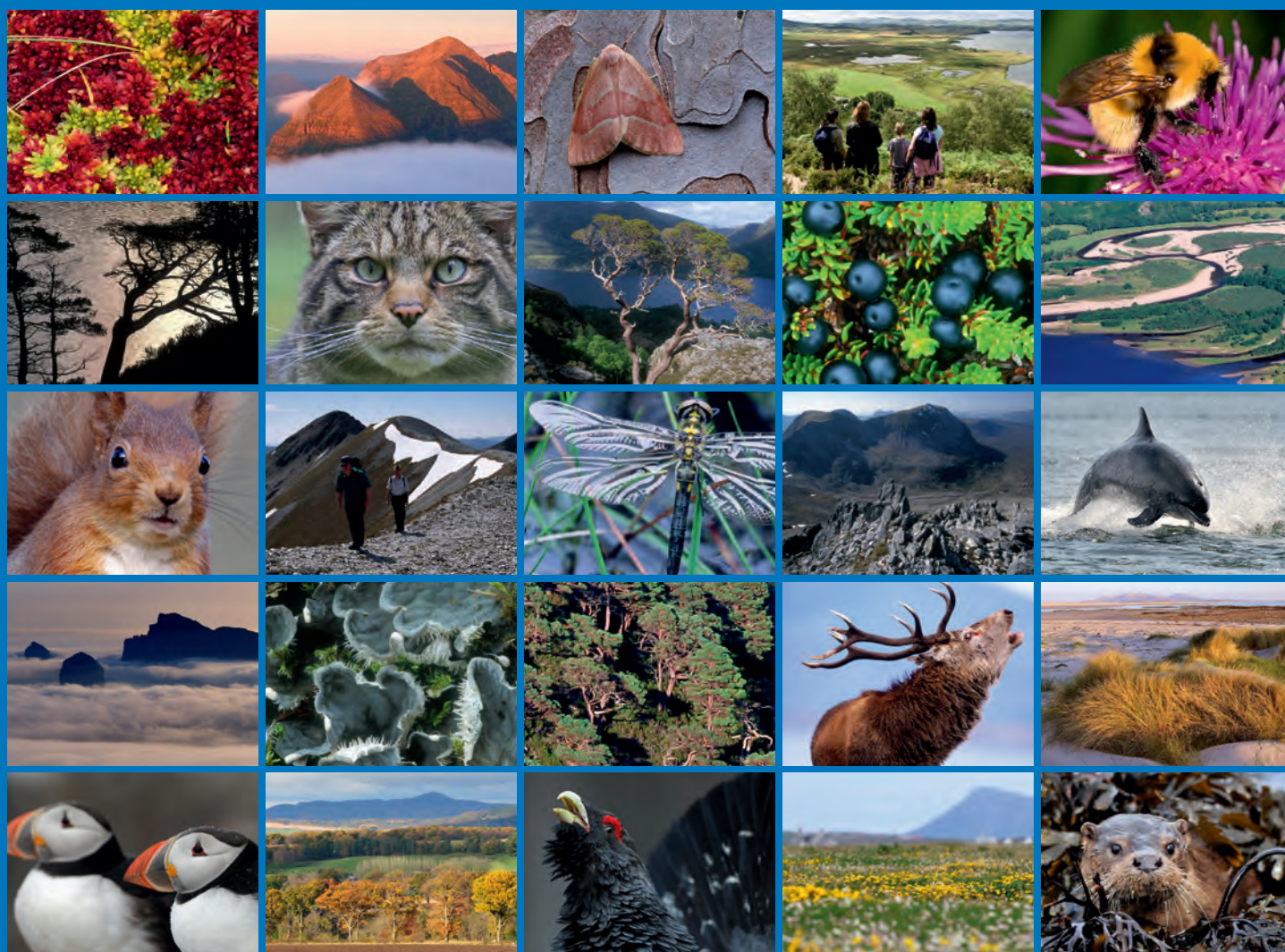


The management of roadside verges for biodiversity





Scottish Natural Heritage
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COMMISSIONED REPORT

Commissioned Report No. 551

The management of roadside verges for biodiversity

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COMMISSIONED REPORT

Summary

The management of roadside verges for biodiversity

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Background

The Scottish Government's Second National Planning Framework was published in 2009. Action 42 of the associated Action Programme is to 'Develop a National Ecological Network (NEN) potentially encompassing large strategic habitat restoration projects'. Appropriately managed, roadside verges have potential to contribute to this network.

The objective of this study was to investigate how road verges can contribute to Scotland's National Ecological Network, and how road verge management can be geared to optimise the biodiversity value of road verges as refuges and corridors for wildlife. The study was desk based, drawing on published and web based information and telephone interviews with a range of stakeholders and technical specialists.

Main findings

- The most common form of management of roadside verges in Scotland – one or more cuts each year – partially mimics that of hay meadows and certain forms of pasture. As such, verges may be regarded as relics or refugia of a declining habitat and, if appropriately managed, can be relatively herb rich and associated with a diverse invertebrate fauna. Trees, hedgerows, scrub and ditches may also contribute to a mosaic or gradient of habitats.
- Their value is limited by: relatively small area compared with similar habitats in the wider countryside; often limited width and containing frequent obstructions; proximity to traffic which is a major hazard for wildlife; and significant practical constraints on management options. Nonetheless, the existing regime seems to be delivering a sensible result given the various priorities.
- There is significant provision for identifying and recording important or sensitive areas and introducing appropriate management within the existing policy framework, especially as encompassed in the landscaping policy for the trunk road network. Less formal opportunities also exist with respect to roadside verges under the management of local authorities. Practical considerations, logistics and costs however limit the extent to which optimal cutting and clearing regimes can be applied.
- Little account has so far been taken of the opportunity to include roadside verges in integrated habitat networks and green infrastructure initiatives. This may relate to the nature of most integrated habitat network (IHN) analysis and modelling to date, and also to the narrowness of most roadside verges, which significantly reduces their value in terms of connectivity. This latter might be addressed if network initiatives could coordinate management action on both roadside verges and adjacent land (for example through the Scotland Rural Development Programme (SRDP)).

- Optimising the contribution of roadside verges to the NEN can only be done through the identification of favourable management practices at local level, as part of area based IHN initiatives. Standard national prescriptions are unlikely to be effective in promoting connectivity, and would be difficult and costly to implement.
- There is therefore a need to continue to support existing locally based verge biodiversity initiatives (mainly targeted at attractive or rare plant and invertebrate assemblages), but seek to integrate these with wider IHN and ultimately NEN initiatives.
- A modest input by SNH in terms of development of better guidance and training resources related to verge management is likely to generate significant returns. Attitudes on the part of managers and operators to biodiversity are generally positive, and much can probably be achieved with relatively minor adjustments to existing management regimes.

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Thanks are also due to Jane MacKintosh for support and understanding during the preparation of this report, and to Phil Baarda who helped get the study off the ground.

1. INTRODUCTION AND BACKGROUND

Scotland's second National Planning Framework (NPF) was published in 2009. It includes the following statement:

"Building environmental capital at a landscape scale can deliver important benefits for the economy and communities. The creation of national ecological networks, potentially encompassing large strategic habitat restoration projects, could make a major contribution to safeguarding and enhancing biodiversity and landscape, make it easier for species to adapt to climate change and create a better environment and new opportunities for local communities. Major linear infrastructure projects such as railways, roads, pipelines and cables should be seen as opportunities to strengthen green infrastructure and ecological networks."

