutrients derived from fertilisers or animal dung from adjacent farmland. This is an issue for roadside verges, which adjoin improved grassland used for livestock grazing; many such verges become dominated by nettles, thistles, docks and coarse grasses.
- Pollution from road run-off and exhaust emissions (especially NO₂, NO and SO₂). Whilst some plants are intolerant of nitrous oxides (NO, NO₂), they can be beneficial for other

species. High levels of nitrogen deposition on roadside verges have been linked to the heightened productivity of soils near the edge of the road, which can lead to the establishment of competitive grasses. Though sulphur is essential for plant growth, Sulphur dioxide (SO₂) is always detrimental to plant growth.

- The dumping of road grit and salt by the roadside, in preparation for winter conditions. Spray from the salt, once applied to the roads, or the salt itself (inappropriately stored), is toxic to many plants and can result in the establishment of halophytic plants such as oraches *Atriplex* spp., salt marsh grasses e.g. *Puccinella*, and lesser sea spurrey *Spergularia marina*. The two metres of roadside verge nearest to the carriageway are the worst affected. Salt pollution creates bare patches, particularly close to the kerb.
- Roadside works including the installation of services such as gas, water, electricity, cable television and roadside improvements such as kerbing and widening all impact upon roadside verge habitats. Car parking and over-riding by large vehicles also physically damages roadside verges.
- The loss of floristic interest as a result of the natural progression of seral succession (i.e. scrubbing over) – a particular threat to the red sites identified either side of the Ettersgill junction and the red site west of High Force Quarry, which without intervention will be lost to scrub (ash, birch, sycamore and willow) regeneration.
- The loss of floristic diversity as a result of a lack of appropriate management, leading to a dominance in the sward by rank grass species such as tufted hair-grass *Deschampsia caespitosa*, false oat-grass *Arrhenatherum elatius* and cocksfoot *Dactylis glomerata*.

In terms of the techniques that are currently widely used to manage grass verges, there are several activities that are detrimental to roadside verge vegetation.

- The emphasis on tidiness with roadside verges being mown, in some cases, every few weeks, particularly outside roadside houses. This leads to the establishment of resilient rosette-forming species such as daisy (*Bellis perennis*).
- The use of flail mowers, which can scalp turf, dig into the soil and destroys the roots of plants.

- The build up of organic materials - grass cuttings are rarely removed. This leaves a thick layer of mulch forming a dense mat that smothers plants and increases the nutrient status of the underlying soils.
- Non-compliance with Highways Authority management strategies by contractors. Examples of such non-compliance includes the cutting (and timing of cutting) of excessively wide swathes and impacts resulting from highways maintenance. Such activities impacted heavily on three Red Sites in the survey area (for specific details, see Section 5.2 earlier).
- Planting of inappropriate flowering plants and tree species such as conifers, daffodils and snowdrops.
- Verges becoming strewn with fallen stones from adjacent walls and therefore left uncut.
- The unofficial adoption of herb-rich verges adjacent to or opposite farms or private dwellings, leading to their development as 'garden extensions or lawns'.

7. The Importance of Upper Teesdale's Roadside Verges as a Conservation Resource

7.1 A Typical Upper Teesdale Roadside Verge - The Link to NVC Category MG3

As determined during the work in Weardale during 2001 and (lower) Teesdale in 2002, the survey of Upper Teesdale's roadside verges revealed the presence of a suite of frequently occurring plant species. These included wood crane's-bill *Geranium sylvaticum*, meadow crane's-bill *G. pratense*, greater burnet *Sanguisorba officinalis*, pignut *Conopodium majus*, greater plantain *Plantago major*, common sorrel *Rumex acetosa*, meadow buttercup *Ranunculus acris*, Lady's mantles *Alchemilla* agg., common mouse-ear *Cerastium holosteoides*, creeping buttercup *Ranunculus repens*, dandelion *Taraxacum officinale* agg., meadow vetchling *Lathyrus pratensis*, daisy *Bellis perennis*, cocksfoot *Dactylis glomerata*, red fescue *Festuca rubra*, yorkshire fog *Holcus lanatus*, sweet vernal grass *Anthoxanthum odoratum*, rough meadow-grass *Poa trivialis*, crested dog's-tail *Cynosaurus cristatus* and smooth meadow-grass *Poa pratensis*. The plant species in the above list are all either constant or frequently occurring elements in the National Vegetation Classification (NVC) community MG3 *Anthoxanthum odoratum*-*Geranium sylvaticum* grassland i.e. a community that is characteristic of Pennine 'dales hay meadows'.

The species composition of the Upper Teesdale roadside verges demonstrated a clear link between the roadside verges and the MG3-type hay meadows of Upper Teesdale. These communities, with their characteristic tall, robust herbs are found only in the higher valleys of the Pennines and the Lake District. Recent estimates suggest that there are less than 1000 ha of upland hay meadow (MG3) in England. The hay meadows of Upper Teesdale (as evidenced by their multiple designation – SPA, NNR and ESA) are therefore of national significance as these grassland communities are not only scarce in the UK, but also Europe. They contain a large number of species as well as nationally rare/scarce plants that are often restricted to these habitats. All ‘MG3’ sites are of European conservation significance.

The roadside verges identified as being 'red, or 'upper amber' in the lower and mid parts of Upper Teesdale have a constituent flora which is closely aligned to that of the ‘MG3’ hay meadows. If these are to be maintained, they require appropriate management. If such verges are left unmanaged, then they may be converted to the coarser *Arrhenatherum elatius* sub-community. Indeed, false oat-grass (*Arrhenatherum elatius*) was recorded at many sites along Upper Teesdale's verges and was, in places, abundant.

The recent history of Lady's mantles shows that they have declined as the amount and quality of suitable habitat has decreased. In the 1950s, *Alchemilla acutiloba* was more frequent in Weardale than in Teesdale and often occurred in meadows. Along with *A. monticola*, it was common along stretches of roadside verge in both dales. Today, its presence along roadside verges is very much reduced and in many places, there are now only isolated plants. During the last fifty years, it is estimated that numbers of *A. acutiloba* at previously documented sites have fallen by nearly 60%. Weardale is still the main area in the country for *Alchemilla acutiloba* and now that it has become less frequent in Weardale, its more effective conservation in Teesdale is essential. Alongside this, *Alchemilla monticola* is found nowhere else in the UK, other than Teesdale and consequently its conservation in roadside verges is of paramount importance.

7.2 Key Biodiversity Issues Identified Along Roadside Verges in Upper Teesdale

The fieldwork undertaken along the roadside verges in Upper Teesdale enabled a number of key biodiversity issues to be identified. These are listed below. The first four issues are all recognised as factors, which exert a negative influence on the Upper Teesdale roadside verges, contributing to the low biodiversity value of certain verges. More positive attributes of the roadside verges are then listed, including sites, which are of botanical importance and examples of those with potential for improvement.

- Current management techniques and schedules are not always conducive to increasing the biodiversity value of roadside verges.
- Agricultural damage of roadside verges e.g. point and non-point source pollution of verges as a result of field run-off of nitrates, phosphates as well as pesticide drift from adjacent crop management works.
- Fragmentation of floristically rich roadside verge habitat.
- Low biodiversity quality on many of the roadside verges. Of the 45 km of verges that were initially assessed, only 7.23 km were identified as being either 'red' or 'amber' (only 5.17 km being 'red' or 'upper amber').
- Significant biodiversity interest in roadside verges identified during the survey included: the presence of Red Data Book species *Alchemilla monticola* (which occurred on ten of the red verges surveyed, plus four other locations) and *A. acutiloba* (which was found on two of the red verges in the dale as well as two other locations).
- The very large verge located close to the Langdon Beck Bridge (Red Site 5), on the east side of the B6277, south east of the Langdon Beck Hotel. This site supports four species of *Alchemilla* (including *A. acutiloba* and *A. monticola*), four species of orchid (fragrant, early-purple, common twayblade and northern marsh) and amassed a total of 73 species in total. It comprises patches of herb-rich flora adjacent to areas of rank grassland and is in serious need of appropriate management.
- The presence of melancholy thistle in considerable amounts along the B6277, particularly on the north verge between High Force Quarry and the High Force Hotel and also, opposite Hill Top (either side of a metal railing).
- The presence of the rare globeflower at four of the red sites in the westernmost section of the survey area.
- The very real significance of roadside verges as a refuge for scarce Lady's mantles in some key zones.

- The importance of adjacent habitat features including ditches, hedgerows and stone walls. The adjacent land use was also significant – a number of the red and upper amber sites adjoined herb-rich hay meadows.

8. Management Recommendations

8.1 Recommendations for the Management of Upper Teesdale's Roadside Verges

This report makes the following recommendations with regard to conserving and subsequently enhancing the wildlife value of the roadside verges in Upper Teesdale:

- The verges that are classified as red should be protected and maintained. This might be most effectively achieved by identifying them in appropriate fashion to the Highways Authority and contractors on maps and electronic prompts such as a Geographical Information System. Those classified as upper amber should be enhanced wherever possible. Lower amber sites should be improved when resources permit.
- The position of 'red' sites should be documented in paper and electronic forms (as appropriate) by the Highways Authority and, where possible, marked on the highway and/or the verge side to facilitate implementation of management recommendations.
- A time-limited, fully costed management plan applicable to all roadside verge sites identified as being of red and amber quality through appropriate survey in the North Pennines AONB and its environs, should be considered for production. This will enable the very specific, ecologically effective techniques required to successfully manage all identified red and amber sites, to be determined and more effectively implemented.
- The stated policies of Durham County Council ('Policy for the Management of Roadside Verges - Environment Department, Durham County Council, 1995') should be adhered to and properly implemented. Resources currently utilised carrying out excessive and unnecessary grass cutting operations (as observed in Upper Teesdale in 2002 & 2003 and Weardale in 2001), which are not required under the policy, should be re-directed to the more appropriate management of 'red' and 'upper amber' sites.
- Apply appropriate grass-cutting regimes to all red sites requiring active sward management (prescriptions for these to be drawn up after due consultation with relevant experts - see

bullet point 3). The only practical method of managing grass verges is by cutting and subsequently removing the grass cuttings. All grass cuttings should be removed within a week of cutting (after setting of seed), to prevent the build-up of nutrients and the smothering of vegetation.

- Areas for salt storage in winter should be sited well away from red verges (as per Policy for the Management of Roadside Verges, Durham County Council, 1995).
- Remove colonising scrub from Red Sites 1, 2 & 3, as this is shading out the ground flora, particularly rare orchids and in the case of Red Site 2, juniper. The timing of grass cutting and flail width cut should also be reviewed on these sites
- Consider interpreting the flora of important roadside verges to the general public using appropriate mechanisms, located in accessible situations – such as an (updated) interpretive panel to be located at the Hanging Shaw picnic site (adjacent to Red Site 4).
- Consider the designation of some of the best and largest red sites as County Wildlife Sites, Red Site 5 near Langdon Beck being a case in point.

8.2 Potential Benefits Following Implementation of Recommendations

A suite of potential benefits would include:

- An economic saving on some of the verge management programme, especially where 'over-cutting' is currently occurring.
- Appropriate management of the roadside verges in Upper Teesdale will prevent the establishment of undesirable species of herbs and grasses, such as nettles, docks and coarse grasses and will limit the establishment of trees and shrubs that might overshadow and eventually prevent the establishment of the majority of flowering plants.
- The number and diversity of plant species present along the roadside verges of Upper Teesdale will increase. This will include species that are important because they are currently rare or declining.

- The visual appeal of the roadside verges will increase due to the presence of a larger number and variety of flowering plants. This will enhance the landscape for the benefit of both local communities and visitors alike.
- The area of roadside verges that constitute fragments of remnant MG3 hay meadows, a grassland type of European importance in terms of nature conservation, will be increased.
- The Upper Teesdale roadside verges will become a 'flagship' that might be used to demonstrate to other local authorities and Highways Authorities the benefits of managing roadside verges for biodiversity.
- There will be an increase in the number of Lady's mantles growing on the roadside verges in Upper Teesdale.
- The Highways Authority will be actively involved in implementing the Durham Biodiversity Action Plan and the Management Plan for the North Pennines AONB.

PART V – APPENDICES AND DATA

The Appendices contain the broad base of biodiversity data that was collated during the project.

Appendix 1 VASCULAR PLANTS RECORDED AT RED SITES DURING THE UPPER TEESDALE ROADSIDE FLORA PROJECT (MAY - AUGUST 2003) – SITE RECORD CARDS

Survey Dates: 29/05/03 10/07/03 31/07/03	Site name: Red Site 1 – B6277 (west of East Friar House access road) – north verge	Grid Ref (Start): NY 89472837	Grid Ref (End): NY 89772831
--	--	---	---------------------------------------

Notes - Red Site 1

The cutting regime of two flail widths may prevent *Coeloglossum viride* (as observed in 2003) from setting seed.

Willow and ash scrub encroachment threatens to shade out ground flora, particularly orchids.

