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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 the Derwent valley are historic routes connecting woodlands and other habitats with settlements, which pass through agricultural land within which there are some areas of important upland hay meadows. Remnants of hay meadow vegetation, less rich than in Durham's more southerly dales, can still be found along some of the roadside verges of the Derwent valley, together with species that are rare or of local interest. Given this information, the Derwent Valley Roadside Flora Project was based on the premise that some of the roadside verges in the Derwent valley 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 (AONB) 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 whole of the Derwent Valley Roadside Flora Project area was located within the North Pennines AONB.

The Derwent Valley Roadside Flora Project was undertaken by the Durham Biodiversity Partnership (with financial support from the North Pennines AONB Partnership), as part of the process of implementing the Durham Biodiversity Action Plan. 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 Derwent Valley 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 Derwent Valley Roadside Flora Project
- To increase the area of DBAP priority habitats (e.g. upland hay meadows), the populations of any 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 Derwent Valley.

- 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 the Derwent valley and highlights those roadside verges which might benefit from improvements in management procedures. The most important roadside verge sites in floristic terms have been mapped, as have the locations of any scarce/rare Lady's mantles discovered.

In total, the survey encompassed almost 40 km of roadside verge between Carterway Heads (in Northumberland) and the edge of Hunstanworth Common (County Durham). Many of the roadside grasslands in the Derwent Valley Roadside Flora Project area were found to comprise either 'improved or semi-improved' grassland and some of these were found to be of only limited botanical value. The survey identified 16 high quality or 'red' sites on roadside verges, with a total length of 1.69 km. The total length of 'amber' (second tier) sites identified for the entire project area was 5.46 km, of which 1.78 km were classified as being of 'upper amber' quality.

The subjective judgement of site surveyors working on all four roadside surveys (2001-2003), was that the species diversity in the Derwent valley, Upper Teesdale and (lower) Teesdale red sites was broadly the same, being somewhat 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 '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).

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 DERWENT VALLEY 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 Derwent Valley 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 Derwent Valley Roadside Flora Project contributes towards the delivery of the following Durham Biodiversity Action Plan targets:

- (i) Habitat Action Plan for 'Upland Hay Meadows' - Targets 1, 2: Actions 2, 3, 5, 6, 7
- (ii) 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 Derwent Valley Roadside Flora Project

2.1 Introduction to the Project

The Derwent Valley 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 in Teesdale during 2002 (as well as additional work done in Upper Teesdale 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 the Derwent valley. Consequently the vision and specific biodiversity objectives of the project are largely similar to those for the Weardale and Teesdale Roadside Flora Projects, although the geographical focus of the project is different.

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

The main surveyed roads in the Derwent valley, were between Carterway Heads, Edmundbyers, Blanchland, Baybridge and up to Hunstanworth, with a loop off to Ramshaw and back to Townfield, i.e. the B6278, the B6306 and associated by-roads.

The landscape of Derwent valley is of particular note for its woodlands but is less well known for its upland hay meadows than the County's other dales, Weardale and Teesdale. That said, there are a number of interesting upland hay meadows, especially close to Ramshaw/Townfield, with a number of herb-rich upland pastures in the Carrick's Haugh area. Over the centuries, traditional management of the dale's grasslands has created meadows that are rich in plant species and in some locations, small amounts of this habitat 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, so even relatively small areas are of significance.

It was in the context of this overall national picture that the Weardale Roadside Flora Project was conducted in 2001 and from that work was developed subsequent work, including the Derwent Valley Roadside Flora Project in 2003. 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 some 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.

This project 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 Derwent Valley Roadside Flora Project is:

"The best roadside grassland verges in the Derwent valley 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 Derwent Valley Roadside Flora Project was located in the Derwent valley, between Carterway Heads (Northumberland) and Hunstanworth (County Durham). The major part of the land area and length of roadside verge surveyed fell into County Durham with two relatively short sections in Northumberland. During the project, 40 km of roadside verges were surveyed (approximately 5 km of which was in Northumberland).

2.4 Aims of the Derwent Valley Roadside Flora Project

The general aim of the Derwent Valley Roadside Flora Project is as follows:

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

Within this overall aim, the Derwent Valley 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 Derwent Valley Roadside Flora Project

- To increase the area of DBAP priority habitats (e.g. upland hay meadows), the populations of any 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 Derwent Valley.
- 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 Derwent valley area particularly as they relate to upland hay meadows and roadside verges and, as a result, 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. 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 the Derwent Valley'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 & the Derwent valley

There are thirteen species of Lady's mantle in the UK of which three are widespread, though 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*. This group of rare plants has been an object of

focus for previous roadside survey work. This was less relevant for work based in the Derwent valley as only one of the rare species occurs, and this only at one documented location.

The Red Data Book species *Alchemilla acutiloba* is almost entirely confined to Weardale and Teesdale, but has been recorded at one 'track side' location near Baybridge in the Derwent Valley. It was not recorded at any roadside verge covered by the present survey.

For more information on Lady's mantles in the Durham area see section 2.5 of the *Teesdale Roadside Flora Project* (2003).

2.6 Roadside Flora - The Historical Context

This section attempts to illustrate how the history of the Derwent valley, 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 upper valley of the Derwent is one of several valleys referred to by geographers as the 'lead dales', due to the past history of lead mining (particularly in the Ramshaw area). Muggleswick, now a hamlet, was once a hunting lodge of the priors of Durham. Above Blanchland is a plateau of grouse moor scarred by the occasional sandstone quarry or disused lead shaft. The history of the Derwent valley area reveals that hay meadows and transport corridors have all played an important role in the development of the landscape that is seen today.

From the eleventh century onwards, large areas of the Pennine dales, including the Derwent valley 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.

2.7 Roadside Flora - The Socio-Economic Context

As well as being rich in biodiversity, many of the Derwent valley'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 Edmundbyers and Blanchland.

The Derwent valley 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; although the Derwent valley (upstream of the A68), has suffered less so from this impact than have both Teesdale and Weardale. 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, i.e. between Carrick's Haugh and Blanchland.

2.8 Current Management of the Roadside Verges in the Derwent Valley

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 Report 2002.

3. The Project Area

The Derwent Valley Roadside Flora Project was entirely located in the Derwent valley, County Durham and Northumberland. The project area commenced at the junction of the A68 with the B6278 at Carterway Heads (in Northumberland) and proceeded to Edmundbyers, thence along the B6306 to Blanchland and from there, on unmarked roads, via Baybridge, to Hunstanworth, and around the hamlets of Ramshaw and Townfield. The whole of the Project area is located within the North Pennines Area of Outstanding Natural Beauty.

The whole of the project area is covered on Ordnance Survey 1:50 000, Landranger Map 87 and 1:25 000 Explorer Map 307. Also see the map inserts at the rear of this report.

3.1 The Derwent Valley Landscape

The Derwent valley gives the impression of a well-wooded vale that breaks, from the wooded valley floor and watercourses, out on to wild moorland fells without the attachment of much of the fringe of enclosed and in-bye land that is so much of a feature of the larger dales in the valleys of the Wear and the Tees. Consequently, the landscape has a more intimate feel in terms of its scale though with a 'still wild', cutting edge to its form.

The whole river valley has largely escaped any level of ribbon development and, uniquely for the major upland rivers of the area, flows into another major river (the Tyne, near Blaydon) rather than into the North Sea directly. Above Allensford the valley is very sparsely populated and despite its relatively close proximity to urban Tyneside has a quiet and distant air about it.

Upland vegetation is an important constituent of the project area's semi-natural vegetation. Much of this is comprised of dwarf shrub heath (heather moorland), but acid grasslands and upland hay meadows are all also represented. All of these occur as individual habitats in the roadside verges of the project area. The moorlands of the Derwent valley contain a mosaic of habitats including dry heathland, wet heathland, blanket bog, flushes and acid grassland. Likewise, they are populated by representative species such as red grouse, merlin, curlew, golden plover and, on the higher tops, a few dunlin. Although the strongholds for upland hay meadows in the Durham BAP area can be found in Teesdale, Lunedale, Baldersdale and Weardale, there is a small sample of representative meadows in the upper Derwent valley. These illustrate the distinctive flora of this habitat type, where the major species are sweet vernal-grass, wood crane's-bill, pignut, great burnet, yellow rattle and Lady's-mantle (though only the more common species of this latter critical group occur in the Derwent valley, with the notable exception of one location near Baybridge, where *Alchemilla acutiloba* has been found).

One of the most notable landscape features of the upper valley is the Derwent Reservoir. This is located just to the north east of Edmundbyers village. It is the largest body of standing water in the North Pennines, containing over 11,000 million gallons, fed from a catchment base that covers an area of some 42 square miles.

The built heritage of the valley reflects its recent and more distant past, with lead mining infrastructure very much in evidence in the Ramshaw area, some small scale quarries and the remains of some medieval dwellings, such as the manor house at Muggleswick.

Of considerable significance to the history of the valley was the basing in the Middle Ages of a Cistercian order Abbey at Blanchland. The location of this ensured that well established drove roads and ecclesiastical routes, from Blanchland to Hexham Abbey for example, were a major feature of the valley's transport infrastructure. A number of the modern day roads follow these tracks, along slightly tortuous routes, through what would have once been dense woodland.

3.2 Geomorphology, Geology, Soils and Climate of the Upper Derwent Valley

The solid geology of the project area comprises principally Millstone Grits, with the influence of the Lower Coal Measures on the fells to the south of Blanchland. Much of this is overlain with drift comprising River Terrace Deposits and peat.

The soils are largely acidic comprising blanket bog on the fell tops and sides, with leached nutrient poor soils on the valley sides and richer brown earths on the wooded valley floor.

The climate of the valley is typical of the western part of 'County Durham', with a mean annual rainfall of over 1600 mm per annum at the head of the valley decreasing to less than 800 mm per annum further east. The mean temperature is 6°C over 7-8 months of the year.