The NPF is supported by an Action Programme. Action 42 is to 'Develop a National Ecological Network potentially encompassing large strategic habitat restoration projects'.

This will contribute to the National Planning Framework Strategy by:

- conserving and enhancing Scotland's distinctive natural and cultural heritage;
- promoting development which helps to reduce Scotland's carbon footprint and facilitates adaptation to climate change.

SNH is identified as a key partner for the implementation of this action.

In the statement of requirements for this study, SNH recognises that "there is no more integrated and connected network than that of roads". Furthermore, "their associated verges already provide, or could potentially provide:

- refuges for species unable to live on agriculturally improved land;
- dispersal corridors for wildlife moving through the landscape in response to changes in land use or climate;
- connectivity between habitat fragments, effectively increasing the extent of habitat available to a species.

SNH therefore decided to commission research on the management of road verges for biodiversity, in order to understand how road verges can contribute to the Scottish National Ecological Network.

The objective of the study is taken to be:

"Investigate how road verges can contribute to Scotland's National Ecological Network, and how road verge management can be geared to optimise the biodiversity value of road verges as refuges and corridors for wildlife."

The study is desk based, drawing on published and web based information and telephone interviews with a range of stakeholders and technical specialists. A full list of those contacted is presented in Annex 1. A key background document which still remains highly relevant is Way (Ed) 1970¹. This includes contributions from engineers and ecologists covering all the issues influencing the nature of verges, and it is yet to be superseded.

¹ Symposium Proceedings, Road verges in Scotland, their function and management. Edited by, J.M. Way, David Hume Tower, Edinburgh. Friday 3rd April 1970 The Nature Conservancy Scotland. http://nora.nerc.ac.uk/7927/1/Road-verge_Scotland.pdf

2. THE RESOURCE

2.1 The extent of Scottish roads

Scotland has roughly 59,000km of road, most of which has some form of roadside verge. The length of the different types of road is shown in figure 1. The bulk of the resource in linear terms is rural minor roads, though the ratio of verge area to road length is probably much higher for rural A roads.

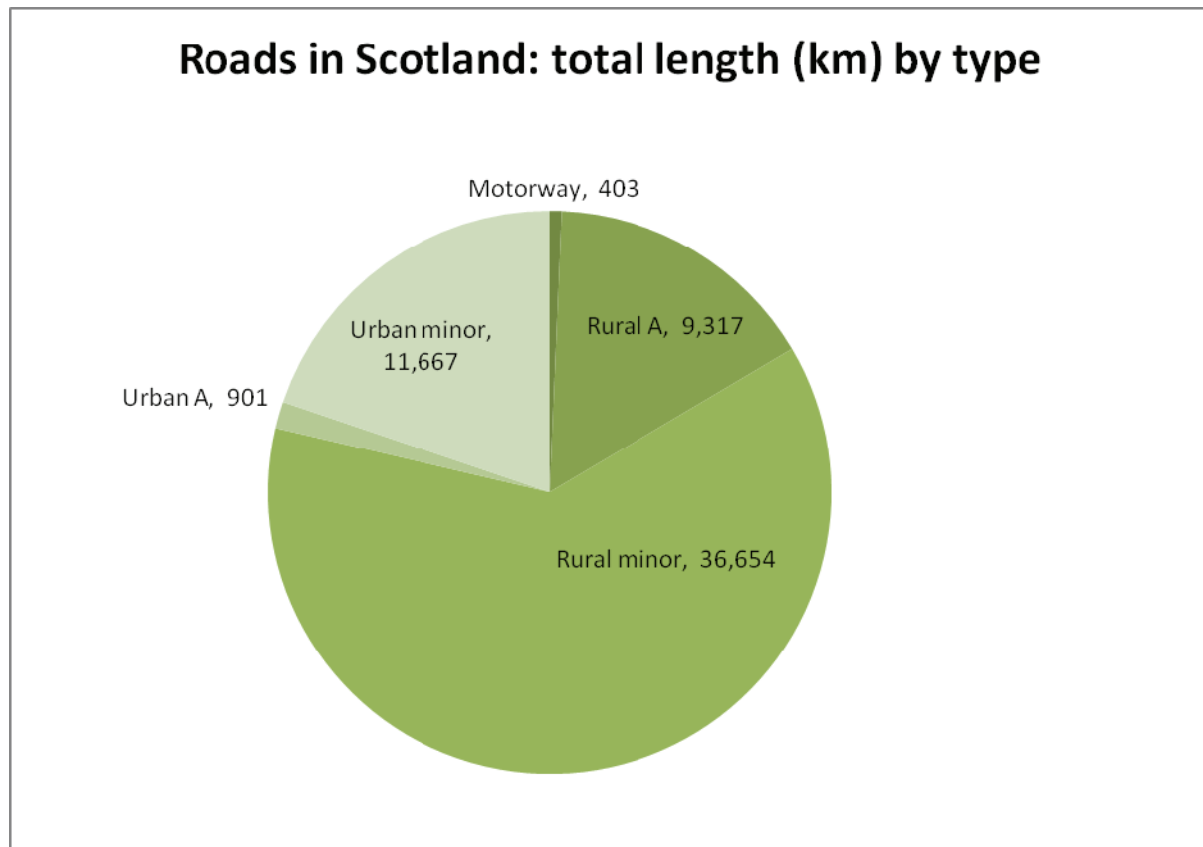


Figure 1. Length of roads by type.²

Although we know the length of road in Scotland we do not know how much of it has verges of a significant width. That information is held locally but tends to be knowledge rather than GIS data and it would take considerable effort to retrieve a total figure for the managed area. We can also assume that the total area of road verges is effectively fixed, which means any increase in the biodiversity they contain would have to come from a management changes.

² [Source](#): Department for Transport Roads major roads database and information from Local Authorities, Government Office Regions and Ordnance Survey



Figure 2. Types of rural road verge

These three pictures are of roads classed as rural. Although one is clearly in a town, settlements with less than 10,000 inhabitants at the 2001 census are classed as rural by the DoT (Perth and Kinross Council class it as urban). We can get an indication of the area if we assume average widths for each type of road.

Table 1 shows the width figures we have used to estimate total area.

The most important roads in terms of verge area are likely to be rural principle roads, rural trunk roads, rural unclassified roads, and trunk motorway.

A total estimated verge area of 19,447ha represents 0.25% of Scotland's total area (7,877,200 ha). About a tenth (probably less) of Scotland's area is under SSSI management, in or approaching favourable condition. If we assume that (say) 10% of roadside verges are of equivalent nature conservation interest, then this would represent (again) about 0.3% of the land area currently managed for nature conservation interest. However, it may be more relevant to compare the area of verges with the total area of unimproved grassland in Scotland – which is only around 30,000ha (Mackintosh 2005). On this basis verges become a significant proportion of the total resource.