Plant species	Plant species	Plant species
<i>Acer pseudoplatanus</i>	<i>Festuca rubra</i>	<i>Prunella vulgaris</i>
<i>Ajuga reptans</i>	<i>Filipendula ulmaria</i>	<i>Ranunculus acris</i>
<i>Alchemilla glabra</i>	<i>Fraxinus excelsior</i>	<i>R. ficaria</i>
<i>Alnus glutinosa</i>	<i>Galium cruciata</i>	<i>R. repens</i>
<i>Bellis perennis</i>	<i>Geranium pratense</i>	<i>Rhinanthus minor</i>
<i>Betula pendula</i>	<i>Geum rivale</i>	<i>Rumex</i> spp. (dock)
<i>Campanula rotundifolia</i>	<i>G. urbanum</i>	<i>Salix cinerea</i>
<i>Carex flacca</i>	<i>Gymnadenia conopsea</i>	<i>Sanguisorba minor</i>
<i>Carex panicea</i>	<i>Heracleum sphondylium</i>	<i>Senecio jacobaea</i>
<i>Centaurea nigra</i>	<i>Hieracium</i> spp.	<i>Succisa pratensis</i>
<i>Cerastium holosteoides</i>	<i>Lathyrus pratensis</i>	<i>Taraxacum officinale</i> agg.
<i>Cirsium arvense</i>	<i>Listera ovata</i>	<i>Trifolium repens</i>
<i>C. heterophyllum</i>	<i>Lotus corniculatus</i>	<i>Tussilago farfara</i>
<i>Coeloglossum viride</i>	<i>Mercurialis perennis</i>	<i>Urtica dioica</i>
<i>Conopodium majus</i>	<i>Myosotis</i> spp.	<i>Vaccinium myrtillus</i>
<i>Dactylis glomerata</i>	<i>Orchis mascula</i>	<i>Veronica chamaedrys</i>
<i>Deschampsia caespitosa</i>	<i>Plantago lanceolata</i>	<i>Vicia cracca</i>
<i>Dryopteris filix-mas</i>	<i>Potentilla anserina</i>	<i>V. sepium</i>
<i>Equisetum arvense</i>	<i>P. erecta</i>	<i>Viola riviniana</i>

Survey Dates: 29/05/03 31/07/03	Site name: Red Site 2 – B6277 (west of Ettersgill road junction) – north verge	Grid Ref (Start): NY 89102842	Grid Ref (End): NY 89302843
--	--	---	---------------------------------------

Notes - Red Site 2

Acer pseudoplatanus scrub threatens to shade out *Juniperis communis* and *Orchis mascula*.

Requires occasional hay crop, plus limit spread of bracken.

Plant species	Plant species
<i>Acer pseudoplatanus</i>	<i>Lathyrus linifolius</i>
<i>Achillea millefolium</i>	<i>L. pratensis</i>
<i>Agrostis stolonifera</i>	<i>Listera ovata</i>
<i>Alchemilla filicaulis</i> ssp. <i>vestita</i>	<i>Lotus corniculatus</i>
<i>A. glabra</i>	<i>Luzula campestris</i>
<i>Alopecurus pratensis</i>	<i>Orchis mascula</i>
<i>Anthoxanthum odoratum</i>	<i>Pimpinella saxifraga</i>
<i>Anthriscus sylvestris</i>	<i>Plantago lanceolata</i>
<i>Arrhenatherum elatius</i>	<i>Poa pratensis</i>
<i>Bellis perennis</i>	<i>P. trivialis</i>
<i>Campanula rotundifolia</i>	<i>Potentilla erecta</i>
<i>Centaurea nigra</i>	<i>P. sterilis</i>
<i>Cerastium holosteoides</i>	<i>Primula veris</i>

<i>Cirsium heterophyllum</i>	<i>P. vulgaris</i>
<i>C. palustre</i>	<i>Prunus spinosa</i>
<i>Conopodium majus</i>	<i>Pteridium aquilinum</i>
<i>Crataegus monogyna</i>	<i>Ranunculus acris</i>
<i>Dactylis glomerata</i>	<i>R. repens</i>
<i>Deschampsia caespitosa</i>	<i>Rumex acetosa</i>
<i>Dryopteris filix-mas</i>	<i>Senecio jacobaea</i>
<i>Euphrasia nemorosa</i>	<i>Silene dioica</i>
<i>Festuca ovina</i>	<i>Sorbus aucuparia</i>
<i>F. rubra</i>	<i>Stellaria graminea</i>
<i>Fraxinus excelsior</i>	<i>Succisa pratensis</i>
<i>Galium aparine</i>	<i>Thymus drucei</i>
<i>G. cruciata</i>	<i>Torilis japonica</i>
<i>G. verum</i>	<i>Ulmus glabra</i>
<i>Geranium robertianum</i>	<i>Urtica dioica</i>
<i>G. sylvaticum</i>	<i>Veronica chamaedrys</i>
<i>Geum urbanum</i>	<i>Vicia sativa</i>
<i>Hypericum pulchrum</i>	<i>Viola canina</i>
<i>Juniperis communis</i>	

Survey Dates: 29/05/03 10/07/03 31/07/03	Site name: Red Site 3 – B6277 (west of High Force Quarry) – north verge (above retaining wall)	Grid Ref (Start): NY 87722903	Grid Ref (End): NY 87752901
--	--	---	---------------------------------------

Notes - Red Site 3

No cutting is possible (or required).

Scrub encroachment threatens to shade out ground flora.

Plant species	Plant species
<i>Acer pseudoplatanus</i>	<i>Hieracium</i> spp.
<i>Agrostis capillaris</i>	<i>Hyacinthoides non-scriptus</i>
<i>Ajuga reptans</i>	<i>Linum catharticum</i>
<i>Alchemilla glabra</i>	<i>Lonicera periclymenum</i>
<i>A. xanthochlora</i>	<i>Lotus corniculatus</i>
<i>Anemone nemorosa</i>	<i>Mercurialis perennis</i>
<i>Anthoxanthum odoratum</i>	<i>Orchis mascula</i>
<i>Arum maculatum</i>	<i>Pilosella officinarum</i>
<i>Betula pendula</i>	<i>Pimpinella saxifraga</i>
<i>Campanula rotundifolia</i>	<i>Plantago lanceolata</i>
<i>Centaurea nigra</i>	<i>Polygala vulgaris</i>
<i>Cirsium arvense</i>	<i>Potentilla erecta</i>
<i>C. heterophyllum</i>	<i>P. sterilis</i>
<i>C. vulgare</i>	<i>Primula veris</i>
<i>Conopodium majus</i>	<i>Prunus spinosa</i>
<i>Corylus avellana</i>	<i>Ranunculus ficaria</i>
<i>Crataegus monogyna</i>	<i>Rosa</i> spp.
<i>Dactylis glomerata</i>	<i>Rubus rubiginosa</i>
<i>Euphrasia</i> spp.	<i>Salix</i> spp.
<i>Festuca ovina</i>	<i>Sanguisorba officinalis</i>
<i>Filipendula ulmaria</i>	<i>Senecio jacobaea</i>
<i>Fragaria vesca</i>	<i>Succisa pratensis</i>
<i>Fraxinus excelsior</i>	<i>Teucrium scorodonia</i>
<i>Galium cruciata</i>	<i>Thymus drucei</i>
<i>G. verum</i>	<i>Veronica chamaedrys</i>
<i>Geum urbanum</i>	<i>Vicia sepium</i>
<i>Helianthemum nummularium</i>	<i>Viola riviniana</i>
<i>Heracleum sphondylium</i>	

Survey Dates: 04/07/03 31/07/03	Site name: Red Site 4 – B6277 (west of Hanging Shaw picnic site) – north verge	Grid Ref (Start): NY 86612988	Grid Ref (End): NY 86652986
--	--	---	---------------------------------------

Notes - Red Site 4
Install interpretative panel at nearby picnic site.

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Galium verum</i>
<i>A. ptarmica</i>	<i>Geum rivale</i>
<i>Alchemilla glabra</i>	<i>Heracleum sphondylium</i>
<i>Alopecurus pratensis</i>	<i>Hieracium</i> spp.
<i>Anthoxanthum odoratum</i>	<i>Holcus lanatus</i>
<i>Arrhenatherum elatius</i>	<i>Lathyrus pratensis</i>
<i>Briza media</i>	<i>Lotus corniculatus</i>
<i>Centaurea nigra</i>	<i>Narcissus pseudonarcissus</i> (cultivar)
<i>Cirsium heterophyllum</i>	<i>Orchis mascula</i>
<i>Conopodium majus</i>	<i>Plantago lanceolata</i>
<i>Crataegus monogyna</i>	<i>P. major</i>
<i>Cynosaurus cristatus</i>	<i>Prunella vulgaris</i>
<i>Dactylis glomerata</i>	<i>Ranunculus acris</i>
<i>Dactylorhiza purpurella</i>	<i>Senecio jacobaea</i>
<i>Deschampsia caespitosa</i>	<i>Trifolium pratense</i>
<i>Equisetum arvense</i>	<i>Veronica chamaedrys</i>
<i>Festuca rubra</i>	<i>Vicia sepium</i>
<i>Filipendula ulmaria</i>	

Survey Dates: 11/06/03 31/07/03	Site name: Red Site 5 – B6277 (south of Langdon Beck Bridge) – east verge	Grid Ref (Start): NY 85413115	Grid Ref (End): NY 85453099
--	---	---	---------------------------------------

Notes - Red Site 5
Patches of herb-rich flora adjacent to areas of rank grassland.
Verge acutely in need of spring and autumn cut (over several years).

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Hieracium</i> spp.
<i>A. ptarmica</i>	<i>Holcus lanatus</i>
<i>Ajuga reptans</i>	<i>Juncus acutiflorus</i>
<i>Alchemilla acutiloba</i>	<i>J. articulatus</i>
<i>A. glabra</i>	<i>Lathyrus pratensis</i>
<i>A. monticola</i>	<i>Leontodon autumnalis</i>
<i>A. xanthochlora</i>	<i>Listera ovata</i>
<i>Alopecurus pratensis</i>	<i>Lotus corniculatus</i>
<i>Anthoxanthum odoratum</i>	<i>Orchis mascula</i>
<i>Anthriscus sylvestris</i>	<i>Phleum pratense</i>
<i>Arrhenatherum elatius</i>	<i>Plantago lanceolata</i>
<i>Bellis perennis</i>	<i>Potentilla erecta</i>
<i>Briza media</i>	<i>Primula veris</i>
<i>Campanula rotundifolia</i>	<i>Ranunculus acris</i>
<i>Cardamine hirsuta</i>	<i>R. repens</i>
<i>C. pratensis</i>	<i>Rhinanthus minor</i>
<i>Carex flacca</i>	<i>Rosa canina</i> agg.
<i>C. panicea</i>	<i>Rumex acetosa</i>
<i>Centaurea nigra</i>	<i>R. crispus</i>
<i>Chamaenerion angustifolium</i>	<i>R. obtusifolius</i>
<i>Cirsium arvense</i>	<i>Sanguisorba minor</i>
<i>Conopodium majus</i>	<i>S. officinalis</i>
<i>Crataegus monogyna</i>	<i>Scabiosa columbaria</i>
<i>Cynosaurus cristatus</i>	<i>Senecio jacobaea</i>
<i>Dactylis glomerata</i>	<i>Stellaria graminea</i>
<i>Dactylorhiza purpurella</i>	<i>Succisa pratensis</i>
<i>Deschampsia caespitosa</i>	<i>Tragopogon pratensis</i>
<i>Equisetum arvense</i>	<i>Trifolium medium</i>
<i>Euphrasia</i> spp.	<i>T. pratense</i>

<i>Festuca ovina</i>	<i>Tussilago farfara</i>
<i>Filipendula ulmaria</i>	<i>Urtica dioica</i>
<i>Galium cruciata</i>	<i>Valeriana officinalis</i>
<i>G. verum</i>	<i>Veronica beccabunga</i>
<i>Geranium sylvaticum</i>	<i>V. chamaedrys</i>
<i>Geum rivale</i>	<i>Vicia sepium</i>
<i>Gymnadenia conopsea</i>	<i>Viola lutea</i>
<i>Heracleum sphondylium</i>	

Survey Dates: 04/07/03 31/07/03	Site name: Red Site 6 – B6277 (south of Langdon Beck Bridge) – west verge	Grid Ref (Start): NY 85383103	Grid Ref (End): NY 85423100
--	---	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Juncus acutiflorus</i>
<i>Agrostis stolonifera</i>	<i>J. conglomeratus</i>
<i>Alchemilla acutiloba</i>	<i>J. inflexus</i>
<i>A. glabra</i>	<i>Lathyrus pratensis</i>
<i>Alopecurus pratensis</i>	<i>Leontodon hispidus</i>
<i>Anthoxanthum odoratum</i>	<i>Linum catharticum</i>
<i>Anthriscus sylvestris</i>	<i>Listera ovata</i>
<i>Arrhenatherum elatius</i>	<i>Lotus corniculatus</i>
<i>Bellis perennis</i>	<i>Plantago lanceolata</i>
<i>Briza media</i>	<i>P. major</i>
<i>Carex flacca</i>	<i>Potentilla reptans</i>
<i>Centaurea nigra</i>	<i>Prunella vulgaris</i>
<i>Cerastium holosteoides</i>	<i>Ranunculus acris</i>
<i>Conopodium majus</i>	<i>R. repens</i>
<i>Cynosaurus cristatus</i>	<i>Rhinanthus minor</i>
<i>Dactylis glomerata</i>	<i>Rumex crispus</i>
<i>Dactylorhiza purpurella</i>	<i>Sanguisorba officinalis</i>
<i>Equisetum arvense</i>	<i>Stellaria graminea</i>
<i>Euphrasia nemorosa</i>	<i>Trifolium medium</i>
<i>Festuca arundinacea</i>	<i>T. pratense</i>
<i>Filipendula ulmaria</i>	<i>T. repens</i>
<i>Galium verum</i>	<i>Tussilago farfara</i>
<i>Gymnadenia conopsea</i>	<i>Veronica chamaedrys</i>
<i>Heracleum sphondylium</i>	<i>Vicia sepium</i>
<i>Holcus lanatus</i>	