3.3 Current Land Usage and Settlement

The population of the project area is very low, probably under 1000 and these are concentrated in a small number of scattered, small-scale settlements, principally the villages at Edmundbyers and Blanchland (which means 'white land') and Hunstanworth, with hamlets or dwelling clusters at Baybridge, Townfield and Ramshaw.

Land usage is principally for pastoral farming, with some rather small scale arable practice, principally producing root crops. The main stocking systems comprise a mixture of sheep with some cattle and, in some instances, a few horses. Silage is a widely taken crop and a small amount of hay is generated in the upper reaches of the catchment, around Ramshaw/Townfield.

Large areas of land, away from the enclosures, are under game management regimes (red grouse on the fell tops and sides, and pheasant rearing in some of the large estates such as that at Ruffside Hall). Woodland covers a significant area of the valley floor and lower slopes. A relatively large proportion of this woodland, particularly upstream of Edmundbyers, is commercial forestry, although there are still abundant examples of natural woodland cover in the valley. Where this occurs it is principally of the sessile oak-birch type.

Other than small scale cottage and crafts industry, there is no appreciable industrial base in the upper Derwent valley. Tourism in the valley is not well developed, although a number of hotels, bed and breakfast facilities and the Edmundbyers Youth Hostel offer opportunities for overnight stays in the area.

3.4 Broad Habitat Description and Biodiversity Issues

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 Derwent valley.

The broadly dominant, semi-natural habitat types present in the upper Derwent valley are grasslands of various types, dwarf shrub heath, with considerable areas of ancient semi-natural woodland and some plantation woodland. The grasslands in the valley are, by and large, mesotrophic or acidic. There are few (if any) examples of unaltered, natural grasslands within the Project area.

Across the project area, hedgerows remain a significant biodiversity feature. This is particularly the case between Edmundbyers and Carterway Heads, where many of the hedgerows are species-rich, and probably ancient, but they tend to be in a very poorly maintained state. Hedgerow trees are not uncommon, with the most commonly encountered species being ash, followed by oak and sycamore, though birch, in the form of maturing roadside scrub, was also evident. Along its length, the Derwent valley is one of the most heavily wooded areas of the north east and the considerable woodlands in the upper valley are a mix of semi-natural ancient and more recent plantation type, the latter comprising mainly conifers. Some elements of the roadside flora well illustrate the woodland origins of the vegetational sward.

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 and Dr Margaret Bradshaw.

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 Derwent Valley Roadside Flora Project commenced in May 2003, fieldwork continuing through into early August. 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* (2003).

Approximately 40 km of roadside verge were assessed during the initial part of the project. This was followed by a 'walk-over survey', which was then undertaken on the areas of roadside vegetation that had not been initially eliminated, covering 37 km of roadside verge in total. The positions of all red and amber sites were noted using 8-figure grid references.

A more detailed survey was carried out on 'red' sites. At each site that was graded as red, the species present were identified and recorded on a recording sheet, which was designed for the project (see Appendix 7). The species present were recorded on two occasions, with a first visit in May/June and a later visit in July/August, to allow for seasonal changes in the flora. The presence of rare or notable species was also recorded. Records of significant species, other than plants, were also kept i.e. invertebrates, mammals, birds, reptiles and amphibia.

- Red sites - these were identified as being of 'prime botanical interest' as defined by species diversity (including the presence of species which are rare or of local interest) and the suite

of species present (e.g. MG3 - mesotrophic grassland). These sites represent a valuable conservation resource and should be protected.

- Amber sites - these were less diverse in terms of species number than red sites, but with appropriate management their conservation value could be enhanced. Amber sites were divided into two categories i.e. 'upper' or 'lower' amber. Sites classed as upper amber were considered to have the greatest potential, if managed appropriately, to become particularly valuable in terms of local biodiversity.
- Green sites - these sites had low levels of species diversity (typically only 5 or 6 species over a 10 m length of verge). They were characterised by rank, invasive species such as nettles, hogweed and thistles. Grasses present were dominated by vigorous fast growing species such as cocksfoot *Dactylis glomerata* and false oat grass *Arrhenatherum elatius*. Many of these sites were detrimentally affected by adjacent land use.

The usage of the terminology 'red', 'amber' and 'green' is intended to simplify the verge management recommendations for the contractors/grounds maintenance operatives. A green site can be managed as per DCC guidelines and a swathe of 1.2 metres wide cut (i.e. "go ahead"). Amber sites have an element of caution overlaying any recommended management proposals (i.e. "proceed with care") whilst red sites should have specific management recommendations for each site (i.e. "stop and consult before cutting or undertaking an operation").

4.2 Project Constraints

Project constraints were identified. The most significant of these were time and safety. For more detail on the identification of project constraints and how these were mediated, see Section 4.2 of the *Teesdale Roadside Flora Report (2003)*. Steps taken:

- To reduce the risks posed by the presence of traffic, surveyors always worked in pairs and wore fluorescent jackets at all times.
- 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.

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).

This 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 plants recorded on 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.

5.2 General Comments & Summary of Habitats as Observed During Fieldwork

As was observed in the work undertaken in Weardale during 2001 and Teesdale in 2002, the roadside verges that the project identified as being of the highest value in the upper Derwent valley, tended to be 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) as well as to the quality and nature of the adjacent habitat (e.g. woodland or grassland).

In general terms, the Derwent valley's roadside verges comprise grasslands that indicate their origins as oak-birch woodland ground flora and acidic grassland as well as some mesotrophic hay meadow-type swards. In the main, the valley's roadside grasslands were less degraded than those that are widely found in Weardale and Teesdale, although a number were in a relatively species-poor state. In a number of locations this degradation seems to have resulted principally from a lack of appropriate management, exacerbated by over-cutting.

5.2.1 Roadside Grasslands & the Derwent Valley Context

In general terms, and in comparison with verges surveyed in Weardale and Teesdale, there was a lower proportion of the total roadside grassland resource dominated by tall, robust herb species, such as the *Umbelliferae*. Badly degraded, nutrient-enriched grasslands, populated principally by docks, thistles and rosebay willowherb *Chamaenerion angustifolium* were, in relative terms, in short supply in the Derwent valley compared to the other dales. In a small handful of grasslands, in the least diverse situations, robust grasses such as cock's-foot *Dactylis glomeratus* dominated to the exclusion of all but a few herb species e.g. stinging nettle *Urtica dioica*, but in the Derwent valley this was very much the exception rather than the 'norm'.

A smaller proportion of roadside grasslands in the Derwent Valley Roadside Flora Project area comprised either 'improved or semi-improved' grassland than in previous surveys conducted. Of the poorer swards some had degraded as a result of nutrient enrichment, probably through the leaching of nutrients and the drift of sprayed inputs from the 'agricultural side of the wall'. In the lower portion of the project area, the roadside verges had a largely woodland 'feel' with a number of typical plants of semi-natural ancient woodlands (such as moschatel *Adoxa moschatellina*). Higher up the valley, adjacent to heathland and pasture land, many of the swards illustrated a strong acidic grassland influence with species such as tormentil *Potentilla erecta*, with a number also exhibiting many of the classic suite of hay meadow species, such as crane'-bills *Geranium* spp. and Lady's mantles *Alchemilla* spp.

A range of orchid species were noted in the verges of the Derwent Valley. These included: common twayblade *Listera ovata*, heath spotted orchid *Dactylorhiza maculata*, early-purple orchid *Orchis mascula*, as well as common spotted orchid *Dactylorhiza fuchsii* and northern marsh orchid *Dactylorhiza purpurella*.

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 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. The best examples were:

- The verge on the north side of the B6278, directly east of Edmundbyers, close to the Youth Hostel. This small site recorded a total of 43 species and including a representative sample of the 'classic' hay meadows species complement.

- 'Carrick's Corner', located at the junction of the B6306 and the unnamed road which runs along the north shore of the Derwent Reservoir, past Carrick's Haugh. This location had a good representative flora, indicative of traditional hay meadows, a large species list (85 species recorded) and large populations of interesting species such as common twayblade and adder's tongue fern.
- 'Skinny Burn Quarry', on the north verge of the B6306, opposite, and close to, the access road for Pow Hill Country Park. This site, a redundant quarry, topped with species-rich heath (including three ericaceous species and crowberry) has the widest representative fern flora of any site surveyed (with eight species present, including 'mountain' or lemon-scented fern).
- Roadside Heath at Balehill Plantation. An acid grassland/heathland verge with a wide variety of acid grassland plants, some well established heathland and a range of interesting species such as common twayblade.

5.2.2 Results Overview, Section by Section – Carterway Heads to Derwent Bridge (Northumberland - North of the Derwent)

This section comprised the least botanically interesting suite of roadside verges in the project area – not a single red site was identified in this subsection of the project envelope – although one probable site was identified (at the entrance to the Derwent Reservoir access road). However, routine, regular grass-cutting meant that adequate survey information was not available to support the identification of it as a red site.

One of the more interesting vegetational elements along this section of road, between Eddisbridge and Derwent Bridge, was the several small colonies of melancholy thistle *Cirsium heterophyllum*, and some patches of tansy *Chrysanthemum vulgare* (the only location at which this species was located on the survey).

This section's hedgerows were of a relatively high species diversity (with over ten woody species recorded and some very mature hedgerow trees), but they were very poorly managed and in a bad state of repair. It is believed that many of these hedgerows are pre Enclosure Acts and serve to de-lineate some of the old valley routes.

5.2.3 Results Overview, Section by Section - Derwent Bridge to Edmundbyers (South of the Derwent)

These verges exhibited, a variable floristic interest, although the overall standard was quite high. There was a small number of good sites, but just one of red standard, nonetheless the vast majority of the verges had a reasonably high interest, particularly early in the season (May-early June). Moschatel, a typical plant of semi-natural ancient woodlands in the Derwent valley, was conspicuous in a number of the hedgerows, as were a number of other woodland plants such as bluebell and primrose. Late in the season (July onwards) large stretches of these verges were dominated by bracken.