Table 1. Estimate of roadside verge area

Road context	Road class	Length in km (Department of Transport)	Estimated verge width in m (total both sides)	Estimated area in ha by road type	Estimated area in ha by context
Motorway and dual carriageway	Trunk M	407	35	1423	2,572
	Trunk Rural	456	15	684	
	Trunk Urban	50	10	50	
	Principal rural	92	15	138	
	Principal urban	185	15	278	
Rural (includes settlements with less than 10,000 inhabitants)	Trunk	2,261	15	3,392	15,487
	Principal	6,565	10	6,565	
	B	6,812	1.5	1,022	
	C	9,885	1.5	1,483	
	Unclassified	20,173	1.5	3,026	
Urban	Trunk	39	5	19	1,388
	Principal	646	4	258	
	B	503	1	25	
	C	767	1	38	
	Unclassified	10,446	1	1,047	
Total verge area in hectares (estimate)					19,447



Figure 3. Examples of non-verge linear features

In urban and residential areas gardens and parks probably have a greater presence. In rural areas much of Scotland has vegetation communities similar to those found in verges. Other linear features such as field boundaries and rivers, shown in Figure 3, should also be taken into account when considering the relative importance of roadside verges (see figure 3). There are 56,200 km of rivers in Scotland. Field boundary lengths are not currently published but our rough estimate (based on samples using up-to-date Google images) suggests that the total length of field boundaries may be five times that of roadside verges in agricultural areas.

Unless roadside verges harbour exceptional biodiversity interest, or fulfil important ecological functions, they are probably not a strategically important nature conservation resource.

The length of hedges and ditches associated with Scottish Roads is not documented at the present time but will be significant, and related in some way to the figures above. As with the grass verges themselves however, we doubt they represent a significant conservation resource in their own right, although they may be locally functionally important. This issue is discussed further in the next section.

2.2 Ownership and responsibility

The following information from Dumfries and Galloway Council summarizes ownership and responsibilities in relation to roads and roadside verges.

- In many cases the adjacent landowner will own title to the solum of the road to its centreline, however under the terms of the Roads (Scotland) Act 1984 the local authority has powers of control over the public road, including the verge. Where no clear boundary exists, a minimum width of 2m from the carriageway edge is assumed to be within the control of the local authority.
- The tree is the adjacent landowners responsibility. The Council can contact them and make them aware of their responsibilities in terms of the Roads (Scotland) Act 1984 and can offer advice on what action should be taken.
- The Council do not carry out hedge cutting and it is the responsibility of the landowner to ensure the road is swept following his hedge cutting operations.

We can contact the landowner and advise him accordingly and can arrange to sweep the road at his expense.

2.3 Status and trends

New roads and major upgrades are subject to a range of environmental requirements as discussed elsewhere in this report, and the overall standards tend to be relatively high, with attention paid to native seed mixes, exploiting natural features, and minimising nutrients (no topsoil).

Maintenance regimes for roads have tended to decline in labour intensity at least in rural areas, and only a 1m strip next to the road and sight lines are mown regularly. There has also been a decline in hedge clearance and scrub control in some areas.

3. THE FUNCTION AND VALUE OF ROADSIDE VERGES

This section summarizes the range of values associated with roadside verges and associated habitat - including those related to road function and those related to biodiversity. It also briefly reviews some of the threats to these values.

3.1 Primary functions of verges

Verges perform a number of functions. The primary functions relate to road safety and maintenance, and service provision. Biodiversity and landscape functions, whilst acknowledged in design and management codes and in the contract specifications, are in practical terms treated as secondary.

3.1.1 Servicing and emergencies

The 0.8-1.2m from the kerb (described as the “grass pavement” by some contractors) is designed to facilitate emergency stopping, road maintenance and access to services. Services buried in the verges have to remain accessible at short notice and be protected as far as possible from tree roots, for example, which can also damage the road edge. The verge may also provide a refuge or route for pedestrians, and this requires that any trip hazards - e.g. drains, inspection covers – are visible.

3.1.2 Drainage

Water on roads is a major hazard. Ditches and other drainage components associated with verges are designed and maintained for rapid dispersal of surface water and ease of maintenance.



Figure 4. Roadside ditch

3.1.3 Environmental Buffer

Verges can help trap salt, grit, rubber and oil run-off and also act as barrier to encroachment by vehicles of more sensitive, or dangerous, areas beyond. Trees and hedges along roads can substantially reduce noise and other forms of traffic pollution.

3.1.4 Sight lines

Most verges are designed to allow motorists to see as much of the road, or roads, as possible – both in front and behind. This function or requirement has a significant influence on management regimes.

3.2 Landscape value

Road verges are valued for their appearance if they are noticed at all. A few can read clues that even the plainest-looking verge might shelter interesting wildlife but most people want it to be either tidy or flowery - any flowers, native or not. Verges, being highly visible, can make more impact on people than SSSIs and field boundaries. These dimensions of biodiversity value – i.e. that appearance can be enhanced by biodiversity, and that attractive verges may enhance awareness of biodiversity - is not based on species present and tends to be addressed by landscape rather than ecology specialists.

Verges have significant landscape value, both as an aesthetic and historic feature in the landscape and as a portrayal, intentional or not, of the values held by the local communities. Each is a major component of an area's "sense of place". These landscape values are therefore highly variable and context dependent. Thus trees may be regarded as highly desirable in one location and a menace in another. Wild flowers may be appreciated in one context; cultivated bulbs and beds in another. Contractors and local authorities are very conscious of the feedback they get (which is significant) when their management does not conform to local expectations.



Figure 5. Wildflower mixture sown on Broxden roundabout, Perth

Overall, these expectations do not appear to be very high however. Akbar *et al* (2003) found that roadside vegetation was described by a majority of the respondents as “unpleasant and drab”, and “respondents showed a positive attitude towards establishing a variety of vegetation types instead of a uniform seed mixture. Grass swards with flowering herbs near the road and trees further away was the most preferred combination of plant types for re-vegetation of road verges”. Of particular interest, Hale found that respondents showed a greater preference for the re-establishment of native species when vegetating or re-vegetating verges. They were however cost conscious, and did not support higher expenditure to enhance the scenic beauty of roadside vegetation.



Figure 6. Road verge

Landscape values of roadside verges – and the opportunity to plant native species - are widely recognised and underpin substantial guidance to road designers and maintenance contractors (section 6).

3.3 Biodiversity value

Roadside verges have two main types of value in relation to biodiversity: functional values, for example as corridors or links between habitat patches which may underpin the ecological quality and resilience of the wider environment; and intrinsic, aesthetic and cultural values – in terms of serving as habitat for rare or attractive species or assemblages.

3.3.1 Functional values

3.3.1.1 Corridors

The actual or potential value of roadside verges and associated habitat as corridors for the movement or dispersal of wildlife is commonly referred to in biodiversity action plans (see Table 2) and guidance materials aimed at promoting roadside biodiversity. Corridors may allow for more effective foraging between habitat patches, species dispersal, and adaptation to climate or habitat change.

While the general hypothesis that connections between habitat patches are important for most species is well supported (Forman 1995; Hughes and Brooks 2009; Hambrey 2010), the scientific evidence for the “connectivity” value of roadside verges is more limited and ambiguous. For example, in their comprehensive review of the ecological effects of roads,

Forman and Alexander (1998) conclude that: “road corridors appear to be relatively unimportant as conduits for species movements”.