Survey Dates: 11/06/03 31/07/03	Site name: Red Site 7 – B6277 (north of Langdon Beck Bridge) – east verge	Grid Ref (Start): NY 85303140	Grid Ref (End): NY 85353131
--	---	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Heracleum sphondylium</i>
<i>A. ptarmica</i>	<i>Hieracium</i> spp.
<i>Alchemilla glabra</i>	<i>Holcus lanatus</i>
<i>A. monticola</i>	<i>Juncus conglomeratus</i>
<i>Anthoxanthum odoratum</i>	<i>J. effusus</i>
<i>Anthriscus sylvestris</i>	<i>Lathyrus pratensis</i>
<i>Arrhenatherum elatius</i>	<i>Leontodon autumnalis</i>
<i>Briza media</i>	<i>Linum catharticum</i>
<i>Caltha palustris</i>	<i>Listera ovata</i>
<i>Campanula rotundifolia</i>	<i>Lotus corniculatus</i>
<i>Cardamine pratensis</i>	<i>Mercurialis perennis</i>
<i>Carex flacca</i>	<i>Myosotis caespitosa</i>

<i>C. panicea</i>	<i>Plantago lanceolata</i>
<i>Centaurea nigra</i>	<i>Potentilla erecta</i>
<i>Cerastium holosteoides</i>	<i>Ranunculus acris</i>
<i>Cirsium arvense</i>	<i>R. ficaria</i>
<i>Conopodium majus</i>	<i>R. repens</i>
<i>Crataegus monogyna</i>	<i>Rhinanthus minor</i>
<i>Dactylis glomerata</i>	<i>Rumex acetosa</i>
<i>Dactylorhiza purpurella</i>	<i>Salix caprea</i>
<i>Deschampsia caespitosa</i>	<i>Sanguisorba officinalis</i>
<i>Equisetum arvense</i>	<i>Sorbus aucuparia</i>
<i>E. palustre</i>	<i>Succisa pratensis</i>
<i>Festuca rubra</i>	<i>Trifolium pratense</i>
<i>Galium cruciata</i>	<i>Tussilago farfara</i>
<i>G. verum</i>	<i>Urtica dioica</i>
<i>Geranium sylvaticum</i>	<i>Veronica chamaedrys</i>
<i>Geum rivale</i>	<i>Vicia sepium</i>

Survey Dates: 11/06/03 31/07/03	Site name: Red Site 8 – B6277 (north of Langdon Beck Bridge) – west verge	Grid Ref (Start): NY 85353139	Grid Ref (End): NY 85383132
--	---	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>G. verum</i>
<i>Alchemilla glabra</i>	<i>Geum rivale</i>
<i>A. monticola</i>	<i>Heracleum sphondylium</i>
<i>Anthoxanthum odoratum</i>	<i>Holcus lanatus</i>
<i>Arrhenatherum elatius</i>	<i>Lathyrus pratensis</i>
<i>Atriplex patula</i>	<i>Leontodon autumnalis</i>
<i>Bellis perennis</i>	<i>L. hispidus</i>
<i>Briza media</i>	<i>Linum catharticum</i>
<i>Carex flacca</i>	<i>Listera ovata</i>
<i>Carex panicea</i>	<i>Lotus corniculatus</i>
<i>Centaurea nigra</i>	<i>Luzula campestris</i>
<i>Cerastium holosteoides</i>	<i>Plantago lanceolata</i>
<i>Cirsium arvense</i>	<i>Potentilla anserina</i>
<i>C. heterophyllum</i>	<i>P. erecta</i>
<i>Conopodium majus</i>	<i>Ranunculus acris</i>
<i>Cynosaurus cristatus</i>	<i>Rhinanthus minor</i>
<i>Dactylis glomerata</i>	<i>Rumex acetosa</i>
<i>Dactylorhiza fuchsii</i>	<i>Sanguisorba officinalis</i>
<i>Dactylorhiza purpurella</i>	<i>Senecio jacobaea</i>
<i>Deschampsia caespitosa</i>	<i>Taraxacum officinale</i> agg.
<i>Euphrasia nemorosa</i>	<i>Trifolium pratense</i>
<i>Festuca rubra</i>	<i>Tussilago farfara</i>
<i>Filipendula ulmaria</i>	<i>Veronica chamaedrys</i>
<i>Galium cruciata</i>	<i>Vicia sepium</i>

Survey Dates: 11/06/03 31/07/03	Site name: Red Site 9 – B6277 (east of St. John's Chapel road junction) – south verge	Grid Ref (Start): NY 84903167	Grid Ref (End): NY 85263143
--	---	---	---------------------------------------

Notes - Red Site 9
Storage of recently felled timber has impacted on herb-rich verge.

Plant species	Plant species
<i>Achillea ptarmica</i>	<i>Hieracium</i> spp.
<i>Ajuga reptans</i>	<i>Juncus effusus</i>
<i>Alchemilla glabra</i>	<i>Lathyrus pratensis</i>
<i>Angelica sylvestris</i>	<i>Luzula campestris</i>
<i>Anthoxanthum odoratum</i>	<i>L. sylvatica</i>
<i>Arrhenatherum elatius</i>	<i>Lychnis flos-cuculi</i>
<i>Bellis perennis</i>	<i>Molinia caerulea</i>
<i>Betonica officinalis</i>	<i>Plantago lanceolata</i>
<i>Betula pubescens</i>	<i>Poa annua</i>
<i>Briza media</i>	<i>P. pratensis</i>
<i>Caltha palustris</i>	<i>Polygala vulgaris</i>
<i>Campanula rotundifolia</i>	<i>Potentilla erecta</i>
<i>Cardamine hirsuta</i>	<i>Ranunculus acris</i>
<i>C. pratensis</i>	<i>R. flammula</i>
<i>Carex flacca</i>	<i>R. repens</i>
<i>C. panicea</i>	<i>Rubus fruticosus</i> agg.
<i>Cerastium holosteoides</i>	<i>R. idaeus</i>
<i>Chamaenerion angustifolium</i>	<i>Rumex obtusifolius</i>
<i>Cirsium heterophyllum</i>	<i>Salix caprea</i>
<i>C. palustre</i>	<i>Senecio aquaticus</i>
<i>Conopodium majus</i>	<i>Sorbus aucuparia</i>
<i>Dactylis glomerata</i>	<i>Stellaria alsine</i>
<i>Dactylorhiza purpurella</i>	<i>Succisa pratensis</i>
<i>Deschampsia caespitosa</i>	<i>Taraxacum officinale</i> agg.
<i>Digitalis purpurea</i>	<i>Trollius europaeus</i>
<i>Dryopteris filix-mas</i>	<i>Valeriana dioica</i>
<i>Epilobium tetragonum</i>	<i>Veronica beccabunga</i>
<i>Equisetum arvense</i>	<i>V. chamaedrys</i>
<i>Festuca rubra</i>	<i>V. serpyllifolia</i>
<i>Filipendula ulmaria</i>	<i>Vicia sepium</i>
<i>Galium saxatile</i>	<i>Viola palustris</i>
<i>Geum rivale</i>	<i>V. riviniana</i>
<i>Heracleum sphondylium</i>	

Survey Dates: 11/06/03 31/07/03	Site name: Red Site 10 - B6277 (west of St. John's Chapel road junction) – north verge	Grid Ref (Start): NY 84393189	Grid Ref (End): NY 84893170
--	--	---	---------------------------------------

Notes - Red Site 10
Requires occasional hay crop – once every three years.

Plant species	Plant species
<i>Achillea ptarmica</i>	<i>Galium verum</i>
<i>Agropyron repens</i>	<i>Geranium pratense</i>
<i>Ajuga reptans</i>	<i>Geum rivale</i>
<i>Alchemilla filicaulis</i> ssp. <i>vestita</i>	<i>Heracleum sphondylium</i>
<i>A. glabra</i>	<i>Hieracium</i> spp.
<i>A. monticola</i>	<i>Juncus articulatus</i>
<i>A. xanthochlora</i>	<i>Lathyrus pratensis</i>
<i>Anthoxanthum odoratum</i>	<i>Leontodon hispidus</i>
<i>Anthriscus sylvestris</i>	<i>Lotus corniculatus</i>
<i>Bellis perennis</i>	<i>Plantago lanceolata</i>
<i>Briza media</i>	<i>Poa pratensis</i>
<i>Campanula rotundifolia</i>	<i>Potentilla anserina</i>
<i>Carex flacca</i>	<i>P. erecta</i>

<i>C. panicea</i>	<i>Ranunculus acris</i>
<i>Centaurea cyanus</i> (cultivar)	<i>R. ficaria</i>
<i>Centaurea nigra</i>	<i>R. repens</i>
<i>Cerastium holosteoides</i>	<i>Rhinanthus minor</i>
<i>Cirsium arvense</i>	<i>Rumex acetosa</i>
<i>C. palustre</i>	<i>Sanguisorba officinalis</i>
<i>C. vulgare</i>	<i>Sorbus aucuparia</i>
<i>Conopodium majus</i>	<i>Succisa pratensis</i>
<i>Dactylis glomerata</i>	<i>Taraxacum officinale</i> agg.
<i>Dactylorhiza purpurella</i>	<i>Trifolium pratense</i>
<i>Deschampsia caespitosa</i>	<i>Tussilago farfara</i>
<i>Equisetum arvense</i>	<i>Veronica chamaedrys</i>
<i>Festuca rubra</i>	<i>Vicia sepium</i>

Survey Dates: 11/06/03 31/07/03	Site name: Red Site 11 – B6277 (east of Greenhills road junction) – north verge	Grid Ref (Start): NY 84263191	Grid Ref (End): NY 84383189
--	---	---	---------------------------------------

Plant species	Plant species
<i>Achillea ptarmica</i>	<i>Geum rivale</i>
<i>Ajuga reptans</i>	<i>Juncus effusus</i>
<i>Alchemilla glabra</i>	<i>Lathyrus pratensis</i>
<i>A. monticola</i>	<i>Linum catharticum</i>
<i>Alopecurus pratensis</i>	<i>Listera ovata</i>
<i>Anthoxanthum odoratum</i>	<i>Lotus corniculatus</i>
<i>Bellis perennis</i>	<i>Plantago lanceolata</i>
<i>Briza media</i>	<i>Ranunculus acris</i>
<i>Campanula rotundifolia</i>	<i>R. repens</i>
<i>Carex flacca</i>	<i>Rumex acetosa</i>
<i>Cerastium holosteoides</i>	<i>Succisa pratensis</i>
<i>Cirsium arvense</i>	<i>Trifolium pratense</i>
<i>Conopodium majus</i>	<i>Tussilago farfara</i>
<i>Dactylis glomerata</i>	<i>Urtica dioica</i>
<i>Equisetum arvense</i>	<i>Valeriana dioica</i>
<i>Eriophorum angustifolium</i>	<i>Veronica chamaedrys</i>
<i>Festuca rubra</i>	<i>Vicia sepium</i>

Survey Dates: 11/06/03 31/07/03	Site name: Red Site 12 – B6277 (adjacent to Greenhills road junction) – north verge	Grid Ref (Start): NY 83483205	Grid Ref (End): NY 84143194
--	---	---	---------------------------------------

Plant species	Plant species
<i>Achillea ptarmica</i>	<i>Hieracium</i> spp.
<i>Alchemilla glabra</i>	<i>Juncus conglomeratus</i>
<i>A. monticola</i>	<i>Knautia arvensis</i>
<i>A. xanthochlora</i>	<i>Lotus corniculatus</i>
<i>Alopecurus pratensis</i>	<i>Luzula campestris</i>
<i>Anthoxanthum odoratum</i>	<i>Plantago lanceolata</i>
<i>Anthriscus sylvestris</i>	<i>Poa pratensis</i>
<i>Arrhenatherum elatius</i>	<i>Potentilla erecta</i>
<i>Briza media</i>	<i>Ranunculus acris</i>
<i>Campanula rotundifolia</i>	<i>R. repens</i>
<i>Carex flacca</i>	<i>Rumex acetosa</i>
<i>Chamaenerion angustifolium</i>	<i>R. obtusifolius</i>
<i>Conopodium majus</i>	<i>Sanguisorba officinalis</i>

<i>Dactylis glomerata</i>	<i>Succisa pratensis</i>
<i>Dactylorhiza purpurella</i>	<i>Taraxacum officinale</i> agg.
<i>Equisetum arvense</i>	<i>Trifolium pratense</i>
<i>Filipendula ulmaria</i>	<i>Tussilago farfara</i>
<i>Geranium sylvaticum</i>	<i>Veronica chamaedrys</i>
<i>Geum rivale</i>	<i>Vicia sepium</i>