5.2.4 Results Overview, Section by Section - Edmundbyers (South of the Derwent)

Two red sites were identified on verges within the village of Edmundbyers. Both of these exhibited a largely acid grassland flora with tormentil, mouse-ear hawkweed and cat's-ear all prominent, although one site also had an abundance of lady's bedstraw. Both of these verges however, were badly managed in relation to their floristic interest, being cut far too regularly as part of 'tidying up' by local people.

5.2.5 Results Overview, Section by Section - Edmundbyers to Blanchland (South of the Derwent)

This was a long section of road, with some considerable biodiversity interest, including a number of red sites (eight). These were scattered between Edmundbyers and Ruffside with a cluster around the Carrick's Corner turn-off for the reservoir, and from there along the south east verge almost continuously to Stonyburn Bridge. This section, some 750 m in length, was determined to be of considerable biodiversity value, with three red sites identified and most of the rest being at least lower amber standard, and a high proportion of it reaching 'upper amber'. A number of the red sites here were damp and contained a variety of marshland species, such as common valerian and marsh valerian.

In overview, this section of verge was the largest length of almost continuous high quality roadside habitat in the whole of the survey area, and one of the largest noted in any of the four tranches of roadside survey work undertaken by the Durham Biodiversity Partnership, 2001-2003.

5.2.6 Results Overview, Section by Section - Blanchland to Baybridge (North of the Derwent , Northumberland)

A short section of surveyable verge revealed little of interest with only a single red site located on the north side of the road close to Clapshaw Plantation. Generally the verges here were narrow and limited in their vegetational composition. The section between Clapshaw Plantation and Baybridge on the north side was far and away the most interesting, comprising as it did a largely tall herb community, with some melancholy thistle and plants such as red campion and a hybrid of red and white campion. Unfortunately, this was cut before it could be adequately surveyed.

5.2.7 Results Overview, Section by Section - Baybridge to Baybridge, Hunstanworth and the 'Ramshaw Loop' (South of the Derwent)

A relatively long section of road, with some biodiversity interest, including four red sites. These were clustered, two between Baybridge and the turn off for Ramshaw, and singles before and after Ramshaw. These largely comprised acidic woodland ground-flora and acid grassland with some heathland communities in the verges. A range of interesting species were recorded including early-purple orchid, moonwort, common twayblade and sanicle.

5.3 Biodiversity Detail and Highlights

Highlights in this project area include the presence of five species of orchid (see section 5.2.1), the presence of moonwort at one site in the upper Derwent valley and a large colony of common adder's tongue fern (numbering 100s of plants) at Carrick's Corner, where marsh orchids and their many hybrids were abundant. Additional biodiversity highlights include, a good representation of herb-rich verges between Carrick's Haugh and Stonyburn Bridge and two high quality heathland/acid grassland verges, at Skinny Burn Quarry and adjacent to Balehill Plantation, between Baybridge and Ramshaw.

5.3.1 Notable Species Present in the Project Area

A total of 225 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:

Common adder's-tongue (*Ophioglossum vulgatum*)
 Moonwort (*Botrychium lunaria*)
 Melancholy thistle (*Cirsium heterophyllum*)
 Moschatel (*Adoxa moschatellina*)
 Common twayblade (*Listera ovata*)
 Heath spotted orchid (*Dactylorhiza maculata*)
 Early-purple orchid (*Orchis mascula*)
 Large numbers of hybrid common spotted and northern marsh orchids

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: 16

Total length of red sites = 1.69 km

Total length of amber sites identified for the entire project area: 5.46 km, of which 1.78 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 DERWENT VALLEY ROADSIDE FLORA PROJECT (MAY TO AUGUST 2003)		
SITE NUMBER	LOCATION / SITE NAME (NUMBER OF SPECIES RECORDED)	SITE GRID REFERENCE
1	B6278 (east of Edmundbyers) – north verge (37)	NZ 01855008 - NZ 01925011
2	Edmundbyers village (B6278) – north west verge (37)	NZ 01554990 - NZ 01584993
3	Edmundbyers village (B6306) (steep verge, west edge of village) – north verge (30)	NZ 01445012 - NZ 01495012
4	B6306 (south of entrance to Pow Hill Country Park) – east verge (53)	NZ 00115119 - NZ 00185105
5	B6306 (Skinny Burn Quarry, adjacent to Pow Hill Country Park) - south west verge (66)	NZ 00825143 - NZ 00105130
6	B6306 (east of Carrick's Corner junction) – south verge (48)	NY 98525115 - NY 98585121

7	Carrick's Corner (triangular verge at junction of B6306 and road to Carrick's Haugh picnic site) (85)	NY 98325103 - NY 98365106 - NY 98355108
8	Minor road (immediately north of Carrick's Corner) – east verge (54)	NY 98355180 - NY 98395125
9	B6306 (opposite Carrick's Corner) – south east verge (48)	NY 98295098 - NY 98355103
10	B6306 (south west of Carrick's Corner) – south east verge (74)	NY 98145083 - NY 98205089
11	B6306 (north east of Stonyburn Bridge) – south east verge (34)	NY 97685032 - NY 97725036
12	Minor road (east of Baybridge) – north verge (29)	NY 96035017 - NY 96085019
13	Minor road (south of Baybridge/Hunstanworth junction) – west verge (32)	NY 95854965 - NY 95854977
14	Minor road (adjacent to Balehill Plantation) – east verge (76)	NY 95904882 - NY 95914895
15	Minor road (adjacent to Bolt's Burn public footpath) – west verge, north of gate (37)	NY 95824820 - NY 95844823
16	Ramshaw Corner (triangular verge and adjacent linear verge) (51)	NY 95004735 - NY 95004731 - NY 95044734 - NY 95094741
	Average number of species per red site: 49.43	

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 – individuals were noted at a couple of sites.
2. Common amphibians - common frog was noted at a number of sites.

5.5.3 Birds

A range of typical farmland birds was noted utilising the roadsides during the survey period. These included whitethroat, linnet and yellowhammer. These were principally associating with

hedgerows and scrub adjacent to grasslands habitats. Kestrels were observed using roadside verges for hunting. The highlight of the survey season was undoubtedly the barn owl noted hunting over the B6306 near Edmundbyers, at 1710 hours on 27 June. For a full species list, see Appendix 5.

5.5.4 Mammals

A number of mammal species were recorded during the survey period

1. Brown hare – a number of corpses were found along the B6306.
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 the Derwent valley and Upper Teesdale 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 the Derwent valley 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 the Derwent valley 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 dale's original climax vegetation type, sessile oak woodland.

The recommendations made for managing the roadside verges in the Derwent valley 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 the Derwent Valley and Elsewhere

It is worth making some comparison between the verges surveyed in Weardale, Teesdale and the Derwent valley (2001-2003). 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 2 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 also had 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 of red sites in the Derwent valley, Upper Teesdale and (lower) Teesdale 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, 13.6% 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%. 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 Derwent Valley

In common with roadside verges in many areas of the UK, the verges of Derwent valley 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 – this is particularly pertinent to the verge at ‘Carrick’s Corner’ where there are a number of ‘negatively impacting’ salt piles. 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 at the junction of ‘Carrick’s Corner’.
- 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 or within settlements (e.g. Edmundbyers). This leads to the establishment of resilient rosette-forming species such as daisy (*Bellis perennis*). This is illustrated by the unofficial adoption of herb-rich verges adjacent to or opposite farms or private dwellings, leading to their development as ‘garden extensions or lawns’. This impacted particularly heavily on some herb-rich verges in the Derwent valley, in particular those located in and around Edmundbyers.

- 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. Example of such non-compliance includes the cutting of excessively wide swathes and the cutting of embankments that have no implications for the safety of road users.
- Planting of inappropriate flowering plants and tree species such as conifers, daffodils and snowdrops.
- Verges becoming strewn with fallen stones from adjacent walls and are therefore left uncut.

7. The Importance of Derwent Valley's Roadside Verges as a Conservation Resource

7.1 A Typical Derwent Valley Roadside Verges - The Link to NVC Category MG3

As determined during the work in Weardale during 2001 and (lower) Teesdale in 2002, the survey of Derwent Valley's roadside verges revealed the presence of a suite of frequently occurring plant species. For more details on species composition, see Section 7.1 of the *Teesdale Roadside Flora Project (2003)*.

In some instances, but less obviously so for Weardale and Teesdale verges, the species composition of the Derwent valley roadside verges demonstrated a link between the roadside verges and the MG3-type hay meadows.

The roadside verges identified as being 'red, or 'upper amber' in the Derwent valley have a constituent flora which is, in some situations, 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 Derwent valley's verges and was, in places, abundant.

7.2 Key Biodiversity Issues Identified Along Roadside Verges in Derwent Valley

The fieldwork undertaken along the roadside verges in Derwent valley enabled a number of key biodiversity issues to be identified. These are listed below. The first five issues listed below are all recognised as factors, which exert a negative influence on the Derwent valley roadside verges, contributing to the low biodiversity value of some of the 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 runoff of nitrates, phosphates as well as pesticide drift from adjacent crop management works.
- Fragmentation of floristically rich roadside verge habitat.
- Relatively low biodiversity quality on many of the roadside verges. Of the 40 km of verges that were initially assessed, only 7.15 km were identified as being either 'red' or 'amber' (only 3.47 km being 'red' or 'upper amber').
- The 'shading-out' of some herb-rich verges by encroaching bracken (*Pteridium aquilinum*) – a particular problem in some of the verges between Edmundbyers and Derwent Bridge.
- Significant biodiversity interest in roadside verges identified during the survey included: the verge at Carrick's Corner with 85 species of plant and the complex suite of rich verges between Carrick's Haugh and Stonyburn Bridge.
- The presence of a small amount of melancholy thistle in a number of colonies, the main ones being between Eddisbridge and Derwent Bridge (in Northumberland).
- The heathland verge site at Skinny Burn Quarry, which was rich in both heathland plants and ferns on the quarry faces. A literature search revealed the existence of an old parsley fern *Cryptogramma crispa* record for this location (*circa.* 1870), a species which may now be extinct in the region.