However, various studies have shown that verges and hedgerows may be important for the maintenance and dispersal of small mammals and invertebrates (Vermeulen 1993, 1994; Vermeulen and Opdam 1995; Gelling *et al* 2007; Davies and Pullin 2007, Noordijk *et al* 2011). Most of these studies also showed that width, spatial relation to other habitats, and continuity are key factors affecting corridor function.



Figure 7. Road verge adjacent to field

3.3.1.2 Refugia

Verges, hedges and ditches may provide a refuge for species in landscapes where post-war agriculture or forestry practice has virtually eliminated them (Cousins and Lindborg 2008):

“Our study suggests that remnant habitats, such as midfield islets, do function as a source community for grassland specialists and enhance diversification of grassland species when grazing is introduced. For long-term conservation of plant species, incorporating small refugia into larger grazing complexes may thus enhance species richness.”

The value of verges as refugia of this type is highlighted in several of the LBAPS listed in Table 2. However, including this function in an assessment of their actual or potential biodiversity value would have to be contingent on a major - and currently unexpected - change in land management practice to provide places to re-colonise. If NPF2 and the NEN initiative are likely to supply such places, such a function might be realised in practice.

The role of verges as "stepping stones" between isolated fragments of quality habitat is also a significant actual or potential value. For example, a recent paper by Cranmer *et al* (2011) explores the way linear features might have economic significance by influencing the route bees take when collecting pollen:

“...plants had increased pollinator activity, pollen receipt and subsequent seed set in patches with more connections. The overall hedgerow connectedness of a landscape is therefore important both to bumblebee movement and to those plants which depend on bumblebees for pollination services.”



Figure 8. Midfield habitats

Hopwood (2008) also highlighted the potential value of roadside vegetation in bee conservation.

3.3.1.3 Contribution to landscape metrics more generally

Bailey (2007) reviewed the evidence that “processes associated with fragmentation, especially processes that reduce physical linkage, reduce or place biodiversity in a parlous state”, and “that these processes can be arrested when fragmentation is halted and reversed when functional connectivity is increased through restoring physical linkage”. She concluded that there was a lack of firm empirical evidence that species increase following attempts to increase connectivity in fragmented woods, and that the extent of regional habitat loss was more important. The intensity of land use between patches – or the “quality of the matrix” - is also a key issue. Bailey’s review illustrates the difficulty of separating out issues such as connectivity from area of habitat, proximity of habitat patches, quality of the matrix etc.

There is rather little practical evidence that roadside verges directly contribute to ecological cohesion. A 2002 report for SNH specifically explored the extent of wildlife corridors and stepping stones in East Dumbartonshire. They mapped “cohesive features” in four categories; stepping stones, major habitat areas, primary and secondary corridors. They identified a total of 103 significant features. Roadside verges did not feature at all in their list.

“Several studies and initiatives have been undertaken to explore and promote the development of green networks (Quadrat Scotland 2002; Humphrey et al 2005; Mosely et al 2008; Ray and Mosely (undated); Briers (undated)). Roadside verges hardly feature in these initiatives or associated reports.”

The value of roadside verges as corridors, stepping stones and refugia while sometimes referred to in (for example) biodiversity plans, has not featured significantly in more specific initiatives to develop green networks. Indeed roads are more often regarded as a constraint rather than an opportunity for these initiatives. This is probably because their value as wildlife corridors is limited by their width, by frequent bottlenecks, by noise, pollution and danger, and by the diversity and limitations of management for priority roadside functions.

Notwithstanding this broad conclusion, roadside verges may have high actual or potential value as refugia, stepping stones or corridors in particular contexts. Attempts to enhance this value will in most cases depend upon broader initiatives in support of green networks.

3.3.2 Value as habitat for rare or attractive species or assemblages

3.3.2.1 General

Most roadside verges may be classed as “neutral grassland”. This habitat, which includes some species rich hay meadows and areas of unmanaged grassland, covers less than 4% of the UK, and there has been a decline in the area of this habitat in Scotland. The character has also altered, with increases in tall competitive species at the expense of typical meadow plants – probably associated with increased levels of fertility as well as lack of cutting or grazing management.

Many of our native plants and animals live in or use road verges, and in some intensively managed landscapes with few and narrow and spray-drifted field boundaries they are the main viable option. In northern and central Europe road verges offer alternative habitats for declining plant and invertebrate species of semi-natural grasslands (Valtonen 2006).

Some road verges contain rich assemblages of meadow plants, and they have great potential for increasing local biodiversity. If they are mowed annually (outside the flowering season) they can provide a much needed refuge for increasingly rare grassland flowers and associated invertebrates

In some areas verge plants like Devils Bit Scabious (*Succisa pratensis*) and Common Knapweed (*Centaurea nigra*) are important nectaring plants for late season butterflies (Commas, Red Admirals, Painted Ladies, Peacocks, Tortoiseshells).

Laursen (1981) showed that parts of road verges were important for foraging and nesting of skylark, and that this species appeared to prefer certain types of verges to adjacent farmland. In France it has been shown that roadside verges are used more than adjacent farmland by buzzards, kestrels and black kites, probably because they provided stable prey habitats and perching sites (Meunier *et al* 2000). Both width and perch site availability were important predictors of use. Harriers on the other hand did not exhibit such a preference. Meunier *et al* (1999) showed that birds’ responses to highways varies greatly according to both verge vegetation and surrounding landscape.

3.3.2.2 Width and structure

Verges are very diverse in type and the 1m mown grass strip that people tend to imagine is not the norm. A stretch of road could have verges of varying width running at all angles to the compass (sun, prevailing weather) and different parts could be windswept, sheltered, wet, dry, protected, steep, level, bright or shaded, and border a wall, a wood, a ditch, a hedge, a fence, a pavement or a field (with or without livestock and crop-sprayers and nutrient run-off), and sit on a haphazard collection of topsoils and subsoils put there during road construction. Any particular management practice will favour the biodiversity associated with some of these conditions but may well be destructive for others.

Being linear, verges have a huge proportion of edge for their area. Edge habitat, between wet and dry, between tall and short etc. is widely regarded as having high biodiversity value. On the other hand, long and thin patch structure may reduce biodiversity value: habitats with the maximum ratio of area to edge – round ones – are usually seen as the most secure for the species they support. It is notable that in guidance for the development of forest

networks 50 m is regarded as the minimum desirable width – ideally with an additional 50m buffer either side.

Saarinena *et al* (2005) showed a slight (non-significant) increase in butterfly diversity between narrower rural verges and wider motorway verges, but abundance of diurnal moths decreased with road size. High nectar abundance was the key factor affecting abundance of meadow butterflies; whereas shelter provided by tall vegetation was the key factor affecting meadow moths.

Le Viol *et al* (2008) found that the presence of hedgerows tends to be associated with higher plant species diversity but similar spider richness. Gelling *et al* (2007) found that small mammal abundance was positively related to width and connectivity, and negatively correlated with “gappiness” in hedgerows.

3.3.2.3 Overall

It is widely recognised that the biodiversity value of verges is highly variable, and appears to be rather limited when compared to that in the wider countryside. However, as Way (1970) notes, it is important to understand them in aggregate:

“No one would claim that all grass verges in isolation have any particular conservation value but as in England, because road verges are continuous and because of the difference in management from adjacent land, they do in aggregate have a considerable importance as a wildlife habitat and communications system. Some individual verges, where rare plants grow or where there is a particularly rich diversity of plants, do in themselves have importance.”