Survey Dates: 04/07/03 31/07/03	Site name: Red Site 13 – B6277 (Bowes Close) - north east verge	Grid Ref (Start): NY 83473251	Grid Ref (End): NY 83503247
--	--	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Holcus lanatus</i>
<i>Alchemilla monticola</i>	<i>Linum catharticum</i>
<i>Arrhenatherum elatius</i>	<i>Lotus corniculatus</i>
<i>Briza media</i>	<i>Senecio jacobaea</i>
<i>Campanula rotundifolia</i>	<i>Thymus drucei</i>
<i>Carex flacca</i>	<i>Trifolium medium</i>
<i>C. panicea</i>	<i>T. pratense</i>
<i>Centaurea nigra</i>	<i>T. repens</i>
<i>Cirsium arvense</i>	<i>Tussilago farfara</i>
<i>Dactylis glomerata</i>	<i>Urtica dioica</i>
<i>Festuca ovina</i>	<i>Veronica chamaedrys</i>
<i>Galium verum</i>	

Survey Dates: 07/07/03 10/07/03 31/07/03	Site name: Red Site 14 – B6277 (north west of Bowes Close) – north east verge (above retaining wall)	Grid Ref (Start): NY 83323266	Grid Ref (End): NY 83463252
--	--	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Geum rivale</i>
<i>Alchemilla glabra</i>	<i>Gymnadenia conopsea</i>
<i>A. monticola</i>	<i>Helianthemum nummularium</i>
<i>Anthoxanthum odoratum</i>	<i>Heracleum sphondylium</i>
<i>Anthyllis vulneraria</i>	<i>Holcus lanatus</i>
<i>Arrhenatherum elatius</i>	<i>Leontodon hispidus</i>
<i>Bellis perennis</i>	<i>Linum catharticum</i>
<i>Briza media</i>	<i>Listera ovata</i>
<i>Campanula rotundifolia</i>	<i>Lotus corniculatus</i>
<i>Carex flacca</i>	<i>Orchis mascula</i>
<i>C. lepidocarpa</i>	<i>Phleum pratense</i>
<i>Centaurea nigra</i>	<i>Plantago lanceolata</i>
<i>Cirsium arvense</i>	<i>Polygala serpyllifolia</i>
<i>C. palustre</i>	<i>P. vulgaris</i>
<i>C. vulgare</i>	<i>Persicaria vivipara</i>
<i>Conopodium majus</i>	<i>Potentilla erecta</i>
<i>Crataegus monogyna</i>	<i>Prunella vulgaris</i>
<i>Dactylis glomerata</i>	<i>Ranunculus acris</i>
<i>Dactylorhiza purpurella</i>	<i>R. repens</i>
<i>Deschampsia caespitosa</i>	<i>Rhinanthus minor</i>
<i>Epilobium montanum</i>	<i>Senecio jacobaea</i>
<i>E. palustre</i>	<i>Stachys sylvatica</i>
<i>Equisetum arvense</i>	<i>Thymus drucei</i>

<i>Euphrasia nemorosa</i>	<i>Trifolium medium</i>
<i>Festuca ovina</i>	<i>T. pratense</i>
<i>F. rubra</i>	<i>T. repens</i>
<i>Filipendula ulmaria</i>	<i>Tussilago farfara</i>
<i>Galium cruciata</i>	<i>Urtica dioica</i>
<i>G. saxatile</i>	<i>Veronica chamaedrys</i>

Survey Dates: 04/07/03 31/07/03	Site name: Red Site 15 – B6277 (north west of Red Site 14, btw. Lingy Hill and Bowes Close) – north east verge	Grid Ref (Start): NY 83183278	Grid Ref (End): NY 83283268
--	--	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>J. inflexus</i>
<i>A. ptarmica</i>	<i>Lathyrus pratensis</i>
<i>Ajuga reptans</i>	<i>Leontodon hispidus</i>
<i>Alchemilla glabra</i>	<i>Listera ovata</i>
<i>Alopecurus pratensis</i>	<i>Lolium perenne</i>
<i>Anthoxanthum odoratum</i>	<i>Plantago lanceolata</i>
<i>Anthriscus sylvestris</i>	<i>Poa pratensis</i>
<i>Briza media</i>	<i>Potentilla erecta</i>
<i>Caltha palustris</i>	<i>Ranunculus acris</i>
<i>Carex binervis</i>	<i>R. repens</i>
<i>Carex flacca</i>	<i>Rhinanthus minor</i>
<i>Centaurea nigra</i>	<i>Rosa</i> spp.
<i>Cirsium palustre</i>	<i>Rumex acetosa</i>
<i>C. vulgare</i>	<i>R. crispus</i>
<i>Conopodium majus</i>	<i>R. obtusifolius</i>
<i>Cynosaurus cristatus</i>	<i>Salix repens</i>
<i>Dactylis glomerata</i>	<i>Senecio jacobaea</i>
<i>Dactylorhiza purpurella</i>	<i>Stellaria graminea</i>
<i>Deschampsia caespitosa</i>	<i>S. holostea</i>
<i>Equisetum arvense</i>	<i>Succisa pratensis</i>
<i>Festuca rubra</i>	<i>Taraxacum officinale</i> agg.
<i>Filipendula ulmaria</i>	<i>Trifolium medium</i>
<i>Galium cruciata</i>	<i>T. repens</i>
<i>Geranium pratense</i>	<i>Tussilago farfara</i>
<i>G. sylvaticum</i>	<i>Urtica dioica</i>
<i>Geum rivale</i>	<i>Vaccinium myrtillus</i>
<i>Holcus lanatus</i>	<i>Veronica chamaedrys</i>
<i>Juncus articulatus</i>	<i>Vicia sepium</i>
<i>J. conglomeratus</i>	

Survey Dates: 04/07/03 31/7/03	Site name: Red Site 16 – B6277 (south east of Lingy Hill) – north east verge	Grid Ref (Start): NY 83033294	Grid Ref (End): NY 83123281
---	--	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>G. robertianum</i>
<i>A. ptarmica</i>	<i>G. sylvaticum</i>
<i>Agostis stolonifera</i>	<i>Geum rivale</i>
<i>Ajuga reptans</i>	<i>Heracleum sphondylium</i>
<i>Alchemilla glabra</i>	<i>Hieracium</i> spp.
<i>A. monticola</i>	<i>Holcus lanatus</i>
<i>A. xanthochlora</i>	<i>Hypericum</i> spp.
<i>Alopecurus pratensis</i>	<i>Lathyrus pratensis</i>

<i>Anthoxanthum odoratum</i>	<i>Leontodon hispidus</i>
<i>Anthriscus sylvestris</i>	<i>Linum catharticum</i>
<i>Arrhenatherum elatius</i>	<i>Listera ovata</i>
<i>Briza media</i>	<i>Lolium perenne</i>
<i>Calluna vulgaris</i>	<i>Lotus corniculatus</i>
<i>Campanula rotundifolia</i>	<i>Molinia caerulea</i>
<i>Carex demissa</i>	<i>Pilosella officinarum</i>
<i>Carex flacca</i>	<i>Plantago lanceolata</i>
<i>C. panicea</i>	<i>Polygala serpyllifolia</i>
<i>Centaurea nigra</i>	<i>Potentilla erecta</i>
<i>Cerastium holosteoides</i>	<i>Prunella vulgaris</i>
<i>Cirsium arvense</i>	<i>Ranunculus repens</i>
<i>C. heterophyllum</i>	<i>Rubus fruticosus agg.</i>
<i>C. vulgare</i>	<i>Senecio jacobaea</i>
<i>Conopodium majus</i>	<i>Stachys sylvatica</i>
<i>Cynosaurus cristatus</i>	<i>Stellaria graminea</i>
<i>Dactylis glomerata</i>	<i>Succisa pratensis</i>
<i>Deschampsia caespitosa</i>	<i>Thymus drucei</i>
<i>Equisetum arvense</i>	<i>Trifolium medium</i>
<i>Festuca ovina</i>	<i>T. pratense</i>
<i>F. rubra</i>	<i>Tussilago farfara</i>
<i>Filipendula ulmaria</i>	<i>Veronica chamaedrys</i>
<i>Fraxinus excelsior</i>	<i>Vicia cracca</i>
<i>Galium cruciata</i>	<i>V. sepium</i>
<i>G. saxatile</i>	<i>Viola riviniana</i>
<i>Geranium pratense</i>	

Survey Dates: 04/07/03 31/07/03	Site name: Red Site 17 – B6277 (south east of Peases Cottage) – north east verge	Grid Ref (Start): NY 82833312	Grid Ref (End): NY 83013298
--	--	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Geum rivale</i>
<i>A. ptarmica</i>	<i>Gymnadenia conopsea</i>
<i>Ajuga reptans</i>	<i>Heracleum sphondylium</i>
<i>Alchemilla glabra</i>	<i>Hieracium spp.</i>
<i>Anthoxanthum odoratum</i>	<i>Holcus lanatus</i>
<i>Bellis perennis</i>	<i>Hypochoeris radicata</i>
<i>Briza media</i>	<i>Juncus articulatus</i>
<i>Campanula rotundifolia</i>	<i>J. inflexus</i>
<i>Cardamine pratensis</i>	<i>Lathyrus pratensis</i>
<i>Carex demissa</i>	<i>Linum catharticum</i>
<i>C. flacca</i>	<i>Orchis mascula</i>
<i>C. lepidocarpa</i>	<i>Pinguicula vulgaris</i>
<i>C. panicea</i>	<i>Plantago lanceolata</i>
<i>C. pulicaris</i>	<i>Poa trivialis</i>
<i>Centaurea nigra</i>	<i>Persicaria vivipara</i>
<i>Cerastium holosteoides</i>	<i>Potentilla erecta</i>
<i>Cirsium heterophyllum</i>	<i>Prunella vulgaris</i>
<i>C. plaustre</i>	<i>Ranunculus acris</i>
<i>Conopodium majus</i>	<i>R. repens</i>
<i>Dactylis glomerata</i>	<i>Rhinanthus minor</i>
<i>Dactylorhiza fuchsii</i>	<i>Rubus fruticosus agg.</i>
<i>D. purpurella</i>	<i>Rumex acetosa</i>
<i>Deschampsia caespitosa</i>	<i>Salix repens</i>
<i>Epilobium montanum</i>	<i>Senecio jacobaea</i>
<i>Eriophorum angustifolium</i>	<i>Stachys sylvatica</i>

<i>Euphrasia nemorosa</i>	<i>Succisa pratensis</i>
<i>Festuca ovina</i>	<i>Thymus drucei</i>
<i>F. rubra</i>	<i>Trifolium pratense</i>
<i>Filipendula ulmaria</i>	<i>T. repens</i>
<i>Fraxinus excelsior</i>	<i>Trollius europaeus</i>
<i>Galium saxatile</i>	<i>Tussilago farfara</i>
<i>G. verum</i>	<i>Veronica chamaedrys</i>
<i>Geranium robertianum</i>	<i>Viola lutea</i>
<i>G. sylvaticum</i>	

Survey Dates: 04/07/03 31/07/03	Site name: Red Site 18 – B6277 (north west of Peases Cottage) – north east verge	Grid Ref (Start): NY 82493364	Grid Ref (End): NY 82673328
--	---	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Juncus</i> spp.
<i>Ajuga reptans</i>	<i>Linum catharticum</i>
<i>Alchemilla filicaulis</i> ssp. <i>vestita</i>	<i>Lotus corniculatus</i>
<i>A. glabra</i>	<i>Luzula campestris</i>
<i>A. monticola</i>	<i>Molinia caerulea</i>
<i>A. xanthochlora</i>	<i>Myosotis arvensis</i>
<i>Anthoxanthum odoratum</i>	<i>Pilosella officinarum</i>
<i>Arrhenatherum elatius</i>	<i>Plantago lanceolata</i>
<i>Bellis perennis</i>	<i>Poa pratensis</i>
<i>Cardamine pratensis</i>	<i>Polygala serpyllifolia</i>
<i>Carex flacca</i>	<i>Potentilla erecta</i>
<i>Centaurea nigra</i>	<i>Prunella vulgaris</i>
<i>Cerastium holosteoides</i>	<i>Rubus fruticosus</i> agg.
<i>Cirsium arvense</i>	<i>Rumex acetosa</i>
<i>C. palustre</i>	<i>R. obtusifolius</i>
<i>C. vulgare</i>	<i>Senecio jacobaea</i>
<i>Conopodium majus</i>	<i>Succisa pratensis</i>
<i>Cynosaurus cristatus</i>	<i>Taraxacum officinale</i> agg.
<i>Dactylis glomerata</i>	<i>Thymus drucei</i>
<i>Dactylorhiza purpurella</i>	<i>Trifolium pratense</i>
<i>Equisetum arvense</i>	<i>T. repens</i>
<i>Euphrasia</i> spp.	<i>Tussilago farfara</i>
<i>Festuca ovina</i>	<i>Ulex europaeus</i>
<i>F. rubra</i>	<i>Urtica dioica</i>
<i>Galium saxatile</i>	<i>Vaccinium myrtillus</i>
<i>Geranium sylvaticum</i>	<i>Veronica chamaedrys</i>
<i>Geum rivale</i>	<i>V. officinalis</i>
<i>Heracleum sphondylium</i>	<i>Vicia sepium</i>
<i>Hieracium</i> spp.	<i>Viola lutea</i>
<i>Holcus lanatus</i>	<i>V. riviniana</i>

Survey Dates: 04/07/03 31/07/03	Site name: Red Site 19 – B6277 (south east of Hill Top) – north east verge	Grid Ref (Start): NY 82433374	Grid Ref (End): NY 82473368
--	---	---	---------------------------------------