8. Management Recommendations

8.1 Recommendations for the Management of Derwent Valley's Roadside Verges

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

- 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, these should be 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 as a result of appropriate survey in the North Pennines AONB and its environs, should be considered for production. Such a document would 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 Weardale in 2001, and Teesdale in 2002 and 2003), which are not required under the policy, should be re-directed to the more appropriate management of 'red' and 'upper amber' sites.
- Appropriate grass-cutting regimes should be applied to all red sites (prescriptions should be drawn up after due consultation with relevant experts – see bullet point 3). The only practical method of managing grass verges (in most instances) 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).
- Consider interpreting the flora of important roadside verges to the general public using appropriate mechanisms, located in accessible situations – such as an interpretive panel to be located in the lay-by area at Skinny Burn Quarry or the picnic areas and car parks at Baybridge, Pow Hill Country Park and Carrick's Haugh.
- The floristic interest of Skinnyburn Quarry, especially the rock face, should be protected against change from storage of highways maintenance materials and fly-tipping.
- Consideration should be given to the designation of some of the best sites, in particular Carrick's Corner grassland, as County Wildlife Sites.

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 the Derwent valley 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 the Derwent valley 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 Derwent valley 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.
- 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 Derwent Valley Roadside Flora Project

(May - August 2003) – Site Record Cards

Survey Dates: 05/06/03 06/08/03	Site name: Red Site 1 – B6278 (east of Edmundbyers) – north verge	Grid Ref (Start): NZ 01855008	Grid Ref (End): NZ 01925011
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Notes - Red Site 1

Narrow verge, close to village.

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Lathyrus pratensis</i>
<i>Alchemilla glabra</i>	<i>Lotus corniculatus</i>
<i>Anthoxanthum odoratum</i>	<i>Myosotis caespitosa</i>
<i>Anthriscus sylvestris</i>	<i>Plantago lanceolata</i>
<i>Arrhenatherum elatius</i>	<i>Poa trivialis</i>
<i>Atriplex patula</i>	<i>Potentilla anserina</i>
<i>Campanula rotundifolia</i>	<i>P. sterilis</i>
<i>Centaurea nigra</i>	<i>Ranunculus ficaria</i>
<i>Cirsium arvense</i>	<i>Rosa canina</i> agg.
<i>Conopodium majus</i>	<i>Rubus fruticosus</i> agg.
<i>Crataegus monogyna</i>	<i>Stellaria graminea</i>
<i>Dactylis glomerata</i>	<i>S. holostea</i>
<i>Festuca ovina</i>	<i>Taraxacum officinale</i> agg.
<i>F. rubra</i>	<i>Torilis japonica</i>
<i>Galium aparine</i>	<i>Urtica dioica</i>
<i>G. cruciata</i>	<i>Veronica chamaedrys</i>
<i>G. verum</i>	<i>Vicia cracca</i>
<i>Geranium pratense</i>	<i>V. sepium</i>
<i>G. sylvaticum</i>	

Survey Dates: 05/06/03	Site name: Red Site 2 – Edmundbyers village (B6278) – north west verge	Grid Ref (Start): NZ 01554990	Grid Ref (End): NZ 01584993
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Notes - Red Site 2

Suffered badly from regular 'tidy' cutting by local residents.

Plant species	Plant species
<i>Alchemilla glabra</i>	<i>Narcissus</i> spp.
<i>Anthriscus sylvestris</i>	<i>Pilosella officinarum</i>
<i>Arrhenatherum elatius</i>	<i>Plantago lanceolata</i>
<i>Bellis perennis</i>	<i>P. major</i>
<i>Cerastium holosteoides</i>	<i>Poa annua</i>
<i>Cirsium arvense</i>	<i>Potentilla anserina</i>
<i>C. vulgare</i>	<i>Ranunculus acris</i>
<i>Conopodium majus</i>	<i>R. bulbosus</i>
<i>Crataegus monogyna</i>	<i>R. repens</i>
<i>Dactylis glomerata</i>	<i>Rumex acetosa</i>
<i>Festuca ovina</i>	<i>Sonchus asper</i>
<i>Geum urbanum</i>	<i>Taraxacum officinale</i> agg.
<i>Holcus lanatus</i>	<i>Trifolium pratense</i>
<i>Hypochoeris radicata</i>	<i>T. repens</i>
<i>Lolium perenne</i>	<i>Ulex europaeus</i>

<i>Lotus corniculatus</i>	<i>Veronica chamaedrys</i>
<i>Luzula campestris</i>	<i>V. officinalis</i>
<i>Medicago lupulina</i>	<i>Vicia sativa</i>
<i>Myosotis caespitosa</i>	

Survey Dates: 05/06/03 31/07/03	Site name: Red Site 3 – Edmundbyers village (B6306) (steep verge, west edge of village) – north verge	Grid Ref (Start): NZ 01445012	Grid Ref (End): NZ 01495012
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Notes - Red Site 3

Suffered badly from regular 'tidy' cutting by local residents.

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Myosotis</i> spp.
<i>Alliaria petiolata</i>	<i>Pilosella officinarum</i>
<i>Anthriscus sylvestris</i>	<i>Plantago lanceolata</i>
<i>Bellis perennis</i>	<i>Poa pratensis</i>
<i>Campanula rotundifolia</i>	<i>Ranunculus bulbosus</i>
<i>Cerastium holosteoides</i>	<i>R. ficaria</i>
<i>Cirsium arvense</i>	<i>R. repens</i>
<i>Conopodium majus</i>	<i>Rumex acetosa</i>
<i>Dactylis glomerata</i>	<i>R. crispus</i>
<i>Festuca rubra</i>	<i>Taraxacum officinale</i> agg.
<i>Galium verum</i>	<i>Trifolium pratense</i>
<i>Holcus lanatus</i>	<i>T. repens</i>
<i>Hypochoeris radicata</i>	<i>Urtica dioica</i>
<i>Lotus corniculatus</i>	<i>Veronica chamaedrys</i>
<i>Medicago lupulina</i>	<i>Vicia sepium</i>

Survey Dates: 05/06/03 15/07/03 06/08/03	Site name: Red Site 4 – B6306 (south of entrance to Pow Hill Country Park) – east verge	Grid Ref (Start): NZ 00115119	Grid Ref (End): NZ 00185105
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Notes - Red Site 4

A varied, interesting verge with acidic grassland, hay-meadow sward and some wetland species in ditch.

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Holcus lanatus</i>
<i>Alchemilla glabra</i>	<i>Juncus acutiflorus</i>
<i>Anthoxanthum odoratum</i>	<i>J. conglomeratus</i>
<i>Anthriscus sylvestris</i>	<i>J. effusus</i>
<i>Bellis perennis</i>	<i>Leontodon autumnalis</i>
<i>Betonica officinalis</i>	<i>L. hispidus</i>
<i>Briza media</i>	<i>Lotus corniculatus</i>
<i>Calluna vulgaris</i>	<i>Luzula campestris</i>
<i>Campanula rotundifolia</i>	<i>Myosotis scorpioides</i>
<i>Carex flacca</i>	<i>Plantago lanceolata</i>
<i>Cerastium holosteoides</i>	<i>P. major</i>
<i>Cirsium arvense</i>	<i>Potentilla erecta</i>
<i>C. palustre</i>	<i>P. sterilis</i>
<i>Conopodium majus</i>	<i>Potamogeton natans</i>
<i>Crataegus monogyna</i>	<i>Pteridium aquilinum</i>
<i>Dactylis glomerata</i>	<i>Ranunculus acris</i>
<i>Deschampsia caespitosa</i>	<i>Rubus fruticosus</i> agg.
<i>Digitalis purpurea</i>	<i>Rumex acetosa</i>
<i>Epilobium palustre</i>	<i>Stachys sylvatica</i>
<i>Equisetum arvense</i>	<i>Torilis japonica</i>
<i>Festuca ovina</i>	<i>Trifolium pratense</i>
<i>Galium palustre</i>	<i>Veronica beccabunga</i>
<i>G. saxatile</i>	<i>V. chamaedrys</i>

<i>G. verum</i>	<i>Vicia cracca</i>
<i>Geranium pratense</i>	<i>V. sepium</i>
<i>G. sylvaticum</i>	<i>Viola canina</i>
<i>Heracleum sphondylium</i>	

Survey Dates: 05/06/03 03/08/03 06/08/03	Site name: Red Site 5 – B6306 (Skinny Burn Quarry, adjacent to Pow Hill Country Park) - south west verge	Grid Ref (Start): NZ 00825143	Grid Ref (End): NZ 00105130
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Notes - Red Site 5

Important site for ferns, subject to damage from fly-tipping and 'storage' of materials in adjacent lay-by during operational activities, such as road re-surfacing.