3.4 Relative value

Irrespective of the various functions or specific habitat or biodiversity features, a key issue for decision makers is relative value, especially when difficult trade-off decisions may need to be made relating to other concerns such as cost, safety or aesthetic appeal.

3.4.1 Extent and quality

Roadside verges are not generally recognised as the most important or most extensive corridors or links. In cropped landscapes, the length of road verge is (very) roughly one fifth of the length of field boundaries (varies considerably based on settlement density - estimate based on our assessment map samples in East Lothian and Fife) and field boundaries have fewer competing management objectives than roads. Despite this the Scottish Government stopped funding most hedgerow work through SRDP in March 2011, as it was drawing too much from a limited budget in relation to other conservation priorities.

Other linear or connecting features include 56,000km of river –with much of the associated habitat qualifying for SRDP; 17,000km of core path, under management by agreement between the owner and local authority, and much of it on field boundaries (and some on roads/verges); and forest rides.

3.4.2 Context and fragility

If the biodiversity value of a verge is judged relative to the total amount of biodiversity in the immediate landscape rather than across the country it follows that a nice example of neutral grassland or woodland ground flora species is only high value in landscapes where it is otherwise very scarce. This is similar to the way, for example, acid grasslands are highly valued in Nottinghamshire but of much less interest in Galloway, and there are more examples of biodiversity value being treated as relative when vying for conservation resources. It indicates that biodiversity value is not simply a list of species present or of the

services they provide us but involves a judgement of their importance in their particular context (in both time and space). Appearance, cultural significance and accessibility all play a part.

Recognising this, when compiling the SSSI series for the UK, the NCC looked for importance at the local level as the best way to handle a potentially awkward issue. By using *rarity within the area of search* (AoS - usually the local authority or county/region scale) as a key criterion, a habitat of type, quality and size designated in one part of the UK may not qualify in another. The Design Manual for Roads and Bridges (discussed in more detail in sections 5 and 6) refers readers to the same criteria NCC used (known as the Ratcliffe Criteria after the NCC's Chief Scientist) when assessing biodiversity quality. These examples, together with the later Local Biodiversity Action Plans (LBAPs) and now the SRDP priorities, set ample precedent for judging the biodiversity value of a road verge against its local context

A second criterion - *fragility* - also applies to verges. This is an assessment of both how likely a habitat could be destroyed and how difficult it would be to recreate - usually because their ecology is complex and only partially known. Many verges are subject to frequent and severe disturbance from the daily wear and tear of traffic and the various roadworks for services. They are not likely to maintain a complex stable plant assemblage although some characteristic native grassland (or woodland) species of might be present. Consequently, though likely to be damaged, "battle-hardened" verges should also be relatively easy to recreate/repair when they do get damaged, compared to a long established grassland for example.



Figure 9. Disturbance to road verge vegetation

3.4.3 Relative value in urban and residential areas

In residential areas the contribution verges make can be judged in relation to biodiversity in gardens, and in industrial and commercial areas, to parks (but where parks are absent verges may be the only living feature in the local landscape, multiplying their value). Their contribution to national biodiversity through species numbers is not that relevant in these contexts but they may still provide the "stepping stones" between patches of better wildlife habitat.

As wildlife corridors roadside verges are probably of significantly less value than other linear features, such as rivers, field margins in rural areas, and core paths, parks and gardens in urban areas.

The value of roadside verges will vary greatly across Scotland according to context – ecological, geographic, and cultural.

Roadside verges are unlikely to be targeted or valued as fragile habitats.

3.5 Values as identified in LBAPs

A review of the LBAPs in Scotland which address biodiversity in roadside verges revealed a range of identified values which are reproduced in Table 2. These are broadly consistent with the values identified above.

3.6 Negative value - hazards and barriers

Roadside verges are by definition adjacent to traffic which means creature fatalities, particularly flying insects, are substantial. Orlowski (2008) reviews the particular risks associated with hedgerows and trees as factors increasing road mortality of birds. A key factor contributing to high mortality is the proximity of trees and hedges to the road.

The other side of a verge may also be subject to intense activity – farming operations and livestock being typical – some of which may be hazardous. These hazards necessarily reduce the actual and potential biodiversity value of roadside verges, although this is little touched on in the literature.

Bats seem to have a problem with roads but it is not suggested that this is because they are attracted by verges (although they may be attracted by hedgerows and trees); it is simply a problem of crossing the traffic.

At a more practical level, attracting larger wildlife species such as deer is clearly undesirable and widely recognised as a significant safety issue. This issue is addressed in detail in many other publications, and will not be considered further here.

Nor should it be forgotten that overall, roads probably reduce landscape connectivity far more than they enhance it, and more attention needs to be paid to mitigating this impact in relation to local biodiversity values.

The dangers to wildlife associated with roads, and the danger to motorists associated with wildlife significantly reduce the actual and potential value of roadside verges for biodiversity.

3.7 Threats to biodiversity value in roadside verges

The main threats to roadside verge biodiversity include:

- Planting with non-native species
- Colonization by unwanted or invasive species on damaged areas
- Cutting too little (allowing rank vegetation to smother flowering herbs)
- Cutting too short or too often (preventing flowering and reducing value as habitat for small mammals and invertebrates)
- Cutting too early (before flowering herbs have set seed)
- Cutting when butterflies are abundant
- Use of herbicides and careless dumping of salt
- Insensitive paving or path creation

Some more specific and practical examples were provided by Roy Sexton of the Scottish Wildlife Trust (SWT):

- Meadow plants in some verges are dependent on annual cutting and as soon as this stops the sites get overgrown. Embankments are particularly susceptible (see case history the 'A9 orchid' in box 9 (section 7)).
- Many verges are overcut, seriously diminishing their biodiversity value. Cutting in late summer in particular removes flowers before the seeds mature. For instance the semi-parasite Yellow Rattle (*Rhinanthus minor*) keeps the grasses on verges dwarfed and allows meadow plants to flourish. In practice it is often cut over large areas before it fruits.
- In some areas verge plants like Devils Bit Scabious (*Succisa pratensis*) and Common Knapweed (*Centaurea nigra*) are important nectaring plants for late season butterflies (Commas, Red Admirals, Painted Ladies, Peacocks, Tortoiseshells). Verges of this type are often cut when they are full of butterflies.
- In one dark beech wood, almost the only plants on the road side verges were Bluebells and Bird's Nest Orchid and these were cut in full flower.
- Verges are often scraped for road widening or footpaths. The replacement at Brig o' Turk of a verge containing Greater Butterfly orchid with a footpath was successfully fought by SWT together with the local community. There was a perfectly adequate footpath on the other side of the road.
- Road side salt piles can be damaging. Colonies of Bird's Nest Orchid and Masterwort, both locally rare plants, have been damaged by this practice.
- Verges along main roadsides are often planted with tracts of non-native species like daffodils. These contribute nothing to the local biodiversity and are visited by few if any insects. Equally spectacular displays can be achieved with native plants like the cowslips that are so successful round the south side of the Edinburgh ring road.
- Some verges along the A74 are reputedly still sprayed with herbicides.