Plant species	Plant species
<i>Achillea ptarmica</i>	<i>Heracleum sphondylium</i>
<i>Ajuga reptans</i>	<i>Hieracium</i> spp.
<i>Alchemilla glabra</i>	<i>Holcus lanatus</i>
<i>Anthyrium filix-femina</i>	<i>Juncus effusus</i>

<i>Arrhenatherum elatius</i>	<i>Lathyrus pratensis</i>
<i>Bellis perennis</i>	<i>Listera ovata</i>
<i>Briza media</i>	<i>Lotus corniculatus</i>
<i>Caltha palustris</i>	<i>Lychnis flos-cuculi</i>
<i>Carex flacca</i>	<i>Plantago lanceolata</i>
<i>Centaurea nigra</i>	<i>Poa annau</i>
<i>Cerastium holosteoides</i>	<i>Potentilla erecta</i>
<i>Cirsium arvense</i>	<i>Ranunculus acris</i>
<i>C. vulgare</i>	<i>R. repens</i>
<i>Dactylis glomerata</i>	<i>Rumex acetosa</i>
<i>Dactylorhiza fuchsii</i>	<i>R. crispus</i>
<i>D. purpurella</i>	<i>R. obtusifolius</i>
<i>Epilobium palustre</i>	<i>Senecio jacobaea</i>
<i>Equisetum arvense</i>	<i>Trifolium repens</i>
<i>E. telmateia</i>	<i>Trollius europaeus</i>
<i>Festuca rubra</i>	<i>Ulex europaeus</i>
<i>Filipendula ulmaria</i>	<i>Urtica dioica</i>
<i>Geranium sylvaticum</i>	<i>Veronica chamaedrys</i>
<i>Geum rivale</i>	

Survey Dates: 10/07/03 31/07/03	Site name: Red Site 20 – B6277 (north of Hill Top) - east verge	Grid Ref (Start): NY 82233408	Grid Ref (End): NY 82343390
--	---	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Juncus conglomeratus</i>
<i>Agrostis capillaris</i>	<i>J. effusus</i>
<i>Alchemilla glabra</i>	<i>Lathyrus pratensis</i>
<i>A. xanthochlora</i>	<i>Listera ovata</i>
<i>Anthoxanthum odoratum</i>	<i>Lotus corniculatus</i>
<i>Arrhenatherum elatius</i>	<i>Luzula multiflora</i>
<i>Bellis perennis</i>	<i>Minuartia</i> spp.
<i>Briza media</i>	<i>Myosotis caespitosa</i>
<i>Cardamine pratensis</i>	<i>Oxalis acetosella</i>
<i>Carex flacca</i>	<i>Plantago lanceolata</i>
<i>C. panicea</i>	<i>Poa trivialis</i>
<i>Centaurea nigra</i>	<i>Polypodium vulgare</i>
<i>Cerastium holosteoides</i>	<i>Potentilla erecta</i>
<i>Cirsium arvense</i>	<i>Prunella vulgaris</i>
<i>C. palustre</i>	<i>Ranunculus acris</i>
<i>C. vulgare</i>	<i>R. repens</i>
<i>Cochlearia officinalis</i>	<i>Rhinanthus minor</i>
<i>Conopodium majus</i>	<i>Rumex acetosa</i>
<i>Dactylorhiza purpurella</i>	<i>R. obtusifolius</i>
<i>Deschampsia caespitosa</i>	<i>Thymus drucei</i>
<i>Dryopteris filix-mas</i>	<i>Trifolium pratense</i>
<i>Empetrum nigrum</i>	<i>T. repens</i>
<i>Equisetum arvense</i>	<i>Trollius europaeus</i>
<i>E. palustre</i>	<i>Tussilago farfara</i>
<i>Euphrasia nemorosa</i>	<i>Veronica chamaedrys</i>
<i>Festuca rubra</i>	<i>V. serpyllifolia</i>
<i>Geum rivale</i>	<i>Vicia cracca</i>
<i>Gymnadenia conopsea</i>	<i>Viola lutea</i>
<i>Holcus lanatus</i>	<i>V. palustre</i>
<i>Hypochoeris radicata</i>	<i>V. riviniana</i>

Survey Dates: 10/07/03 31/07/03	Site name: Red Site 21 – B6277 (east of Rough Rigg) – north verge	Grid Ref (Start): NY 82033423	Grid Ref (End): NY 82173423
--	--	---	---------------------------------------

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Hypochoeris radicata</i>
<i>A. ptarmica</i>	<i>Juncus effusus</i>
<i>Alchemilla glabra</i>	<i>Lathyrus linifolius</i>
<i>Anthoxanthum odoratum</i>	<i>Lotus corniculatus</i>
<i>Briza media</i>	<i>Luzula campestris</i>
<i>Centaurea nigra</i>	<i>Plantago lanceolata</i>
<i>Cerastium holosteoides</i>	<i>Potentilla erecta</i>
<i>Cirsium arvense</i>	<i>Ranunculus acris</i>
<i>C. palustre</i>	<i>R. repens</i>
<i>C. vulgare</i>	<i>Rumex acetosa</i>
<i>Coeloglossum viride</i>	<i>Thymus drucei</i>
<i>Dactylis glomerata</i>	<i>Trifolium pratense</i>
<i>Deschampsia caespitosa</i>	<i>T. repens</i>
<i>Equisetum arvense</i>	<i>Tussilago farfara</i>
<i>Euphrasia nemorosa</i>	<i>Urtica dioica</i>
<i>Festuca rubra</i>	<i>Veronica chamaedrys</i>
<i>Holcus lanatus</i>	

Survey Dates: 10/07/03 31/07/03	Site name: Red Site 22 – B6277 (north west of Rough Rigg) – north east verge	Grid Ref (Start): NY 81933535	Grid Ref (End): NY 81953434
--	--	---	---------------------------------------

Plant species	Plant species
<i>Alchemilla glabra</i>	<i>Listera ovata</i>
<i>Anthoxanthum odoratum</i>	<i>Lotus corniculatus</i>
<i>Briza media</i>	<i>Luzula campestris</i>
<i>Carex flacca</i>	<i>Plantago lanceolata</i>
<i>Cerastium holosteoides</i>	<i>Prunella vulgaris</i>
<i>Cirsium vulgare</i>	<i>Ranunculus acris</i>
<i>Dactylis glomerata</i>	<i>Thymus drucei</i>
<i>Equisetum arvense</i>	<i>Trifolium repens</i>
<i>Festuca ovina</i>	<i>Tussilago farfara</i>
<i>Holcus lanatus</i>	<i>Veronica chamaedrys</i>
<i>Hypochoeris radicata</i>	

Survey Dates: 10/07/03 31/07/03	Site name: Red Site 23 – B6277 (south east of Ashgill Head) – north east verge	Grid Ref (Start): NY 80923541	Grid Ref (End): NY 81013529
--	--	---	---------------------------------------

Plant species	Plant species
<i>Agrostis capillaris</i>	<i>J. squarrosus</i>
<i>Alchemilla glabra</i>	<i>Lathyrus pratensis</i>
<i>Anthoxanthum odoratum</i>	<i>Lotus corniculatus</i>
<i>Arrhenatherum elatius</i>	<i>Luzula multiflora</i>
<i>Briza media</i>	<i>Lychnis flos-cuculi</i>
<i>Cardamine pratensis</i>	<i>Molinia caerulea</i>
<i>Carex demissa</i>	<i>Nardus stricta</i>
<i>C. flacca</i>	<i>Plantago lanceolata</i>
<i>C. nigra</i>	<i>P. major</i>
<i>C. ovalis</i>	<i>Potentilla erecta</i>

Notes - Red Site 23
Sloping verge with herb-rich flora (esp. sedges) interspersed with rank grassland.

<i>C. panicea</i>	<i>Prunella vulgaris</i>
<i>C. pulicaris</i>	<i>Ranunculus acris</i>
<i>Cirsium palustre</i>	<i>R. repens</i>
<i>Cynosaurus cristatus</i>	<i>Rumex acetosa</i>
<i>Dactylis glomerata</i>	<i>R. acetosella</i>
<i>Dactylorhiza fuchsii</i>	<i>Senecio jacobaea</i>
<i>Deschampsia caespitosa</i>	<i>Stellaria graminea</i>
<i>Equisetum arvense</i>	<i>Thymus drucei</i>
<i>Euphrasia nemorosa</i>	<i>Trifolium repens</i>
<i>Festuca ovina</i>	<i>Urtica dioica</i>
<i>F. rubra</i>	<i>Veronica chamaedrys</i>
<i>Galium saxatile</i>	<i>V. officinalis</i>
<i>Geum rivale</i>	<i>V. serpyllifolia</i>
<i>Hieracium</i> spp.	<i>Viola lutea</i>
<i>Holcus lanatus</i>	<i>V. palustris</i>
<i>Juncus conglomeratus</i>	<i>V. riviniana</i>
<i>J. effusus</i>	Fern spp.

Appendix 2 VASCULAR PLANTS RECORDED DURING THE UPPER TEESDALE ROADSIDE FLORA PROJECT (MAY - AUGUST 2003)

Scientific Name	Common Name
Horsetails	
<i>Equisetum arvense</i>	Field horsetail
<i>Equisetum palustre</i>	Marsh horsetail
<i>Equisetum telemateia</i>	Great horsetail
Ferns	
<i>Pteridium aquilinum</i>	Bracken
<i>Athyrium filix-femina</i>	Lady fern
<i>Dryopteris filix-mas</i>	Male fern
<i>Dryopteris dilatata</i>	Broad buckler fern
<i>Phyllitis scolopendrium</i>	Hartstongue
<i>Polypodium vulgare</i>	Common polypody
Buttercups	
<i>Caltha palustris</i>	Marsh marigold
<i>Anemone nemorosa</i>	Wood anemone
<i>Ranunculus acris</i>	Meadow buttercup
<i>Ranunculus auricomus</i>	Goldilocks buttercup
<i>Ranunculus repens</i>	Creeping buttercup
<i>Ranunculus flammula</i>	Lesser spearwort
<i>Ranunculus ficaria</i>	Lesser celandine
<i>Trollius europaeus</i>	Globeflower
Poppy family	
<i>Meconopsis cambrica</i>	Welsh poppy
<i>Papaver arvensis</i>	Field poppy
Elms	
<i>Ulmus glabra</i>	Wych elm
Nettles	
<i>Urtica dioica</i>	Common nettle
Oak family	
<i>Fagus sylvatica</i>	Beech
<i>Quercus petraea</i>	Sessile oak
<i>Betula pendula</i>	Silver birch
<i>Betula pubescens</i>	Downy birch
<i>Alnus glutinosa</i>	Alder
<i>Corylus avellana</i>	Hazel
Rock-rose family	
<i>Helianthemum nummularium</i>	Common rock-rose

St. John's-wort family	
<i>Hypericum perforatum</i>	Perforate St. John's-wort
<i>Hypericum pulchrum</i>	Slender St. John's-wort
Goosefoot & oraches	
<i>Chenopodium album</i>	Fat-hen
<i>Atriplex patula</i>	Common orache
Campions, sandworts & pinks	
<i>Moehringia trinervia</i>	Three-veined sandwort
<i>Stellaria alsine</i>	Bog stitchwort
<i>Stellaria graminea</i>	Lesser stitchwort
<i>Stellaria holostea</i>	Greater stitchwort
<i>Stellaria media</i>	Common chickweed
<i>Cerastium holosteoides</i>	Common mouse-ear
<i>Lychnis flos-cuculi</i>	Ragged robin
<i>Silene alba</i>	White campion
<i>Silene dioica</i>	Red campion
Docks	
<i>Rumex acetosa</i>	Common sorrel
<i>Rumex acetosella</i>	Sheep's sorrel [agg.]
<i>Rumex crispus</i>	Curled dock
<i>Rumex obtusifolius</i>	Broad-leaved dock
<i>Rumex conglomeratus</i>	Clustered dock
<i>Polygonum aviculare</i>	Knotgrass
<i>Polygonum bistorta</i>	Common bistort
<i>Persicaria vivipara</i>	Alpine bistort
<i>Reynoutria japonica</i>	Japanese knotweed
Violets	
<i>Viola canina</i>	Heath dog-violet
<i>Viola riviniana</i>	Common dog-violet
<i>Viola lutea</i>	Mountain pansy
<i>Viola palustris</i>	Marsh violet
Willow family	
<i>Salix cinerea</i> agg.	Grey willow
<i>Salix caprea</i>	Goat willow
<i>Salix pentandra</i>	Bay willow
<i>Salix repens</i>	Creeping willow
Mustards, cresses & cabbages	
<i>Alliaria petiolata</i>	Garlic mustard