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Fragaria vesca</i>
<i>Alchemilla glabra</i>	<i>Galium saxatile</i>
<i>Anthoxanthum odoratum</i>	<i>Hypochoeris radicata</i>
<i>Anthyrium filix-femina</i>	<i>Juncus effusus</i>
<i>Arctium minus</i>	<i>Leontodon hispidus</i>
<i>Bellis perennis</i>	<i>Linum catharticum</i>
<i>Blechnum spicant</i>	<i>Lotus corniculatus</i>
<i>Briza media</i>	<i>Luzula campestris</i>
<i>Calluna vulgaris</i>	<i>Medicago lupulina</i>
<i>Cardamine flexuosa</i>	<i>Molinia caerulea</i>
<i>Carex flacca</i>	<i>Myosotis sylvatica</i>
<i>Cerastium holosteoides</i>	<i>Oreopteris limbosperma</i>
<i>Chenopodium album</i>	<i>Oxalis acetosella</i>
<i>Cirsium arvense</i>	<i>Pilosella officinarum</i>
<i>C. vulgare</i>	<i>Plantago lanceolata</i>
<i>Conopodium majus</i>	<i>Polygala vulgaris</i>
<i>Crataegus monogyna</i>	<i>Potentilla erecta</i>
<i>Dactylis glomerata</i>	<i>Prunella vulgaris</i>
<i>Digitalis purpurea</i>	<i>Pteridium aquilinum</i>
<i>Dipsacus fullonum</i>	<i>Ranunculus bulbosus</i>
<i>Dryopteris borreeri</i>	<i>R. repens</i>
<i>D. cambrensis</i>	<i>Rubus idaeus</i>
<i>D. dilatata</i>	<i>R. fruticosus</i> agg.
<i>D. filix-mas</i>	<i>Rumex obtusifolius</i>
<i>Empetrum nigrum</i>	<i>Senecio jacobaea</i>
<i>Epilobium neterioides</i>	<i>Spergularia marina</i>
<i>E. tetragonum</i>	<i>Stachys sylvatica</i>
<i>Equisetum arvense</i>	<i>Trifolium pratense</i>
<i>E. palustre</i>	<i>Urtica dioica</i>
<i>Erica cinerea</i>	<i>Vaccinium myrtillus</i>
<i>E. tetralix</i>	<i>Veronica chamaedrys</i>
<i>Euphrasia</i> spp.	<i>Vicia sepium</i>
<i>Festuca rubra</i>	<i>Viola riviniana</i>

Survey Dates: 27/06/03 06/08/03	Site name: Red Site 6 – B6306 (east of Carrick's Corner junction) – south verge	Grid Ref (Start): NY 98525115	Grid Ref (End): NY 98585121
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Plant species	Plant species
<i>Acer pseudoplatanus</i>	<i>Lathyrus pratensis</i>
<i>Ajuga reptans</i>	<i>Leontodon hispidus</i>
<i>Alchemilla glabra</i>	<i>Lotus corniculatus</i>
<i>Anthoxanthum odoratum</i>	<i>Luzula campestris</i>
<i>Arrhenatherum elatius</i>	<i>L. multiflora</i>
<i>Bellis perennis</i>	<i>Molinia caerulea</i>

<i>Betula pendula</i>	<i>Plantago lanceolata</i>
<i>Blechnum spicant</i>	<i>P. major</i>
<i>Carex flacca</i>	<i>Potentilla erecta</i>
<i>Cirsium palustre</i>	<i>Prunella vulgaris</i>
<i>Conopodium majus</i>	<i>Pteridium aquilinum</i>
<i>Dactylis glomerata</i>	<i>Ranunculus repens</i>
<i>Dactylorhiza fuchsii</i>	<i>Rubus fruticosus</i> agg.
<i>Digitalis purpurea</i>	<i>Rumex acetosa</i>
<i>Dryopteris dilatata</i>	<i>Senecio jacobaea</i>
<i>D. filix-mas</i>	<i>Stellaria graminea</i>
<i>Festuca ovina</i>	<i>Succisa pratensis</i>
<i>F. rubra</i>	<i>Taraxacum officinale</i> agg.
<i>Filipendula ulmaria</i>	<i>Trifolium pratense</i>
<i>Galium cruciata</i>	<i>Vaccinium myrtillus</i>
<i>G. saxatile</i>	<i>Veronica chamaedrys</i>
<i>Heracleum sphondylium</i>	<i>V. officinalis</i>
<i>Hypericum</i> spp.	<i>Vicia sativa</i>
<i>Juncus effusus</i>	<i>Viola riviniana</i>

Survey Dates: 04/06/03 27/06/03 06/08/03	Site name: Red Site 7 – Carrick's Corner (triangular verge between B6306 and road to Carrick's Haugh picnic site)	Grid Ref (Start): NY 98325103	Grid Ref (End): NY 98365106 NY 98355108
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Notes - Red Site 7

Largest species list of any site – high quality grassland.

Plant species	Plant species
<i>Achillea millefolium</i>	<i>Lathyrus pratensis</i>
<i>A. ptarmica</i>	<i>Listera ovata</i>
<i>Agrostis capillaris</i>	<i>Lotus corniculatus</i>
<i>Ajuga reptans</i>	<i>L. uliginosus</i>
<i>Alchemilla glabra</i>	<i>Luzula campestris</i>
<i>A. xanthochlora</i>	<i>Lysimachia nemorum</i>
<i>Alnus glutinosa</i>	<i>Myosotis arvensis</i>
<i>Alopecurus pratensis</i>	<i>M. caespitosa</i>
<i>Anthoxanthum odoratum</i>	<i>M. discolor</i>
<i>Anthriscus sylvestris</i>	<i>Ophioglossum vulgatum</i>
<i>Arrhenatherum elatius</i>	<i>Pilosella officinarum</i>
<i>Bellis perennis</i>	<i>Plantago lanceolata</i>
<i>Betula pendula</i>	<i>P. major</i>
<i>Briza media</i>	<i>Poterium sanguisorba</i>
<i>Carex flacca</i>	<i>Potentilla erecta</i>
<i>C. ovalis</i>	<i>P. sterilis</i>
<i>Centaurea nigra</i>	<i>Primula veris</i>
<i>Cerastium holosteoides</i>	<i>P. vulgaris</i>
<i>Cirsium arvense</i>	<i>Prunella vulgaris</i>
<i>Cirsium palustre</i>	<i>Pteridium aquilinum</i>
<i>C. vulgare</i>	<i>Ranunculus repens</i>
<i>Crataegus monogyna</i>	<i>Rhinanthus minor</i>
<i>Dactylis glomerata</i>	<i>Rumex acetosa</i>
<i>Dactylorhiza fuchsii</i>	<i>R. acetosella</i>
<i>D. maculata</i>	<i>Salix caprea</i>
<i>Deschampsia caespitosa</i>	<i>S. cinerea</i>
<i>Equisetum arvense</i>	<i>S. pentandra</i>
<i>Euphrasia</i> spp.	<i>Senecio jacobaea</i>
<i>Festuca ovina</i>	<i>Stellaria graminea</i>
<i>F. rubra</i>	<i>S. holostea</i>
<i>Filipendula ulmaria</i>	<i>Succisa pratensis</i>
<i>Galium saxatile</i>	<i>Symphoricarpos rivularis</i>

<i>Geranium pratense</i>	<i>Taraxacum officinale</i> agg.
<i>G. sylvaticum</i>	<i>Trifolium pratense</i>
<i>Geum urbanum</i>	<i>T. repens</i>
<i>Heracleum sphondylium</i>	<i>Tussilago farfara</i>
<i>Holcus lanatus</i>	<i>Veronica chamaedrys</i>
<i>Hyacinthoides non-scripta</i>	<i>V. officinalis</i>
<i>Juncus acutiflorus</i>	<i>Vicia cracca</i>
<i>J. articulatus</i>	<i>V. sepium</i>
<i>J. conglomeratus</i>	<i>Viola lutea</i>
<i>J. effusus</i>	<i>V. riviniana</i>
<i>J. inflexus</i>	

Survey Dates: 05/06/03	Site name: Red Site 8 – Minor road (immediately north of Carrick’s Corner) – east verge	Grid Ref (Start): NY 98355180	Grid Ref (End): NY 98395125
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Plant species	Plant species
<i>Acer pseudoplatanus</i>	<i>Lotus corniculatus</i>
<i>Achillea millefolium</i>	<i>Myosotis sylvatica</i>
<i>Aegopodium podagraria</i>	<i>Plantago lanceolata</i>
<i>Ajuga reptans</i>	<i>P. major</i>
<i>Alchemilla glabra</i>	<i>Poterium sanguisorba</i>
<i>Angelica sylvestris</i>	<i>Potentilla erecta</i>
<i>Anthoxanthum odoratum</i>	<i>P. sterilis</i>
<i>Anthriscus sylvestris</i>	<i>Pteridium aquilinum</i>
<i>Betonica officinalis</i>	<i>Quercus petraea</i>
<i>Cardamine flexuosa</i>	<i>Ranunculus ficaria</i>
<i>C. pratensis</i>	<i>R. repens</i>
<i>Centaurea nigra</i>	<i>Rumex acetosa</i>
<i>Cerastium holosteoides</i>	<i>R. obtusifolius</i>
<i>Chamaenerion angustifolium</i>	<i>Rubus fruticosus</i> agg.
<i>Cirsium palustre</i>	<i>Senecio jacobaea</i>
<i>Conopodium majus</i>	<i>Silene dioica</i>
<i>Crataegus monogyna</i>	<i>Stachys sylvatica</i>
<i>Dactylis glomerata</i>	<i>Stellaria holostea</i>
<i>Dactylorhiza purpurella</i>	<i>Symphoricarpos rivularis</i>
<i>Deschampsia caespitosa</i>	<i>Taraxacum officinale</i> agg.
<i>Equisetum arvense</i>	<i>Trifolium pratense</i>
<i>Festuca rubra</i>	<i>Tussilago farfara</i>
<i>Filipendula ulmaria</i>	<i>Urtica dioica</i>
<i>Galium aparine</i>	<i>Valeriana officinalis</i>
<i>Geranium sylvaticum</i>	<i>Veronica chamaedrys</i>
<i>Heracleum sphondylium</i>	<i>Vicia sepium</i>
<i>Hyacinthoides non-scripta</i>	<i>Viola canina</i>

Survey Dates: 05/06/03 06/08/03	Site name: Red Site 9 – B6306 (opposite Carrick’s Corner) – south east verge	Grid Ref (Start): NY 98295098	Grid Ref (End): NY 98355103
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Plant species	Plant species
<i>Achillea ptarmica</i>	<i>Holcus lanatus</i>
<i>Agrostis capillaris</i>	<i>Hypericum pulchrum</i>
<i>Ajuga reptans</i>	<i>Juncus articulatus</i>
<i>Alchemilla glabra</i>	<i>J. conglomeratus</i>
<i>Anthoxanthum odoratum</i>	<i>J. effusus</i>