Another perspective on this was offered by one of the sub-contractors who works both directly for Councils and for the main road maintenance contractors. There is a widespread feeling that the level and quality of maintenance is in decline, and "countryside skills" are also in decline. The upshot of all this is more rank vegetation and scrub, including brambles – at least beyond the 1m safety zone - and more blocked ditches and drains on the smaller rural roads. The implications of this for biodiversity are unclear – but probably positive for birds, small mammals, and negative for many wildflowers. Impacts on invertebrates are unclear.

Other than the obvious general threats related to use of herbicides and salt, most of the threats relate to inappropriate management for specific biodiversity interests. Since most verge communities are the product of a particular verge management regime, the main threat is therefore any significant change to the management regime.

Table 2 illustrates the variety of roadside verge values identified in Local Biodiversity Action Plans (LBAPS).

Table 2: Roadside verge values identified in LBAPs

Council/LBAP	Values identified
Skye and Lochalsh	<ul style="list-style-type: none"> • Farmland plants; wildlife corridors
Wester Ross	<ul style="list-style-type: none"> • Farmland plants; wildlife corridors
Sutherland	<ul style="list-style-type: none"> • Hedges and species-rich verges have been identified as a locally important habitat in Sutherland, retaining once abundant farmland plants such as orchids, ragged robin, meadowsweet and water avens for local communities and visitors to admire. • Habitat for several priority species
Caithness	<ul style="list-style-type: none"> • Locally important habitat retaining once abundant farmland plants such as orchids, ragged robin, meadowsweet and water avens for local communities and visitors to admire. • Important as wildlife corridors allowing relatively safe passage for wildlife from one habitat to the next. • Tree sparrows, goldfinch and yellowhammer are three locally important bird species that benefit from these habitats
Argyll and Bute	<ul style="list-style-type: none"> • Green Network Corridors and links – continuous corridors of greenspace along rivers, disused railways, paths and cycleways and existing railways and roads which serve to connect Green Network Cores/Hubs. • Green Network Stepping stones –many plant and animal species are able to move short distances between areas of habitat. • Many Victorian and Georgian suburbs had regular public and private squares set amongst densely developed terraces. The development of Green Network Stepping Stones can provide incomplete corridors linking larger areas of greenspace. This could include the planting of street trees, improved roadside verges or garden improvement. • It is likely that there will always be some isolated greenspaces which provide considerable benefits to local communities.
East Lothian BAP; urban open space plan; greenspace networks	<ul style="list-style-type: none"> • A river brings the countryside into a town but so can a railway line or roadside verge. • Gardens, hedges and trees radiating from a park encourage wildlife to move around a town. • Any break in the network can affect urban wildlife. • It is important that greenspaces are recognised as part of a wildlife network and not just as isolated areas.
Midlothian LBAP	<ul style="list-style-type: none"> • Roadside verges can be covered with grass and they can become valuable corridors for wildlife if we manage them appropriately. • This is more likely to occur in rural areas where there is less grass-cutting. • Some verges have rare wildflowers, which are either remnants from the seed bank that was there before the road was developed or have since established there from neighbouring fields
West Lothian BAP	<ul style="list-style-type: none"> • The stone dykes, hedges and shelterbelts that reflect man's influence on West Lothian's countryside are important landscape and wildlife corridors. • As such they allow dispersal and movement between other habitats. In a similar way, the habitats associated with rivers, burns and Union Canal, and the verges alongside railways, motorways, roads, cycle tracks and footpaths provide actual or potentially valuable wildlife links across the countryside. • The network is a complex of man-made and natural features linking

	habitats and crossing both settlements and the countryside
Falkirk	<ul style="list-style-type: none"> These urban habitats are especially valuable where they form part of a network of open areas or wildlife corridors along with features such as railway embankments, streams, canals, community woodlands, road verges, and hedges. <p>Such networks allow animals and plant seeds to move from site to site within an otherwise inhospitable urban area.</p>
Dumbarton	Within Dunbartonshire, neutral grasslands are of two main types: those on roadside verges dominated by False Oat Grass, which are generally ungrazed; and those on fields.



Figure 10. Cornflower and other species in the wildflower mixture sown on Broxden roundabout, Perth

4. POLICY AND LEGAL OBLIGATIONS AND OBJECTIVES

This section summarizes the obligations and requirements that are placed on those responsible for the management of roadside verges arising from national and local government policies, plans and performance frameworks

4.1 Nature Conservation (Scotland) Act 2004

This act places a specific duty on all public bodies to further the conservation of biodiversity and to have regard to the Scottish Biodiversity Strategy. The Landscape and Ecosystems objective seeks a landscape level outcome in which:

"Organisms can move, feed, reproduce and disperse effectively, and are better able to adapt to changing circumstances of land use and climate change".

4.2 National highways/transport infrastructure policy

The overarching Scottish Government policy relating to roads infrastructure is the **National Transport Strategy**. This makes no reference to biodiversity or functional ecological networks other than in relation to the contribution of biodiversity to bio-fuels.

However the policy operated by Transport Scotland is summed up in Box 1, as elicited by a Freedom of Information request from Susan Davis.³

In our discussions with stakeholders, both Transport Scotland and major contractors referred to *"Cost effective landscape – learning from nature"*⁴ as the basic policy guidance document for roadside management at the present time. This document is currently being updated, with some SNH input.

Box 1: Transport Scotland Policy relating to protecting the ecology of roadside verges

"Transport Scotland does not operate a specific ecological protection scheme for road verges but does require consultants and contractors to follow the guidance in the agency's landscape design and management policy document, *Cost Effective Landscape: Learning from Nature*. In addition, part of the remit of the Operating Companies, who undertake the maintenance of the trunk road on behalf of Transport Scotland, is to identify and record areas of ecological importance as they develop their maintenance strategies for the routes under their responsibility. *As long as the variation does not impact on the safety of road users*, this provides the opportunity to adjust the timing and/or extent of the specified maintenance operations for that area in order to safeguard the ecological resource. "Transport Scotland is also in the process of developing a Geographical Information System to record and manage the trunk road soft estate and this will provide a greater level of refinement in the identification and protection of areas of high ecological value within the trunk road boundary." [*Response to Susan Davis FOI request 2009*](#)

³ <http://www.transportscotland.gov.uk/road/policy>

⁴ Scottish Office 1998. Cost effective landscape-learning from nature. Landscape design and management policy A roads, bridges and traffic in the countryside initiative

The objectives as set down in this document are:

- The road must remain safe and the verges must not represent a hazard to road users
- It must give good value for money in whole life terms
- Visual amenity must be provided to both road users and those living close by
- There must be a demonstrable endeavour to make a positive contribution to the landscape character, natural vegetation and wildlife habitats.

As is clear from the title, the policy places emphasis on working with nature, and this in turn requires an understanding of ecological processes and habitats, and an awareness of both short and long term costs associated with design and on-going maintenance. It calls specifically for professionals to:

“Search for benefits, in terms of biodiversity and sustainability, which can be delivered as part of the design”.

Amongst the expected benefits of the approach are:

“To nature conservation – provision of greater diversity of habitats, flora and fauna along the road corridor, and greater integration with adjacent habitats”.

The policy recommends a procedure with five stages:

- Understand context and set objectives
- Prepare conceptual solutions
- Specify detail
- Monitor implementation
- Manage the developing landscape.