<i>Cardamine pratensis</i>	Cuckoo-flower
<i>Cardamine flexuosa</i>	Wavy bitter-cress
<i>Cardamine hirsuta</i>	Hairy bitter-cress
<i>Hesperis matronalis</i>	Dame's-violet
<i>Cochlearia officinalis</i>	Common scurvy-grass
Heathers	
<i>Calluna vulgaris</i>	Heather
<i>Vaccinium myrtillus</i>	Bilberry
Crowberry family	
<i>Empetrum nigrum</i>	Crowberry
Primulas	
<i>Primula vulgaris</i>	Primrose
<i>Primula veris</i>	Cowslip
Rose family	
<i>Filipendula ulmaria</i>	Meadowsweet
<i>Rubus idaeus</i>	Raspberry
<i>Rubus fruticosus</i> agg.	Bramble
<i>Potentilla anserina</i>	Silverweed
<i>Potentilla erecta</i>	Tormentil
<i>Potentilla reptans</i>	Creeping cinquefoil
<i>Potentilla sterilis</i>	Barren strawberry
<i>Fragaria vesca</i>	Wild strawberry
<i>Geum rivale</i>	Water avens
<i>Geum urbanum</i>	Herb bennet (Wood avens)
<i>Poterium sanguisorba</i>	Salad burnet
<i>Sanguisorba officinalis</i>	Great burnet
<i>Alchemilla acutiloba</i>	a Lady's mantle
<i>Alchemilla monticola</i>	a Lady's mantle
<i>Alchemilla xanthochlora</i>	a Lady's mantle
<i>Alchemilla filicaulis</i> ssp. <i>vestita</i>	a Lady's mantle
<i>Alchemilla glabra</i>	a Lady's mantle
<i>Rosa canina</i> agg.	Dog rose
<i>Rosa rubiginosa</i>	Sweet briar
<i>Prunus spinosa</i>	Blackthorn
<i>Sorbus aucuparia</i>	Rowan
<i>Crataegus monogyna</i>	Hawthorn
Pea family	
<i>Anthyllis vulneraria</i>	Kidney vetch
<i>Lotus corniculatus</i>	Common bird's-foot-trefoil

<i>Vicia cracca</i>	Tufted vetch
<i>Vicia sepium</i>	Bush vetch
<i>Vicia sativa</i>	Common vetch
<i>Lathyrus linifolius</i>	Bitter vetch
<i>Lathyrus pratensis</i>	Meadow vetchling
<i>Medicago lupulina</i>	Black medick
<i>Trifolium campestre</i>	Hop trefoil
<i>Trifolium repens</i>	White clover
<i>Trifolium pratense</i>	Red clover
<i>Trifolium medium</i>	Zig-zag clover
<i>Cytisus scoparius</i>	Broom
<i>Ulex europaeus</i>	Gorse
Willowherbs	
<i>Epilobium tetragonum</i>	Square-stalked willowherb
<i>Epilobium montanum</i>	Broad-leaved willowherb
<i>Epilobium palustre</i>	Marsh willowherb
<i>Epilobium hirsutum</i>	Great (hairy) willowherb
<i>Chamaenerion angustifolium</i>	Rosebay willowherb
Dogwoods	
<i>Ilex aquifolium</i>	Holly
Spurges	
<i>Mercurialis perennis</i>	Dog's mercury
Flaxes	
<i>Linum catharticum</i>	Fairy flax
Milkwort family	
<i>Polygala vulgaris</i>	Common milkwort
<i>Polygala serpyllifolia</i>	Heath milkwort
Maple family	
<i>Acer pseudoplatanus</i>	Sycamore
Wood-sorrel family	
<i>Oxalis acetosella</i>	Wood-sorrel
Geraniums	
<i>Geranium sylvaticum</i>	Wood crane's-bill
<i>Geranium pratense</i>	Meadow crane's-bill
<i>Geranium dissectum</i>	Cut-leaved crane's-bill
<i>Geranium robertianum</i>	Herb-Robert
Ivy family	
<i>Hedera helix</i>	Ivy
Umbellifers (carrot family)	

<i>Angelica sylvestris</i>	Wild angelica
<i>Anthriscus sylvestris</i>	Cow parsley
<i>Daucus carota</i>	Wild carrot
<i>Myrrhis odorata</i>	Sweet cicely
<i>Conopodium majus</i>	Pignut
<i>Aegopodium podagraria</i>	Ground-elder
<i>Pimpinella saxifraga</i>	Burnet-saxifrage
<i>Heracleum sphondylium</i>	Hogweed
Bindweeds	
<i>Calystegia sepium</i>	Hedge bindweed
<i>Calystegia sylvatica</i>	Large bindweed
Borage family	
<i>Myosotis caespitosa</i>	Tufted forget-me-not
<i>Myosotis arvensis</i>	Field forget-me-not
<i>Myosotis discolor</i>	Changing forget-me-not
<i>Myosotis sylvatica</i>	Wood forget-me-not
Mints (labiates)	
<i>Betonica officinalis</i>	Betony
<i>Stachys sylvatica</i>	Hedge woundwort
<i>Lamium album</i>	White dead-nettle
<i>Teucrium scorodonia</i>	Wood sage
<i>Ajuga reptans</i>	Bugle
<i>Prunella vulgaris</i>	Selfheal
<i>Glechoma hederacea</i>	Ground ivy
<i>Thymus drucei</i>	Wild thyme
<i>Mentha aquatica</i>	Water mint
Butterwort family	
<i>Pinguicula vulgaris</i>	Common butterwort
Plantains	
<i>Plantago major</i>	Greater plantain
<i>Plantago lanceolata</i>	Ribwort plantain
<i>Plantago maritima</i>	Sea plantain
Olive family	
<i>Fraxinus excelsior</i>	Ash
<i>Syringa vulgaris</i>	Lilac
Figworts and speedwells	
<i>Digitalis purpurea</i>	Foxglove
<i>Veronica serpyllifolia</i>	Thyme-leaved speedwell
<i>Veronica beccabunga</i>	Brooklime

<i>Veronica officinalis</i>	Heath speedwell
<i>Veronica chamaedrys</i>	Germander speedwell
<i>Euphrasia nemorosa</i>	Common eyebright
<i>Rhinanthus minor</i>	Yellow rattle
Bellflowers	
<i>Campanula rotundifolia</i>	Harebell
Bedstraws	
<i>Galium saxatile</i>	Heath bedstraw
<i>Galium verum</i>	Lady's bedstraw
<i>Galium cruciata</i>	Crosswort
<i>Galium aparine</i>	Cleavers
Honeysuckle family	
<i>Sambucus nigra</i>	Elder
<i>Lonicera periclymenum</i>	Honeysuckle
Valerian family	
<i>Valeriana dioica</i>	Marsh valerian
<i>Valeriana officinalis</i>	Common valerian
Teasel family	
<i>Scabiosa columbaria</i>	Small scabious
<i>Knautia arvensis</i>	Field scabious
<i>Succisa pratensis</i>	Devil's-bit scabious
Composites (dandelion fam.)	
<i>Cirsium vulgare</i>	Spear thistle
<i>Cirsium palustre</i>	Marsh thistle
<i>Cirsium arvense</i>	Creeping thistle
<i>Cirsium heterophyllum</i>	Melancholy thistle
<i>Centaurea nigra</i>	Common knapweed
<i>Centaurea cyanus</i>	Perennial cornflower
<i>Hypochoeris radicata</i>	Common cat's-ear
<i>Leontodon autumnalis</i>	Autumn hawkbit
<i>Leontodon hispidus</i>	Rough hawkbit
<i>Tragopogon pratensis</i>	Goat's-beard
<i>Taraxacum officinale</i> agg.	Dandelion
<i>Pilosella officinarum</i>	Mouse-ear hawkweed
<i>Hieracium</i> spp.	a hawkweed
<i>Lapsana communis</i>	Nipplewort
<i>Bellis perennis</i>	Daisy
<i>Matricaria matricoides</i>	Pineappleweed
<i>Sonchus arvensis</i>	Perennial sow-thistle

<i>Sonchus asper</i>	Prickly sow-thistle
<i>Achillea millefolium</i>	Yarrow
<i>Achillea ptarmica</i>	Sneezewort
<i>Senecio aquaticus</i>	Marsh ragwort
<i>Senecio jacobaea</i>	Common ragwort
<i>Senecio vulgaris</i>	Groundsel
<i>Tussilago farfara</i>	Colt's-foot
<i>Petasites hybridus</i>	Butterbur
Rushes and wood-rushes	
<i>Juncus squarrosus</i>	Heath rush
<i>Juncus acutiflorus</i>	Sharp-flowered rush
<i>Juncus articulatus</i>	Jointed rush
<i>Juncus effusus</i>	Soft rush
<i>Juncus conglomeratus</i>	Compact rush
<i>Juncus inflexus</i>	Hard rush
<i>Luzula sylvatica</i>	Great wood-rush
<i>Luzula campestris</i>	Field wood-rush
<i>Luzula multiflora</i>	Heath wood-rush
Sedges	
<i>Carex ovalis</i>	Oval sedge
<i>Carex desticha</i>	Brown sedge
<i>Carex flacca</i>	Glaucous sedge
<i>Carex panicea</i>	Carnation sedge
<i>Carex demissa</i>	Common yellow sedge
<i>Carex pulicaris</i>	Flea sedge
<i>Carex nigra</i>	Common sedge
<i>Carex lepidocarpa</i>	Long-stalked yellow sedge
<i>Carex binervis</i>	Green-ribbed sedge
<i>Eleocharis palustris</i>	Common spike-rush
<i>Eriophorum angustifolium</i>	Common cotton-grass
Grasses	
<i>Nardus stricta</i>	Mat-grass
<i>Festuca arundinacea</i>	Tall fescue
<i>Festuca rubra</i>	Red fescue
<i>Festuca ovina</i> agg.	Sheep's fescue
<i>Lolium perenne</i>	Perennial rye-grass
<i>Cynosaurus cristatus</i>	Crested dog's-tail
<i>Poa annua</i>	Annual meadow-grass
<i>Poa trivialis</i>	Rough meadow-grass

<i>Poa pratensis</i>	Smooth meadow-grass
<i>Briza media</i>	Quaking grass
<i>Dactylis glomerata</i>	Cock's-foot
<i>Arrhenatherum elatius</i>	False oat-grass
<i>Deschampsia caespitosa</i>	Tufted hair-grass
<i>Holcus lanatus</i>	Yorkshire fog
<i>Anthoxanthum odoratum</i>	Sweet vernal grass
<i>Agrostis capillaris</i>	Common bent
<i>Agrostis stolonifera</i>	Creeping bent
<i>Alopecurus pratensis</i>	Meadow foxtail
<i>Phleum pratense</i>	Timothy
<i>Molinia caerulea</i>	Purple moor-grass
Arum family	
<i>Arum maculatum</i>	Lords-and-Ladies
Lilies	
<i>Hyacinthoides non-scripta</i>	Bluebell
<i>Allium ursinum</i>	Ramsons
<i>Narcissus</i> spp.	Daffodil
Orchids	
<i>Listera ovata</i>	Common twayblade
<i>Orchis mascula</i>	Early-purple orchid
<i>Coeloglossum viride</i>	Frog orchid
<i>Gymnadenia conopsea</i>	Fragrant orchid
<i>Dactylorhiza fuchsii</i>	Common spotted orchid
<i>Dactylorhiza purpurella</i>	Northern marsh orchid
Cypress family	
<i>Juniperus communis</i>	Juniper

All the species listed in Appendices 1 to 6 were observed during the fieldwork phase of the Upper Teesdale Roadside Flora Project.

Appendix 3 LICHENS - Reindeer moss

Although lichens do not frequently occur amongst verge vegetation, the roadside trees and drystone walls provide a suitable habitat for a rich lichen flora. Drystone walls and bridges were seen to be particularly important habitats and supported dense growths of foliose lichens. The abundance of foliose and fructose lichens suggests low levels of atmospheric pollution.

Appendix 4 INVERTEBRATES

Butterflies

<i>Lycaena phlaeus</i>	Small copper
<i>Inachis io</i>	Peacock
<i>Vanessa atalanta</i>	Red admiral
<i>Aglais urticae</i>	Small tortoiseshell
<i>Pieris rapae</i>	Small white
<i>Pieris napi</i>	Green-veined white
<i>Pieris brassicae</i>	Large white
<i>Maniola jurtina</i>	Meadow brown
<i>Coenonympha pamphilus</i>	Small heath
<i>Thymelicus sylvestris</i>	Small skipper
<i>Ochlodes venatus</i>	Large skipper
<i>Lasionmmata megera</i>	Wall brown

Moths

<i>Zygaena filipendilae</i>	Six-spot burnet
<i>Odezia atrata</i>	Chimney sweeper

Appendix 5 VERTEBRATES

REPTILIA and AMPHIBIA (Reptiles and Amphibians)

<i>Lacerta vivipara</i>	Common/viviparous lizard
<i>Bufo bufo</i>	Common toad
<i>Rana temporaria</i>	Common frog
<i>Triturus vulgaris</i>	Palmate newt

AVES (Birds)

<i>Ardea cinerea</i>	Grey heron
<i>Buteo buteo</i>	Buzzard
<i>Accipiter nisus</i>	Sparrowhawk
<i>Falco tinnunculus</i>	Kestrel
<i>Falco columbarus</i>	Merlin (road kill)
<i>Falco peregrinus</i>	Peregrine
<i>Perdix perdix</i>	Grey partridge
<i>Phasianus colchicus</i>	Pheasant
<i>Lagopus lagopus</i>	Red grouse
<i>Tetrao tetrix</i>	Black grouse
<i>Himantopus ostralegus</i>	Oystercatcher
<i>Pluvialis apricaria</i>	Golden plover
<i>Vanellus vanellus</i>	Lapwing