<i>Arrhenatherum elatius</i>	<i>Lathyrus linifolius</i>
<i>Betonica officinalis</i>	<i>L. pratensis</i>
<i>Betula pendula</i>	<i>Lotus corniculatus</i>
<i>Briza media</i>	<i>Plantago lanceolata</i>
<i>Campanula rotundifolia</i>	<i>P. major</i>
<i>Cardamine pratensis</i>	<i>Potentilla erecta</i>
<i>Carex nigra</i>	<i>Quercus petraea</i>
<i>Centaurea nigra</i>	<i>Ranunculus repens</i>
<i>Cirsium arvense</i>	<i>Rubus fruticosus</i> agg.
<i>C. palustre</i>	<i>Salix caprea</i>
<i>Dactylis glomerata</i>	<i>Sanguisorba officinalis</i>
<i>Dactylorhiza maculata</i>	<i>Stellaria graminea</i>
<i>Deschampsia caespitosa</i>	<i>S. holostea</i>
<i>D. flexuosa</i>	<i>Succisa pratensis</i>
<i>Dryopteris filix-mas</i>	<i>Tussilago farfara</i>
<i>Equisetum arvense</i>	<i>Vaccinium myrtillus</i>
<i>Filipendula ulmaria</i>	<i>Veronica chamaedrys</i>
<i>Galium palustre</i>	<i>Vicia cracca</i>
<i>Geranium sylvaticum</i>	<i>Viola riviniana</i>

Survey Dates: 05/06/03 15/07/03 31/07/03	Site name: Red Site 10 – B6306 (south west of Carrick's Corner) – south east verge	Grid Ref (Start): NY 98145083	Grid Ref (End): NY 98205089
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Plant species	Plant species
<i>Achillea millefolium</i>	<i>Juncus acutiflorus</i>
<i>A. ptarmica</i>	<i>J. articulatus</i>
<i>Agrostis stolonifera</i>	<i>J. conglomeratus</i>
<i>Ajuga reptans</i>	<i>J. inflexus</i>
<i>Alchemilla glabra</i>	<i>Lathyrus linifolius</i>
<i>Alopecurus pratensis</i>	<i>L. pratensis</i>
<i>Angelica sylvestris</i>	<i>Lotus corniculatus</i>
<i>Arrhenatherum elatius</i>	<i>Lysimachia nemorum</i>
<i>Betonica officinalis</i>	<i>Myosotis caespitosa</i>
<i>Betula pendula</i>	<i>Plantago lanceolata</i>
<i>Campanula rotundifolia</i>	<i>Poa annua</i>
<i>Cardamine flexuosa</i>	<i>P. pratensis</i>
<i>C. hirsuta</i>	<i>Polypodium vulgare</i>
<i>Carex demissa</i>	<i>Potentilla erecta</i>
<i>C. panicea</i>	<i>Prunella vulgaris</i>
<i>Centaurea nigra</i>	<i>Quercus petraea</i>
<i>Cerastium holosteoides</i>	<i>Ranunculus ficaria</i>
<i>Cirsium palustre</i>	<i>Rosa canina</i> agg.
<i>C. vulgare</i>	<i>Rubus fruticosus</i> agg.
<i>Conopodium majus</i>	<i>R. idaeus</i>
<i>Crataegus monogyna</i>	<i>Rumex acetosa</i>
<i>Dactylis glomerata</i>	<i>R. obtusifolius</i>
<i>Deschampsia caespitosa</i>	<i>Senecio jacobaea</i>
<i>Dryopteris filix-mas</i>	<i>Stachys sylvatica</i>
<i>Epilobium montanum</i>	<i>Stellaria graminea</i>
<i>E. palustre</i>	<i>S. holostea</i>
<i>Equisetum arvense</i>	<i>Succisa pratensis</i>
<i>Filipendula ulmaria</i>	<i>Taraxacum officinale</i> agg.
<i>Galium aparine</i>	<i>Trifolium pratense</i>
<i>G. palustre</i>	<i>Tussilago farfara</i>

<i>G. saxatile</i>	<i>Urtica dioica</i>
<i>Geranium pratense</i>	<i>Valeriana dioica</i>
<i>G. sylvaticum</i>	<i>V. officinalis</i>
<i>Geum urbanum</i>	<i>Veronica chamaedrys</i>
<i>Heracleum sphondylium</i>	<i>Vicia cracca</i>
<i>Holcus lanatus</i>	<i>V. sepium</i>
<i>Hypericum pulchrum</i>	<i>Viola riviniana</i>

Survey Dates: 27/06/03	Site name: Red Site 11 – B6306 (north east of Stonyburn Bridge) – south east verge	Grid Ref (Start): NY 97685032	Grid Ref (End): NY 97725036
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Plant species	Plant species
<i>Arrhenatherum elatius</i>	<i>Geum urbanum</i>
<i>Cardamine flexuosa</i>	<i>Heracleum sphondylium</i>
<i>Centaurea nigra</i>	<i>Holcus lanatus</i>
<i>Cirsium arvense</i>	<i>Juncus effusus</i>
<i>C. heterophyllum</i>	<i>Lathyrus pratensis</i>
<i>C. palustre</i>	<i>Phleum pratense</i>
<i>C. vulgare</i>	<i>Plantago major</i>
<i>Dactylis glomerata</i>	<i>Ranunculus repens</i>
<i>Deschampsia caespitosa</i>	<i>Rubus fruticosus</i> agg.
<i>Dryopteris filix-mas</i>	<i>Rumex acetosa</i>
<i>Epilobium montanum</i>	<i>Sanguisorba officinalis</i>
<i>Equisetum arvense</i>	<i>Stachys sylvatica</i>
<i>E. telemateia</i>	<i>Stellaria alsine</i>
<i>Festuca rubra</i>	<i>S. graminea</i>
<i>Filipendula ulmaria</i>	<i>Urtica dioica</i>
<i>Galium aparine</i>	<i>Vicia cracca</i>
<i>Geranium sylvaticum</i>	<i>V. sepium</i>

Survey Dates: 15/07/03	Site name: Red Site 12 – Minor road (east of Baybridge) – north verge	Grid Ref (Start): NY 96035017	Grid Ref (End): NY 96085019
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Plant species	Plant species
<i>Achillea millefolium</i>	<i>Geum urbanum</i>
<i>Anthriscus sylvestris</i>	<i>Heracleum sphondylium</i>
<i>Arrhenatherum elatius</i>	<i>Holcus lanatus</i>
<i>Betonica officinalis</i>	<i>Potentilla sterilis</i>
<i>Centaurea nigra</i>	<i>Rubus fruticosus</i> agg.
<i>Chenopodium album</i>	<i>Rumex acetosa</i>
<i>Cirsium arvense</i>	<i>Senecio jacobaea</i>
<i>C. heterophyllum</i>	<i>Stachys sylvatica</i>
<i>Crataegus monogyna</i>	<i>Taraxacum officinale</i> agg.
<i>Dactylis glomerata</i>	<i>Tussilago farfara</i>
<i>Digitalis purpurea</i>	<i>Urtica dioica</i>
<i>Dryopteris filix-mas</i>	<i>Veronica chamaedrys</i>
<i>Epilobium montanum</i>	<i>Vicia sepium</i>
<i>Festuca rubra</i>	<i>Viola riviniana</i>
<i>Galium aparine</i>	

Survey Dates: 27/06/03	Site name: Red Site 13 – Minor road (south of Baybridge and Hunstanworth junction) – west verge	Grid Ref (Start): NY 95854965	Grid Ref (End): NY 95854977
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Plant species	Plant species
<i>Acer pseudoplatanus</i>	<i>Luzula sylvatica</i>
<i>Anthyrium filix-femina</i>	<i>Mercurialis perennis</i>
<i>Carex flacca</i>	<i>Myosotis caespitosa</i>
<i>Centaurea nigra</i>	<i>Oxalis acetosella</i>
<i>Cirsium vulgare</i>	<i>Potentilla sterilis</i>
<i>Crataegus monogyna</i>	<i>Pteridium aquilinum</i>
<i>Dactylis glomerata</i>	<i>Quercus petraea</i>
<i>Digitalis purpurea</i>	<i>Rubus fruticosus</i> agg.
<i>Dryopteris filix-mas</i>	<i>R. idaeus</i>
<i>Fagus sylvatica</i>	<i>Sanicula europaea</i>
<i>Fraxinus excelsior</i>	<i>Senecio jacobaea</i>
<i>Geranium sylvaticum</i>	<i>Sorbus aucuparia</i>
<i>Geum urbanum</i>	<i>Stellaria graminea</i>
<i>Heracleum sphondylium</i>	<i>Taraxacum officinale</i> agg.
<i>Hyacinthoides non-scripta</i>	<i>Vicia sepium</i>
<i>Listera ovata</i>	<i>Viola riviniana</i>

Survey Dates: 27/06/03 15/07/03 06/08/03	Site name: Red Site 14 – Minor road (adjacent to Balehill Plantation) – east verge	Grid Ref (Start): NY 95904882	Grid Ref (End): NY 95914895
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Plant species	Plant species
<i>Achillea millefolium</i>	<i>L. pratensis</i>
<i>A. ptarmica</i>	<i>Leontodon hispidus</i>
<i>Alchemilla glabra</i>	<i>Listera ovata</i>
<i>A. xanthochlora</i>	<i>Lotus corniculatus</i>
<i>Angelica sylvestris</i>	<i>Luzula campestris</i>
<i>Anthoxanthum odoratum</i>	<i>L. sylvatica</i>
<i>Anthriscus sylvestris</i>	<i>Molinia caerulea</i>
<i>Arrhenatherum elatius</i>	<i>Phleum pratense</i>
<i>Betonica officinalis</i>	<i>Plantago lanceolata</i>
<i>Briza media</i>	<i>P. major</i>
<i>Calluna vulgaris</i>	<i>P. media</i>
<i>Campanula rotundifolia</i>	<i>Poa pratensis</i>
<i>Carex flacca</i>	<i>Polypodium vulgare</i>
<i>C. ovalis</i>	<i>Potentilla erecta</i>
<i>Centaurea nigra</i>	<i>Prunella vulgaris</i>
<i>Chamaenerion angustifolium</i>	<i>Ranunculus acris</i>
<i>Chrysanthemum leucanthemum</i>	<i>R. repens</i>
<i>Cirsium palustre</i>	<i>Rosa rubiginosa</i>
<i>C. vulgare</i>	<i>Rubus fruticosus</i> agg.
<i>Conopodium majus</i>	<i>Rumex acetosa</i>
<i>Crataegus monogyna</i>	<i>R. obtusifolius</i>
<i>Dactylis glomerata</i>	<i>Senecio jacobaea</i>
<i>Deschampsia caespitosa</i>	<i>Solidago virgaurea</i>
<i>Digitalis purpurea</i>	<i>Sorbus aucuparia</i>
<i>Dryopteris filix-mas</i>	<i>Succisa pratensis</i>
<i>Erica cinerea</i>	<i>Taraxacum officinale</i> agg.
<i>Festuca ovina</i>	<i>Trifolium pratense</i>
<i>F. rubra</i>	<i>T. repens</i>