... implemented using three themes or principles:

- Use natural characteristics (understand processes, materials, features);
- Explore alternatives and
- Use resources wisely

Understanding “ecological potential” is seen as a key part in this process, and the designer shall “understand and take account of” various sources including the Local Biodiversity Action Plan, and “opportunities for addressing habitat and species fragmentation, improving biodiversity and protecting species”. More specifically “the landscape designer shall:

- Preserve existing rich biodiversity
- Design for biodiversity by utilising and creating varied ground conditions and grade vegetation both vertically and horizontally wherever possible. Averaging out the ground conditions shall be avoided unless uniform conditions are the objective.
- Native species shall be used wherever they can effectively perform the requirements of the design. Plant material of local origin shall always be sought.

Cost effective landscape – learning from nature offers a set of working examples to illustrate the approach. In practice much of what is presented is more relevant to road improvements or new build, but the principles are also relevant to routine maintenance.

The document specifically refers to and endorses the **Design Manual for Roads and Bridges (Vol 10 and 11)** and requires “all professionals concerned with trunk road

assessment, planning, design and management to comply” with the procedures, guidance and good practice described therein.

The UK wide Design Manual for Roads and Bridges, Volume 10 (Nature Conservation)⁵, as referred to in the Scottish Policy guidance, offers relatively detailed advice on (and standards for) landscape management and nature conservation on new and relating to improvements on existing roads. This encompasses generic advice on nature conservation, and more specific advice on badgers, bats, otters, dormice, amphibians and reptiles. Of particular relevance, Volume 10, section 1.2 states:

“Opportunities for habitat creation and enhancement should be taken wherever possible”

Section 3.4 “Habitat Creation and Enhancement” includes the following:

“Creation and enhancement can be undertaken alongside other works, such as mitigation and translocation, and ongoing roadside management.”

“Designs for the project should be based on appropriate survey information and on an understanding of the natural processes and human influences relating to that site.”

“Linkages (e.g. continuous or ‘stepping stones’) between habitats, using existing routes if available, should be restored or created where practicable. Installations such as tunnels, ledges, culverts or bridges, in association with fencing, should be used to achieve this.”

“Opportunities for additional or alternative areas of habitats should be used to reduce the effects of fragmentation where land is suitable.”

“Opportunities for natural habitat/species migration, or species introduction should be encouraged where possible. Techniques such as soil stripping where a suitable seed source is nearby, and installation of artificial nesting and roosting sites could be used.”

It is notable that section 3 also refers to the “Ratcliffe criteria” for assessing conservation value.

There are already significant obligations on road developers and maintenance contractors relating to biodiversity, and basic advice is in place to promote enhanced biodiversity. However there are significant questions relating to priorities: roads authorities and contractors have so many things to consider under the environment tag alone that biodiversity in the wider countryside is likely to come pretty low on their priorities, particularly as pressure mounts to minimise costs.

4.3 National Planning Framework

The National Planning Framework (NPF) is a strategy for the long-term development of Scotland's towns, cities and countryside. It has been referred to in the introduction as one of the drivers behind this piece of research. It proposes the development of a *national ecological network*, and specifically identifies major linear infrastructure projects such as railways, roads, pipelines and cables as “opportunities to strengthen green infrastructure and ecological networks”.

The NPF is supported by an Action Programme. Action 42 is to ‘Develop a National Ecological Network potentially encompassing large strategic habitat restoration projects’.

⁵ <http://www.dft.gov.uk/ha/standards/dmr/vol10/section4.htm>

Milestones associated with this action include development of ecological modelling, decision support and associated web based portal; assessment of habitat fragmentation; inclusion of NEN considerations in national plans, programmes and strategic restoration projects, planning guidance, and environmental assessment. Delivery bodies include a range of government and non-government institutions, including SNH and those responsible for roads infrastructure.

Coordinated effort to meet these milestones appear to have been lacking, though there have been localised initiatives to underpin (analysis and modelling) and facilitate (advice and possibly grant aid for woodland planting) local green networks (see section 6.8 for more discussion of these initiatives). Other than these initiatives and discussions at Board level in SNH, we have been unable to identify any significant progress in implementation of this action, but it would appear to offer a significant lever for action.

Progress appears to have been limited in taking forward the concept of a national ecological network in Scotland under the National Planning Framework.

4.4 National performance framework and Single Outcome Agreements

No reference was made to the National Performance Framework or Single Outcome Agreements by those we talked to in the transport organisations, local authorities and contractors. However, it is worth briefly examining the framework in terms of possible opportunities to lever management for biodiversity.

Scotland Performs "measures and reports on progress of government in Scotland in creating a more successful country, with opportunities for all to flourish through increasing sustainable economic growth. Progress towards the Purpose is tracked by 7 Purpose Targets and it is supported by 16 National Outcomes and 50 National Indicators, covering key areas of health, justice, environment, economy, and education measure progress. Three national outcomes are relevant:

10. We live in well-designed, sustainable places where we are able to access the amenities and services we need

12. We value and enjoy our built and natural environment and protect it and enhance it for future generations

15. Our public services are high quality, continually improving, efficient and responsive to local people's needs

Four national indicators have some limited relevance:

- Improve people's perception of the quality of public services
- Improve people's perception of their neighbourhood
- Increase the abundance of terrestrial breeding birds
- Improve the condition of protected nature sites

In theory these serve as the overarching framework for single outcome agreements with local government which are also performance indicator based. By way of example the SOA for Highland Council includes the following indicators:

Under national outcome 10 and 12:

- Our natural heritage is protected and enhanced enabling it to deliver economic, health and learning benefit

- Under National Outcome 15:
- Public services are delivered effectively, efficiency and jointly

The national performance framework and SOA process offers no particular mechanism to conserve or enhance the biodiversity and ecosystem services associated with roadside verges. However, there are several initiatives in Scotland to promote green infrastructure and/or habitat networks, and there is interest in developing environmental indicators which measure ecological connectivity as one dimension of environmental quality. If such indicators are progressed and used by local government in support of single outcome agreements, this would undoubtedly serve as a lever to promote all forms of network, including the contributions made by roadside verges.

4.5 Local government duties with regard to road maintenance and biodiversity

4.5.1 Single Outcome agreements and other obligations

Local Government duties with regard to roadside management are largely defined by Single Outcome Agreements as discussed above. These offer little guidance or leverage at the present time. In practice, in most cases, their policy is broadly defined by the lead given by Transport Scotland.

4.5.2 Local Government transport strategies

A brief review of some of these documents reveals little if any attention to biodiversity. While many emphasise sustainability, this mainly relates to health and “active” transport such as cycling and walking.

For example in the Highland Transport Strategy the only significant reference to the natural environment is as follows:

“Environment: Manage/reduce the impacts of transport on the natural and built environment”.

The Southwest of Scotland Transport Partnership Regional Transport Strategy refers to sustainable development including environmental protection, but there is no specific reference to biodiversity, green networks etc.; the main environmental theme is carbon footprint.

4.5.3 Structure Plans and local plans

There are specific emerging opportunities relating to planning at regional and local level. Local plans respond in practical terms to the strategic needs of structure plans⁶ - for example housing needs. The West Lothian Local Plan identified three new core development areas for which the design criteria included the need for robust landscape frameworks and detailed landscaping. Developers were asked to plan new wooded landscapes on the basis of the Forest Habitat Network principles (Ray and Moseley 2005; West Lothian Council 2006). The success or otherwise of this scheme is yet to be assessed. Biodiversity action plans.