<i>Gallinago gallinago</i>	Snipe
<i>Numenius arquata</i>	Curlew
<i>Tringa totanus</i>	Redshank
<i>Actites hypocleucos</i>	Common sandpiper
<i>Larus ribibundus</i>	Black-headed gull
<i>Larus fuscus</i>	Lesser black-backed gull
<i>Larus argentatus</i>	Herring gull
<i>Colmba livia</i>	Feral pigeon
<i>Columba oenas</i>	Stock dove
<i>Columba palumbas</i>	Wood pigeon
<i>Streptopelia decaocto</i>	Collared dove
<i>Cuculus canorous</i>	Cuckoo
<i>Apus apus</i>	Swift
<i>Alauda arvensis</i>	Skylark
<i>Riparia riparia</i>	Sand martin
<i>Hirundo rusticola</i>	Swallow
<i>Delichon urbica</i>	House martin
<i>Anthus pratensis</i>	Meadow pipit
<i>Motacilla flava</i>	Yellow wagtail
<i>Motacilla cinera</i>	Grey wagtail
<i>Motacilla alba yarellii</i>	Pied wagtail
<i>Cinclus cinclus</i>	Dipper
<i>Troglodytes troglodytes</i>	Wren
<i>Prunella modularis</i>	Dunnock
<i>Erithacus rubecula</i>	Robin
<i>Turdus torquata</i>	Ring ouzel
<i>Turdus merula</i>	Blackbird
<i>Turdus philmelos</i>	Song thrush
<i>Turdus viscivorus</i>	Mistle thrush
<i>Sylvia atricapilla</i>	Blackcap
<i>Phylloscopus collybita</i>	Chiffchaff
<i>Phylloscopus trochilus</i>	Willow warbler
<i>Muscicapa striata</i>	Spotted flycatcher
<i>Parus ater</i>	Coal tit
<i>Parus caeruleus</i>	Blue tit
<i>Parus major</i>	Great tit
<i>Pica pica</i>	Magpie
<i>Garrulus glandarius</i>	Jay
<i>Corvus monedula</i>	Jackdaw
<i>Corvus frugilegus</i>	Rook
<i>Corvus corone corone</i>	Carrion crow

<i>Sturnus vulgaris</i>	Starling
<i>Fringilla coelebs</i>	Chaffinch
<i>Carduelis chloris</i>	Greenfinch
<i>Carduelis carduelis</i>	Goldfinch
<i>Carduelis cannabina</i>	Linnet
<i>Carduelis cabaret</i>	Redpoll
<i>Carduelis spinus</i>	Siskin
<i>Emberiza citrinella</i>	Yellowhammer
<i>Emberiza schoeniclus</i>	Reed bunting

MAMMALIA (Mammals)

<i>Erinaceus europaeus</i>	Hedgehog
<i>Talpa europaea</i>	Mole (over 130 corpses notes on one roadside gibbet)
<i>Sorex araneus</i>	Common shrew
<i>Oryctolagus cuniculus</i>	Rabbit
<i>Lepus europaeus</i>	Brown hare
<i>Clethrionomys glareolus</i>	Bank vole
<i>Microtus agrestis</i>	Short-tailed vole
<i>Apodemus sylvaticus</i>	Wood mouse
<i>Vulpes vulpes</i>	Fox

Appendix 6 SPECIES RICHNESS IN RED, AMBER AND GREEN SITES – WEARDALE 2001

This appendix is included as a means of highlighting part of the ‘determining process’ that was employed when identifying ‘red’, ‘amber’ and ‘green’ sites – it is based on work undertaken in Weardale during 2001 (Daly 2001). One of the criteria used when deciding whether a verge should be classed as amber, red or green was the number of species present. The table below shows the mean species richness for five separate sites in Weardale (2001).

In order to obtain this data, five different roadside areas in Weardale were selected as follows:

Area 1: Midway between the junction of the A68 and A689

Area 2: Halfway between Wolsingham and Frosterley

Area 3: East of Frosterley

Area 4: Western border of Stanhope

Area 5: West of Eastgate, near Lafarge Cement UK’s Weardale Works

At each general location, a ‘red’, ‘amber’ and ‘green’ site in close proximity to each other were identified and the number of different species present in five 1metre² quadrats within each site was recorded, with the mean value for the five quadrats calculated. The results are shown in Table 2.

Table 2: Mean species richness (from data analysed for five 1metre² quadrats s at five different sites)

Site Number	Site Category <u>Red</u>	Standard Error of the Mean	Site Category <u>Amber</u>	Standard Error of the Mean	Site Category <u>Green</u>	Standard Error of the Mean
1	13.4	1.21	8.4	0.93	7.8	0.37
2	11.8	1.20	11.2	0.58	6.4	0.60
3	8.2	0.97	6.4	0.60	4.4	0.81
4	9.6	0.40	12.6	0.75	5.2	0.58
5	7.4	1.17	5.6	0.93	4.2	0.66
1-5	<u>10.08</u>		<u>8.84</u>		<u>5.6</u>	

(after Daly, 2001)

The data shown in the above table confirms, in four examples out of five, the validity of the subjective method of assigning verges to red, amber or green categories. However, it should be noted that species richness was not the only criterion used when assigning verges to categories. The suite of species present and the presence of rare species or those of local interest were other criteria that were used. It is also important to note that the sites were not of uniform size.

GLOSSARY

AONB Area of Outstanding National Beauty. A landscape designation, used to highlight the importance of landscape that is of equivalent value to a National Park, but without any of the planning and designation structures that are associated with National Parks.

Apomictism The ability (in plants) to set fertile seed without the need for pollination.

Biodiversity Biological diversity, i.e. the variety of life; all wildlife and its habitats. The term embraces the full range of habitats, species, and the variation found within species (i.e. genetic variation) across those areas in which these species and habitats occur or would be expected to occur. Often used to refer to all of the wildlife found within a habitat or area.

Biodiversity Action Plan (BAP) A plan to conserve or re-create biodiversity. The term may be used to describe the whole process by which this happens, the 'biodiversity action planning process', or sometimes a document that sets out how this is to be achieved.

County Wildlife Site A site of local nature conservation importance, designated for its local wildlife importance but which has no statutory protection (sometimes known as an SNCI).

Durham Biodiversity Action Plan (DBAP) The local biodiversity action plan for County Durham, Gateshead, Darlington, South Tyneside and the City of Sunderland. The term is also used to describe the process by which action is taken locally to conserve wildlife, specifically those habitats and species for which our area has a special responsibility under the UK BAP.

Durham Wildlife Audit A thorough habitat survey of County Durham and Darlington that mapped and measured the amounts of important wildlife habitat across the county in the early 1990s.

Ecology The study of the inter-relationships between plants, animals and other organisms within the environment or habitat.

Ecosystem An interacting network of physical environment, plants and animals within a particular habitat all dependent, in one way or another, on each other.

Environmentally Sensitive Area (ESA) A designation which pertains to agricultural practice in an area of wildlife-sensitive landscape. Special grants are available within ESAs for wildlife-sensitive management.

Flora and Fauna A collective term denoting the plant and animal life of an area or habitat.

Geomorphology The shape of the landscape as dictated by the interaction of underlying geological strata as well as short, and long, term climatic processes and factors e.g. glaciation.

Gley A sticky waterlogged soil that is grey/blue in colour.

Habitat Action Plan (HAP) One of the two sorts of plans contained within the DBAP document (see also SAP). A HAP is geared toward the conservation or re-creation of a particular habitat such as lowland heathland, upland oak wood or limestone grassland.

Habitat A part of the landscape which takes its character from particular types of vegetation e.g. marsh or woodland, and which is inhabited by a characteristic suite of flora and fauna.

Halophytic Salt-loving/tolerant, usually referring to plants or animals.

Herpetofauna/herpetiles Amphibians and reptiles.

Indicator Species A species whose presence or status provides information on the health/condition of an ecosystem. Otter is such a species for rivers.

International Convention on Biodiversity (1992) A convention, negotiated under the auspices of the United Nations Environment Programme (UNEP), which came about as a result of the 1992 'Rio Earth Summit'. The convention has the following objectives: conservation of biological diversity; sustainable use of its components; fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. The convention came into force on 29th December 1993 and, to date, 163 countries have become parties to it. The convention provides a framework to develop national strategies, plans and programmes and under the convention all signatories are expected to produce BAPs.

Invertebrate Any animal lacking a backbone. This group include insects (e.g. butterflies, moths, flies, bees, wasps, beetles) and non-insect invertebrates (e.g. worms, molluscs - such as snails and slugs - and crustaceans, such as crabs and crayfish).

Local Biodiversity Action Plan (LBAP) Local Biodiversity Action Plans are plans drawn up to prioritise and direct action for threatened species and habitats in the local context as well as to deliver the local element of the nationally identified targets. The Department of the Environment, Food and Rural Affairs (DEFRA) have determined that amongst the key functions of LBAPs are: ensuring that national targets for species and habitats, as specified in the UK Biodiversity Action Plan, are translated into effective local action and to raise awareness of the need for biodiversity conservation in the local context.

Local Agenda (or Action) 21 (LA21), [part of Agenda (or Action) 21] An environmental agenda for the 21st Century dealing with social and economic dimensions, the conservation and management of natural resources, the strengthening of the role of major groups as well as looking at the means of implementation. LA21, describes the actions we must take locally to promote sustainability and sustainable development, which has its origins in the 1992 'Rio Earth Summit'. Sustainable development has been described as "development that meets the needs of the present, without compromising the ability of future generations to meet their own needs".

LNR Local Nature Reserve.

Native Species Plants, animals or fungi that occur naturally in a habitat or region.

NNR National Nature Reserve.

NVC National Vegetation Classification, a system for defining habitat types by analysing the various components (i.e. the species present and the area each covers) of the vegetation that constitute the habitat.

Podzol An acidic infertile soil with minerals leached from its surface layers to lower horizons.

Rio Earth Summit The United Nations Convention on Environment and Development (UNCED) held in Rio de Janeiro in June 1992 i.e. the 'Earth Summit'. This was convened to address a range of global environmental issues such as loss of biodiversity, loss of natural resources and

climate change. This summit produced two international agreements (the UN Framework Convention on Climate Change and the UN Convention on Biological Diversity), two statements of principles (the Rio Declaration on Environment and Development, and a statement of principles on management and conservation on all types of forests) as well as a major agenda on worldwide sustainable development i.e. Agenda 21.

SAC Special Area of Conservation. A designation made under the European Habitats Directive that highlights the particular importance of an area for its specialised flora and habitats.

Site of Special Scientific Interest (SSSI) A nationally important wildlife or geological site, which has legal protection under the Wildlife and Countryside Act (1981).

Site of Nature Conservation Importance (SNCI) A site designated for its local wildlife importance but which has no legal protection (sometimes known as a County Wildlife Site or a SINC - 'site of importance for nature conservation').

Species A taxonomic group into which a genus is divided, the members of which are capable of interbreeding. For example, the blackbird and song thrush are related and are in the same genus, but are different species. This is shown in these birds' scientific names; the blackbird is *Turdus merula* and the song thrush *Turdus philomelos*. They both share the genus name *Turdus* and the second name is the species name.

Species Action Plan (SAP) One of two sorts of plans contained within the DBAP document (see also HAP). A plan geared toward the conservation or re-introduction of a particular species, such as red squirrel.

Standard Error of the Mean In statistics, the standard deviation of a sample measures is used to find the average deviation of the measurements taken from the mean of that sample. If many samples are taken from a population, these sample means will vary. It is possible to calculate the standard deviation for the sample means to see how scattered they are. To distinguish this from the original standard deviation, this statistic is referred to as the standard error of the mean.

Stagnogleys Seasonally waterlogged gley soils

Stagnohumic gleys Slowly permeable seasonally waterlogged fine loamy soils with a peaty surface horizon.

Taxon (plural Taxa) A systematic unit within a taxonomy, that is used to name and highlight the degree of inter-relatedness of flora and fauna e.g. family (swallow family - hirundines), genus (swallow - *Hirundo rusticola*) or species (swallow - *Hirundo rusticola*).

UK Biodiversity Action Plan 'Biodiversity: The Action Plan (1994)', the BAP for the United Kingdom, which has its roots in the 1992 'Rio Earth Summit'. Various UK BAP documents have been produced by the UK government which detail actions necessary for a wide range of the country's habitats and most threatened plants and animals. The UK BAP forms the basis for all local Biodiversity Action Plans as well as other initiatives.

Vertebrate Any animal with a backbone, e.g. fish, amphibian, bird or mammal.

BIBLIOGRAPHY

- Anonymous, 2001. Quality of Life Capital - Application Guide for Statutory and Non-Statutory Plans
- Anonymous, 2000. Thinking Globally, Acting Locally ~ an Earthwatch Guide to the Environment, Earthwatch, Europe
- Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G. & Jeffcoate, S. 2001. The Millennium Atlas of Butterflies in Britain and Ireland, Oxford University Press, Oxford.
- Ball, S.G. 1987. Invertebrate Site Register Report No.72: Regional Review of Rare and Notable Invertebrates in N.E. England, Nature Conservancy Council
- Bellamy D. & Quayle B. 1989 England's Last Wilderness – A Journey through the North Pennines Michael Joseph Limited London
- Bowey, K. & Street, M. 2003. The Teesdale Roadside Flora Project. Durham Biodiversity Partnership.
- Bradshaw, M.E. 1962. The distribution and status of the five species of the *Alchemilla vulgaris* L. aggregate in Upper Teesdale. *Journal of Ecology*, 50: 681-706.
- Bradshaw, M.E. 1976. Origin and history of the Teesdale flora. In Bradshaw, M.E. (ed.) *The Natural History of Upper Teesdale*, Durham County Conservation Trust Ltd.
- Bradshaw, M.E. 1981. Monitoring grassland plants in Upper Teesdale. In Synge, H. (Ed.) *The Biological Aspects of Rare Plant Conservation*, John Wiley & Sons Ltd.
- Bradshaw, M. E. (Ed.) 2003. *The Natural History of Upper Teesdale*. 4th Ed. Durham Wildlife Trust Ltd, Rainton Meadows.
- Bradshaw, M.E. 2003. Report of the changes in the Status of five species of the *Alchemilla vulgaris* agg. in Teesdale and Weardale between the 1950s and 2000/02/03. (Incomplete draft)
- Bradshaw, M.E. & Doody, J.P. 1978. Plant population studies and their relevance to nature conservation. *Biological Conservation* 14: 223-42.