<i>Galium saxatile</i>	<i>Tussilago farfara</i>
<i>Geranium sylvaticum</i>	<i>Ulex europaeus</i>
<i>Heracleum sphondylium</i>	<i>Urtica dioica</i>
<i>Hieracium</i> spp.	<i>Vaccinium myrtillus</i>
<i>Holcus lanatus</i>	<i>Valeriana officinalis</i>
<i>Hypericum hirsutum</i>	<i>Veronica chamaedrys</i>
<i>Juncus articulatus</i>	<i>Vicia cracca</i>
<i>J. conglomeratus</i>	<i>V. sativa</i>
<i>J. effusus</i>	<i>V. sepium</i>
<i>Lathyrus linifolius</i>	<i>Viola riviniana</i>

Survey Dates: 27/06/03 15/07/03	Site name: Red Site 15 – Minor road (adjacent to Bolt's Burn public footpath) – west verge, north of gate	Grid Ref (Start): NY 95824820	Grid Ref (End): NY 95844823
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Plant species	Plant species
<i>Acer pseudoplatanus</i>	<i>Lotus corniculatus</i>
<i>Achillea millefolium</i>	<i>Luzula campestris</i>
<i>Alchemilla glabra</i>	<i>L. sylvatica</i>
<i>Anthoxanthum odoratum</i>	<i>Molinia caerulea</i>
<i>Calluna vulgaris</i>	<i>Orchis mascula</i>
<i>Carex flacca</i>	<i>Plantago lanceolata</i>
<i>Chamaenerion angustifolium</i>	<i>P. major</i>
<i>Cirsium arvense</i>	<i>Potentilla erecta</i>
<i>C. palustre</i>	<i>Prunella vulgaris</i>
<i>Cynosaurus cristatus</i>	<i>Rubus idaeus</i>
<i>Dactylis glomerata</i>	<i>Rumex acetosa</i>
<i>Dactylorhiza purpurella</i>	<i>Senecio jacobaea</i>
<i>Galium saxatile</i>	<i>Sorbus aucuparia</i>
<i>Geranium sylvaticum</i>	<i>Stellaria graminea</i>
<i>Heracleum sphondylium</i>	<i>S. holostea</i>
<i>Holcus lanatus</i>	<i>Trifolium pratense</i>
<i>Lathyrus pratensis</i>	<i>T. repens</i>
<i>Leontodon hispidus</i>	<i>Veronica chamaedrys</i>
<i>Listera ovata</i>	

Survey Dates: 27/06/03 15/07/03 06/08/03	Site name: Red Site 16 – Ramshaw Corner (triangular verge and adjacent linear verge)	Grid Ref (Start): NY 95004735 NY 95004731	Grid Ref (End): NY 95044734 NY 95094741
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Plant species	Plant species
<i>Achillea millefolium</i>	<i>Lathyrus pratensis</i>
<i>Anthoxanthum odoratum</i>	<i>Leontodon autumnalis</i>
<i>Anthriscus sylvestris</i>	<i>L. hispidus</i>
<i>Botrychium lunaria</i>	<i>Linum catharticum</i>
<i>Briza media</i>	<i>Lotus corniculatus</i>
<i>Calluna vulgaris</i>	<i>Luzula campestris</i>
<i>Campanula rotundifolia</i>	<i>Molinia caerulea</i>
<i>Cerastium holosteoides</i>	<i>Myosotis caespitosa</i>
<i>Chrysanthemum leucanthemum</i>	<i>Pilosella officinarum</i>
<i>Cirsium arvense</i>	<i>Pinus sylvestris</i>
<i>C. vulgare</i>	<i>Plantago lanceolata</i>
<i>Conopodium majus</i>	<i>P. major</i>
<i>Cynosaurus cristatus</i>	<i>Polygala serpyllifolia</i>

<i>Dactylis glomerata</i>	<i>Ranunculus acris</i>
<i>Deschampsia caespitosa</i>	<i>R. repens</i>
<i>Digitalis purpurea</i>	<i>Senecio jacobaea</i>
<i>Dryopteris filix-mas</i>	<i>Sonchus asper</i>
<i>Equisetum arvense</i>	<i>Taraxacum officinale</i> agg.
<i>Euphrasia</i> spp.	<i>Teucrium scorodonia</i>
<i>Festuca ovina</i>	<i>Trifolium pratense</i>
<i>F. rubra</i>	<i>T. repens</i>
<i>Fraxinus excelsior</i>	<i>Ulex europaeus</i>
<i>Galium saxatile</i>	<i>Urtica dioica</i>
<i>Heracleum sphondylium</i>	<i>Vaccinium myrtillus</i>
<i>Holcus lanatus</i>	<i>Veronica chamaedrys</i>
<i>Hypochoeris radicata</i>	

APPENDIX 2

Vascular Plants Recorded During The Derwent Valley 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>Ophioglossum vulgatum</i>	Common adder's-tongue
<i>Pteridium aquilinum</i>	Bracken
<i>Athyrium filix-femina</i>	Lady fern
<i>Blechnum spicant</i>	Hard fern
<i>Botrychium lunaria</i>	Moonwort
<i>Polypodium vulgare</i>	Common polypody
<i>Oreopteris limbosperma</i>	Mountain fern
<i>Dryopteris filix-mas</i>	Male fern
<i>Dryopteris cambrensis</i>	Western scaly male fern
<i>Dryopteris borrieri</i>	Scaly male fern
<i>Dryopteris dilatata</i>	Broad buckler fern
Buttercups	
<i>Ranunculus acris</i>	Meadow buttercup
<i>Ranunculus repens</i>	Creeping buttercup
<i>Ranunculus bulbosus</i>	Bulbous buttercup
<i>Ranunculus flammula</i>	Lesser spearwort
<i>Ranunculus ficaria</i>	Lesser celandine
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>Alnus glutinosa</i>	Alder
Goosefoot & oraches	
<i>Chenopodium album</i>	Fat hen
<i>Atriplex patula</i>	Common orache
Campions, sandworts & pinks	
<i>Spergularia marina</i>	Lesser sea spurrey
<i>Stellaria holostea</i>	Greater stitchwort

<i>Stellaria graminea</i>	Lesser stitchwort
<i>Stellaria media</i>	Common chickweed
<i>Stellaria alsine</i>	Bog stitchwort
<i>Cerastium holosteoides</i>	Common mouse-ear
<i>Silene dioica</i>	Red campion
Docks	
<i>Rumex acetosella</i>	Sheep's sorrel [agg.]
<i>Rumex acetosa</i>	Common sorrel
<i>Rumex crispus</i>	Curled dock
<i>Rumex conglomeratus</i>	Clustered dock
<i>Rumex obtusifolius</i>	Broad-leaved dock
<i>Polygonum persicaria</i>	Redshank
<i>Polygonum aviculare</i>	Knotgrass
Violets	
<i>Viola riviniana</i>	Common dog-violet
<i>Viola canina</i>	Heath dog-violet
Mustards, cresses & cabbages	
<i>Alliaria petiolata</i>	Garlic mustard
<i>Cardamine flexuosa</i>	Wavy bitter-cress
<i>Cardamine pratensis</i>	Cuckoo-flower
<i>Cardamine hirsuta</i>	Hairy bitter-cress
<i>Hesperis matronalis</i>	Dame's-violet
<i>Nasturtium officinale</i>	Water cress
Milkwort family	
<i>Polygala serpyllifolia</i>	Heath milkwort
<i>Polygala vulgaris</i>	Common milkwort
St. John's-wort family	
<i>Hypericum hirsutum</i>	Hairy St. John's-wort
<i>Hypericum perforatum</i>	Perforate St. John's-wort
<i>Hypericum pulchrum</i>	Slender St. John's-wort
Heathers	
<i>Calluna vulgaris</i>	Heather
<i>Erica cinera</i>	Bell heather
<i>Erica tetralix</i>	Cross-leaved heath
<i>Vaccinium myrtillus</i>	Bilberry
Crowberry family	
<i>Empetrum nigrum</i>	Crowberry
Primulas	

<i>Primula vulgaris</i>	Primrose
<i>Primula veris</i>	Cowslip
<i>Lysimachia nemorum</i>	Yellow pimpernel
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 xanthochlora</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 avium</i>	Wild cherry
<i>Prunus spinosa</i>	Blackthorn
<i>Malus sylvestris sens.str.</i>	Crab apple
<i>Sorbus aucuparia</i>	Rowan
<i>Crataegus monogyna</i>	Hawthorn
Currant family	
<i>Ribes uva-crispa</i>	Gooseberry
Pea family	
<i>Lotus corniculatus</i>	Common bird's-foot-trefoil
<i>Lotus uliginosus</i>	Greater 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>Sarothamnus scoparius</i>	Broom
<i>Ulex europaeus</i>	Gorse
Willowherbs	
<i>Epilobium montanum</i>	Broad-leaved willowherb
<i>Epilobium neterioides</i>	'New Zealand' willowherb
<i>Epilobium palustre</i>	Marsh willowherb
<i>Epilobium tetragonum</i>	Square-stalked willowherb
<i>Epilobium hirsutum</i>	Great (hairy) willowherb
<i>Chamaenerion angustifolium</i>	Rosebay willowherb
Spurges	
<i>Euphorbia amygdaloides</i>	Wood spurge
<i>Mercurialis perennis</i>	Dog's mercury
Flaxes	
<i>Linum catharticum</i>	Fairy flax
Maple family	
<i>Acer pseudoplatanus</i>	Sycamore
Wood-sorrel family	
<i>Oxalis acetosella</i>	Wood-sorrel
Willow family	
<i>Salix caprea</i>	Goat willow
<i>Salix cinerea</i>	Grey willow
<i>Salix fragilis</i>	Crack willow
<i>Salix pentandra</i>	Bay willow
Geraniums	
<i>Geranium sylvaticum</i>	Wood crane's-bill
<i>Geranium pratense</i>	Meadow crane's-bill
<i>Geranium robertianum</i>	Herb-Robert
Umbellifers (carrot family)	
<i>Anthriscus sylvestris</i>	Cow parsley
<i>Angelica sylvestris</i>	Angelica
<i>Conopodium majus</i>	Pignut
<i>Aegopodium podagraria</i>	Ground-elder
<i>Sanicula europaea</i>	Sanicle
<i>Heracleum sphondylium</i>	Hogweed
<i>Oenanthe crocata</i>	Hemlock water-dropwort
<i>Torilis japonica</i>	Upright hedge-parsley
Borage family	

<i>Myosotis caespitosa</i>	Tufted forget-me-not
<i>Myosotis discolor</i>	Changing forget-me-not
<i>Myosotis sylvatica</i>	Wood forget-me-not
<i>Myosotis scorpioides</i>	Water forget-me-not
<i>Symphytum x uplandicum</i>	Russian comfrey
Mints (labiates)	
<i>Betonica officinalis</i>	Betony
<i>Stachys sylvatica</i>	Hedge woundwort
<i>Lamium album</i>	White dead-nettle
<i>Lamium purpureum</i>	Red dead-nettle
<i>Teucrium scorodonia</i>	Wood sage
<i>Ajuga reptans</i>	Bugle
<i>Prunella vulgaris</i>	Selfheal
<i>Mentha aquatica</i>	Water mint
Plantains	
<i>Plantago major</i>	Greater plantain
<i>Plantago lanceolata</i>	Ribwort plantain
Olive family	
<i>Fraxinus excelsior</i>	Ash
Figworts and speedwells	
<i>Digitalis purpurea</i>	Foxglove
<i>Veronica serpyllifolia</i>	Thyme-leaved speedwell
<i>Veronica officinalis</i>	Heath speedwell
<i>Veronica chamaedrys</i>	Germander speedwell
<i>Veronica beccabunga</i>	Brooklime
<i>Rhinanthus minor</i>	Yellow-rattle
<i>Euphrasia micrantha</i>	Common slender eyebright
<i>Euphrasia nemorosa</i>	Common eyebright
Bellflowers	
<i>Campanula rotundifolia</i>	Harebell
Bedstraws	
<i>Galium saxatile</i>	Heath bedstraw
<i>Galium verum</i>	Lady's bedstraw
<i>Galium palustre</i>	Common marsh-bedstraw
<i>Galium cruciata</i>	Crosswort
<i>Galium aparine</i>	Cleavers
Honeysuckle family	

<i>Lonicera periclymenum</i>	Honeysuckle
<i>Symphoricarpos rivularis</i>	Snowberry
Valerian family	
<i>Valeriana dioica</i>	Marsh valerian
<i>Valeriana officinalis</i>	Common valerian
Moschatel family	
<i>Adoxa moschatellina</i>	Moschatel
Teasel family	
<i>Dipsascus fullonum</i>	Teasel
<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>Hypochoeris radicata</i>	Common cat's-ear
<i>Leontodon autumnalis</i>	Autumn hawkbit
<i>Leontodon hispidus</i>	Rough hawkbit
<i>Arctium minus</i>	Lesser burdock
<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>Sonchus arvensis</i>	Perennial sow-thistle
<i>Sonchus asper</i>	Prickly sow-thistle
<i>Bellis perennis</i>	Daisy
<i>Achillea millefolium</i>	Yarrow
<i>Achillea ptarmica</i>	Sneezewort
<i>Chrysanthemum leucanthemum</i>	Oxeye daisy
<i>Chrysanthemum vulgare</i>	Tansy
<i>Senecio jacobaea</i>	Common ragwort
<i>Solidago virgaurea</i>	Goldenrod
<i>Tussilago farfara</i>	Colt's-foot
Rushes and wood-rushes	
<i>Juncus acutiflorus</i>	Sharp-flowered rush
<i>Juncus articulatus</i>	Jointed rush
<i>Juncus conglomeratus</i>	Compact rush

<i>Juncus effusus</i>	Soft rush
<i>Juncus inflexus</i>	Hard rush
<i>Luzula campestris</i>	Field wood-rush
<i>Luzula multiflora</i>	Heath wood-rush
<i>Luzula sylvatica</i>	Great wood-rush
Sedges	
<i>Carex ovalis</i>	Oval sedge
<i>Carex flacca</i>	Glaucous sedge
<i>Carex panicea</i>	Carnation sedge
<i>Carex demissa</i>	Common yellow sedge
<i>Carex nigra</i>	Common sedge
Grasses	
<i>Festuca rubra sens.str.</i>	Red fescue
<i>Festuca ovina</i> agg.	Sheep's fescue [agg.]
<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
Lilies	
<i>Hyacinthoides non-scripta</i>	Bluebell
<i>Polygonatum multiflorum</i>	Common solomon's-seal
<i>Narcissus</i> spp.	Daffodil
Orchids	
<i>Orchis mascula</i>	Early-purple orchid
<i>Listera ovata</i>	Common twayblade
<i>Dactylorhiza maculata</i>	Heath spotted orchid
<i>Dactylorhiza fuchsii</i>	Common spotted orchid

<i>Dactylorhiza purpurella</i>	Northern marsh orchid
Pondweed family	
<i>Potamogeton natans</i>	Broad-leaved pondweed
Pine family	
<i>Pinus sylvestris</i>	Scots pine

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

Appendix 3 LICHENS

Dog lichen

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 – this was particularly evident in the Hunstanworth area. 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 in the Derwent valley.

FUNGI

Agaricus campestris

Russula spp

Appendix 4 INVERTEBRATES

Damselflies

Enallagma cyathigerum Common blue damselfly

Ischnura elegans Blue-tailed damselfly

Aeshna cyanaea Southern hawker dragonfly

Butterflies

Polyommatus icarus Common blue

Lycaena phlaeus Small copper

Inachis io Peacock

Vanessa atalanta Red admiral

Vanessa cardui Painted lady

Aglais urticae Small tortoiseshell

Anthocharis cardamines Orange tip

Pieris rapae Small white

Pieris napi Green-veined white

Pieris brassicae Large white

<i>Maniola jurtina</i>	Meadow brown
<i>Lasiommata megera</i>	Wall brown
<i>Coenonympha pamphilus</i>	Small heath
<i>Thymelicus sylvestris</i>	Small skipper
<i>Ochlodes venata</i>	Large skipper

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

AVES (Birds)

<i>Ardea cinerea</i>	Grey heron
<i>Accipiter nisus</i>	Sparrowhawk
<i>Falco tinnunculus</i>	Kestrel
<i>Perdix perdix</i>	Grey partridge
<i>Phasianus colchicus</i>	Pheasant
<i>Lagopus lagopus</i>	Red 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 ridibundus</i>	Black-headed gull
<i>Larus fuscus</i>	Lesser black-backed gull
<i>Larus argentatus</i>	Herring gull
<i>Columba livia</i>	Feral pigeon
<i>Columba oenas</i>	Stock dove
<i>Columba palumbus</i>	Wood pigeon
<i>Streptopelia decaocto</i>	Collared dove
<i>Tyto alba</i>	Barn owl
<i>Cuculus canorus</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>Anthus trivialis</i>	Tree pipit
<i>Motacilla cinera</i>	Grey wagtail
<i>Motacilla alba yarellii</i>	Pied wagtail
<i>Troglodytes troglodytes</i>	Wren
<i>Prunella modularis</i>	Dunnock
<i>Erithacus rubecula</i>	Robin
<i>Turdus merula</i>	Blackbird
<i>Turdus philmelos</i>	Song thrush
<i>Turdus viscivorus</i>	Mistle thrush
<i>Sylvia communis</i>	Whitethroat
<i>Sylvia borin</i>	Garden warbler
<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>Corvus monedula</i>	Jackdaw
<i>Corvus frugilegus</i>	Rook
<i>Corvus corone corone</i>	Carrion crow
<i>Sturnus vulgaris</i>	Starling
<i>Passer domesticus</i>	House sparrow
<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>Pyrrhula pyrrhula</i>	Bullfinch
<i>Emberiza citrinella</i>	Yellowhammer
<i>Emberiza schoeniclus</i>	Reed bunting

MAMMALIA (Mammals)

<i>Erinaceus europaeus</i>	Hedgehog
<i>Talpa europaea</i>	Mole

<i>Sorex araneus</i>	Common shrew
<i>Oryctolagus cuniculus</i>	Rabbit
<i>Lepus europaeus</i>	Brown hare (roadkill)
<i>Sciurus carolinensis</i>	Grey squirrel
<i>Clethrionomys glareolus</i>	Bank vole
<i>Microtus agrestis</i>	Short-tailed vole
<i>Apodemus sylvaticus</i>	Wood mouse
<i>Vulpes vulpes</i>	Fox
<i>Mustela ermina</i>	Stoat

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.
- Atkinson, F. 1977. Life and tradition in Northumberland and Durham. J.M. Dent & Sons, London.
- 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. 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.

Fraser, C. & Emsley, K. 1989. Northumbria. Phillimore & Co. Ltd, Chichester.

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 extinction's 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