Brodin, N. 2001. A Biodiversity Audit of the North East. The North East Biodiversity Forum, c/o English Nature – Northumbria Team.

Buckingham, H., Chapman, J. & Newman, R. 1999. The future for hay meadows in the Peak District National Park. *British Wildlife* 10: 311-318.

Bullock, J. 1996. Plants. In Sutherland, W.J. (ed.) *Ecological Census Techniques: a handbook*, Cambridge University Press, Cambridge.

Cambridgeshire County Council 2001. *Roadside Verges: Local Habitat Action Plan for Cambridgeshire*, Cambridgeshire County Council.

<http://www.camcnty.gov.uk/sub/cntryside/biodiv/plans/verge.html>

Site visited: 03-07-03.

Cheshire Wildlife Trust, 2002. *Countdown 2002 - Cheshire region Biodiversity Programme – Roadside Verges*. Cheshire Wildlife Trust. <http://www.whitwell-it.i12.com/cheshire-biodiversity/habitat-rverges.htm> Site visited: 18-07-03.

Clifton, S. J. and Hedley, S. 1995. *Durham Wildlife Audit*, English Nature/Durham County Council.

Corbet, G.B. and Harris, S.(eds) 1992 *The Handbook of British Mammals*, Blackwell, Oxford

Crofts, A. 1999. Roadside verges. In Crofts A. & Jefferson, R.G. (ed.). *The Lowland Grassland Management Handbook*. (2nd. Ed.), English Nature & The Wildlife Trusts, Peterborough.

Daly, F. 2001. A roadside verge management protocol to enhance the floristic interest of roadside verges in Weardale (Co. Durham), through certain targets specified within the Durham Biodiversity Action Plan, Unpublished MSc dissertation, University of Sunderland, 2001.

Department of the Environment, 1994. *Biodiversity: The UK Action Plan*, H.M.S.O, London.

DETR, 2000. *Accounting for nature. Assessing habitats in the UK countryside*, Department of the Environment, Transport and the Regions, London.

Dover, J. 1990. Butterflies and wildlife corridors. In Nodder, C. (ed.) *The Game Conservancy Review of 1989*, 62-64. The Game Conservancy, Fordingbridge.

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

Durham County Council. 1995. Policy for the Management of Roadside Verges. Environment Department, Durham County Council, County Hall, Durham City.

Durham Biodiversity Partnership, 1997. The Durham Biodiversity Action Plan: an Introductory Guide. Durham Biodiversity Partnership

Durham Biodiversity Partnership, 1999. Action for Wildlife: The Durham Biodiversity Plan (and subsequent supplements). Durham Biodiversity Partnership.

English Nature, 1997. Natural Area Profile: The North Pennines: an assessment of the nature conservation resource of the North Pennines - a Natural Area and Area of Outstanding Natural Beauty (draft report), English Nature, Northumbria Team.

Essex Wildlife Trust. Essex Roadside Verges – they need your help. Essex wildlife Trust.
http://www.essexwt.org.uk/conservation/verges/_text.htm Site visited: 18/07/03.

Fitter, R., Fitter, A. & Blamey, M. 2003. Wild Flowers of Britain & Ireland. A & C Black, London.

Fitter, R., Fitter, A. & Farrer, A. 1984. Grasses, Sedges, Rushes & Ferns of Britain & Northern Europe. HarperCollins.

Fuller, R. M. 1987. The changing extent and conservation interest of lowland grasslands in England and Wales: a review of grassland surveys 1930-1984, *Biological Conservation* 40: 281-300.

Goldsmith, F.B. 1983. Ecological Effects of Visitors and the Restoration of Damaged Areas. In Warren, A. & Goldsmith, F.B. (eds.) *Conservation in Perspective*, John Wiley & Sons, Chichester.

Graham, G.G. 1988. The Flora and Vegetation of County Durham. The Durham Flora Committee and Durham County Conservation Trust.

Greig-Smith, P. 1983. *Quantitative Plant Ecology*. 3rd. Ed. Blackwell Scientific Publications, Oxford.

Hawksworth, D.L. (ed.) 1995. *Biodiversity: Measurement and Estimation*. The Royal Society, Chapman & Hall, London.

HMSO. 1992. This Common Inheritance: Britain's Environmental Strategy (The Second Year Report). Her Majesty's Stationery Office, London.

Holm, C. A survey of the road verges near Cleadon Hills. Countryside Volunteers South Tyneside and Cleadon Hills Conservation Group.

Hopkins, J.J. 1999. Grassland management decision making. In Crofts A. & Jefferson, R.G. (eds.). The Lowland Grassland Management Handbook. (2nd. Ed.), English Nature & The Wildlife Trusts, Peterborough.

Hubbard, C.E. 1984. Grasses: A Guide to their Structure, Identification, Uses and Distribution in the British Isles. 3rd. Ed. Penguin Books, London.

Jefferson, R.C. 1999. Introduction to lowland semi-natural grasslands. In Crofts A. & Jefferson, R.G. (eds). The Lowland Grassland Management Handbook. (2nd. Ed.), English Nature & The Wildlife Trusts, Peterborough.

Jefferson, R.C. 1999. Mowing and cutting. In Crofts A. & Jefferson, R.G. (eds.). The Lowland Grassland Management Handbook. (2nd. Ed.) English Nature & The Wildlife Trusts, Peterborough

Jerram, R et al. 2001. Meadows and Enclosed Pastures. In Backshall, J, Manley, J and Rebane, M. (eds.) The Upland Management Handbook, English Nature, Peterborough

Johnson G.A.L. 1970. Geology of Durham County, Trans. Nat. Hist. Soc. Northumb. 41: 1

Johnson G.A.L. (ed.) 1995. Robson's Geology of North East England, Trans. Nat. Hist. Soc. Northumb. 56: 5

Jones, A. 2001. Comment: We plough the fields, but what do we scatter? A look at the science and practice of grassland restoration. British Wildlife 12: 229-235.

Jones, A.T. & Hayes, M.J. 1999. Increasing floristic diversity in grassland: the effects of management regime and provenance on species introduction. Biological Conservation 87: 381-390.

Keble Martin, W. 1982. The New Concise British Flora, Bloomsbury Books, London.

Kent, M. & Coker, P. 1992. *Vegetation Description and Analysis: A Practical Approach.*, John Wiley & Sons, Chichester.

Lancashire Wildlife Trust , 1992. *Roadside Verge: Management in Lancashire* (leaflet). Lancashire Wildlife Trust & Lancashire County Council, Bamber Bridge, Preston.

Laursen, K. 1981. Birds on roadside verges and the effect of mowing on frequency and distribution, *Biological Conservation* 20: 59-68.

Lincolnshire Wildlife Trust, 2001. *Protected Roadside Verges (PRV)*. Lincolnshire Wildlife Trust. <http://www.lincstrust.co.uk/reserves/nr/prv.html> Site visited: 25-07-01.

Mabey, R. 1996. *Flora Britannica*, Sinclair-Stevenson, London.

Marren, P. 2001. 'What time hath stole away: local extinctions in our native flora'. *British Wildlife* 12: 305-310.

Mercer, I. 1974. *The Role of Local Government in Nature Conservation*. In Warren, A. & Goldsmith, F.B. (Eds.). *Conservation in Practice*, John Wiley & Sons, London.

Morris, P. 1995. *Ecology - Overview*. In Morris, P. & Therivel, R. (ed.) *Methods of Environmental Impact Assessment*, UCL Press Limited, London.

Morris, P., Thurling, D. & Shreeve, T. 1995. *Terrestrial ecology*. In Morris, P. & Therivel, R. (Ed.) *Methods of Environmental Impact Assessment*. UCL Press Limited, London.

Munguira, M.L. & Thomas, J.A. 1992. Use of road verges by butterfly and burnet populations, and the effect of roads on adult dispersal and mortality. *Journal of Applied Ecology* 29: 316-329.

Neath Port Talbot Environmental Quality Unit. 2003. Often ignored and overlooked, the roadside verge is about to get the attention and accalim it deserves. Neath Port Talbot Biodiversity Forum. http://www.neath-porttalbot.gov.uk/pressreleases/pr2003_05_02a.html Site visited: 03-07-03

Parr, T.W. & Way, J.M. 1988. Management of roadside vegetation: the long-term effects of cutting. *Journal of Applied Ecology* 25: 1073-1087.

Powys County Council. Communications Unit – Roadside verge management 'on table'. Powys County Council. <http://www.pr.powys.gov.uk/english/showrelease.php3?page=verge> Site visited: 03-07-03.

Preston, C.D. , Pearman, D.A. & Dines, T.D. (Eds.) 2002. New Atlas of the British and Irish Flora: An Atlas of the Vascular Plants of Britain, Ireland and the Isle of Man and the Channel Islands. Oxford University Press, Oxford.

Robertson, H. 1999. Grassland monitoring. In Crofts A. & Jefferson, R.G. (ed.). The Lowland Grassland Management Handbook. (2nd. Ed.) English Nature & The Wildlife Trusts, Peterborough.

Rodwell, J. S. (ed.) 1992. British Plant Communities Vol. 3: Grassland and montane communities, Cambridge University Press, Cambridge.

Rose, F. 1981. The Wild Flower Key: A guide to plant identification in the field, with and without flowers. Frederick Warne, London.

St. Osyth Parish Council, 2001. The Essex Special Roadside Verges Project. Tendring District, Colchester. <http://www.stosyth.gov.uk/default.asp?/calltype=may01verges> Site visited: 03/07/03.

Schaffers, A. P. Vesseur, M.C. & Sykora, K.V. 1998. Effects of delayed hay removal on the nutrient balance of roadside plant communities. *Journal of Applied Ecology* 35: 349-364.

Schoon. N. 1996. Going Going Gone: The Story of Britain's Vanishing Natural History, Bookman Publishers.

Scottish Natural Heritage, 2001. Hitch a ride on the Wildflower Expressway, Scottish Natural Heritage Publications, Perth.

Shetland News Agency, 2003. Living Shetland launch roadside verge leaflet – 24th May. The Shetland News.

Smith, R.S. & Jones, L. 1991. The phenology of mesotrophic grassland in northern England: historic hay cutting dates, vegetation variation and plant species phenologies, *Journal of Applied Ecology* 28: 42-59.

Smith, R.S., Shiel, R.S., Millward, D. & Corkhill, P. 2000. The interactive effects of management on the productivity and plant community structure of an upland meadow: an 8-year field trial. *Journal of Applied Ecology* 37: 1029-1043.

Stace, C. 1999. *Field Flora of the British Isles*. Cambridge University Press, Cambridge.

Stace, C. 1997. *New Flora of the British Isles*, (2nd edition) Cambridge University Press

Street, M. 2002. *The Weardale Roadside Flora Project*. Durham Biodiversity Partnership.

Streeter, D. 1983. *The Wild Flowers of the British Isles*. Macmillan, London.

Suffolk Wildlife Trust, 2001. *Protected Roadside Nature Reserves*. Suffolk Wildlife Trust.
<http://www.wildlifetrust.org.uk/suffolk/ca/ia/ctry/verges.htm> Site visited: 18-07-03.

Tansley, A.G. (ed.) 1911. *Types of British Vegetation*. Cambridge University Press, Cambridge.

Tansley, A.G. 1939. *The British Islands and their Vegetation*. Cambridge University Press, Cambridge.

Taylor, R. 1978. *Roadside Verges in the Tyne to Tees Area*. Durham County Conservation Trust Ltd.

UKBAP, 2001 *UK Biodiversity: Action Plans for your area*. <http://www.ukbap.org.uk>
Site visited: 26-07-01.

UK Biodiversity Group, 1998. *Tranche 2 Action Plans. Volume 1 - Vertebrates and Vascular Plants*, English Nature, Peterborough (on behalf of the UK Biodiversity Group)

UK Biodiversity Steering Group, 1995. *Biodiversity: The UK Steering Group Report. Volume 1: Meeting the Rio Challenge*, H.M.S.O., London

United Nations Conference on Environment and Development. 1992. *Convention on Biological Diversity*, United Nations

United Nations Conference on Environment and Development, 1992. *Agenda 21*, United Nations Various (1989)

Waite, S. 2000. Statistical ecology in practice: A guide to analysing environmental and ecological field data. Pearson Education Limited, Harlow.

Way, J.M. 1977. Roadside verges and conservation in Britain: a review. *Biological Conservation* 12: 65-74.

Wheater, C.P.1999. *Urban Habitats*, Routledge, London

Wiggington, M.J. (ed.)(1999), *British Red Data Books 1: Vascular Plants (3rd. Ed.)*, Joint Nature Conservation Committee, Peterborough

Worcestershire County Council (2001). *Road Verges*, Worcestershire County Council.
http://www.worcestershire.gov.uk/biodiversity/habitats11-19/roadverg_text.htm