There is no national level biodiversity plan for verges, although road verge vegetation corresponding to the definition of lowland meadows are considered part of that BAP priority habitat. However, the English highways agency does have its own Biodiversity Action Plan⁷ including the following objectives:

⁶ The structure Plans and Local Plans together form the statutory development plan

⁷ <http://www.highways.gov.uk/aboutus/723.aspx>

- To provide habitat and species action plans which are relevant and appropriate to the network and to the work of the Agency, including some requested by national and regional conservation organisations.
- To set practical and realistic actions and targets so that the Agency's contribution to biodiversity can be maximised.
- To raise awareness and understanding of the importance of the Agency's biodiversity work among the Agency's staff and contractors, its environmental partners, and the general public.

Its biodiversity action plan (currently under revision) has specific actions supporting at least 10 interventions to support protected species and enhance habitats.

A Scottish "*Trunk Roads Biodiversity Action Plan: a review for discussion*" was produced in 2000, but was never officially finalised, is no longer available on the SG website, and was not referred to by any of our consultees. In practice "Working with Nature" referred to above serves an equivalent and possibly more effective role in terms of setting down basic principles and guidance.

Both Argyll and Bute and Shetland have specific roadside verge action plans as part of their local biodiversity action plans.

In so far as the LBAPs plans are developed by partnerships in which the local authority is usually the major player, they represent the main framework and opportunity for enhancing biodiversity and connectivity of non-trunk roads. They are discussed in more detail in Section 7.

4.6 SNH Guidance

SNH has produced a simple leaflet on biodiversity in roadside verges, but this has no policy standing and was not mentioned by any of the (non SNH) consultees. When prompted, Transport Scotland indicated that it was not used by their staff.

4.7 Section summary

It is clear from the overarching National Transport Strategy that the primary objectives of road design and maintenance are safety, efficiency and cost effectiveness; nature conservation interests will normally be secondary to these. Nonetheless, substantial effort has been put into officially defining the needs and opportunities related to nature conservation alongside roads at UK, Scottish, and in a few cases at local government levels; including a clear recognition in policy and guidance documents of the potential to minimise fragmentation of habitat, and perhaps to strengthen linkage and coherence.

Although the policy drivers and guidance appear to be somewhat weaker for non-trunk roads, the biodiversity action planning process offers particular potential to identify and promote opportunities at local level.

5. INSTITUTIONS, PEOPLE AND PRACTICAL DECISION MAKING

This section offers a brief insight into the people and institutions who respond to the various policies and obligations relating to roadside management, and who ultimately decide or determine the management regime on our roadside verges. It explores how decisions are made and by whom, what their motivations and priorities are, and how they might promote/facilitate or constrain initiatives to enhance/conservate verge biodiversity and connectivity.

Most of this material is based on interviews with selected stakeholders, supplemented with more general findings from the literature and the web.

5.1 The general public

Roadside verges and associated features are highly visible to most people in their daily lives, and it was notable that some local authorities we talked to implied that telephone complaints from the general public had a significant influence on verge management. It was beyond the scope of this review to survey public attitudes, but through our discussions with other major stakeholders the following may be inferred.

To most people a roadside verge is a bit like the government's garden. They want it to be neat and tidy, and should it be necessary, they want to be able to walk along it comfortably without getting wet feet. Many also want it to be full of flowers, though they probably do not mind whether these are wild or cultivated.

Road users tend to prefer open views of the countryside, so high hedges are probably not widely favoured, though "avenues" of trees – offering a mixture of close and distant interest – may be appreciated.

Those living close to roads may (literally) take the opposite view, preferring hedges or dense lines of trees to hide the road and reduce traffic noise.

The general public have a wide range of perspectives on what constitutes appropriate management for roadside verges, but biodiversity as such is rarely the primary concern. Their views can be strong and influential over local government policy and practice.

5.2 Wildlife NGOs

The wildlife NGOs range in their basic approach from amateur naturalists to campaigners to human ecologists and political strategists. Their approach to nature conservation ranges from micro-preservation to landscape ecology.

SWT has been a key player in initiatives to conserve roadside verges of special interest; SWT are also at the forefront of seeking to promote a "landscape approach" to nature conservation with strong emphasis on connectivity and habitat mosaics. A range of other organisations are also relevant ranging from local natural history societies and specialist groups (such as Plantlife and BSBI) to national and international organisations such as RSPB and WWF.

Wildlife NGOs, and especially SWT, are important potential partners in promoting the conservation of roadside verges, and indeed have already been active in this area as described below in section 7. Some are also prepared to put in voluntary work for nature conservation, such as grass cutting and scrub clearance, although safety regulations increasingly constrain this type of activity on government owned land.

Although aware of “the bigger picture” most NGOS would ideally wish to identify and conserve “special” verges, where there is significant wildlife interest such as rare or unusual plants or birds. Small mammals and invertebrates tend to receive less attention, simply because of their lack of visibility and more limited expertise. The visibility of roadside verges, and the fact that they are managed by government makes them good opportunities for community mobilisation and action.

While most members of the general public would like to see “neat and tidy” verges, and are generally very happy to see cultivated bulbs planted on verges, members of wildlife organisations will be less concerned with the neat and tidy, and will generally campaign for wild seed mixes and management for wild flowers. Wildlife NGOs tend to be outraged when they see wild flowers or butterflies etc. being “mown” on roadside verges, and can be highly effective partners for local conservation initiatives.

Annex 2 presents a comprehensive response by Roy Sexton of SWT to some of the questions we posed during our discussions with him.

Wildlife NGOS tend to favour a “micro-management” approach to enhance or protect specific identified conservation interests.

5.3 Scottish Government Transport Department⁸

5.3.1 Transport Scotland

Transport Scotland is responsible for the development and management of over 3,200km of trunk road and associated verges, comprising more than 6000ha of land.

As noted in section 5, Transport Scotland is currently updating its basic policy document on road landscapes, which incorporates biodiversity issues, with input from SNH. They have staff specifically responsible for implementing landscape and environmental policy and promoting this throughout the roads network.

Transport Scotland is also in the process of developing a Geographical Information System to record and manage the trunk road “soft estate” which may eventually hold information on types of verge, and ideally biodiversity or functional values. It is not clear how long it will be before this can be used as a tool for identifying management needs or opportunities, or as a practical resource for contractors.

Transport Scotland develops specifications and issues the major contracts for trunk road development and maintenance in Scotland. These are usually in the form of major higher level “3G and 4G” contracts issued for the main regions of Scotland (SE, SW, NE, NW). The SW and NW contracts are currently out for tender; SE and NE will be up for renewal in 2 years. The relevant provisions relating to biodiversity are discussed further in section 6.

It was suggested by representatives of Transport Scotland that contractors tend to prefer relatively prescriptive rather than outcome orientated specifications, and a mixture of the two is typical in most contracts. However, they do not prescribe much in relation to biodiversity but rather ensure that this is taken into account through:

- the requirement to demonstrate expertise in these areas (landscape, ecology) in the bidding process;
- the general duties of contractors with regard to biodiversity;

⁸ Transport Department ,Victoria Quay , Edinburgh EH6 6QQ . Tel: 0131 556 8400 or 08457 741741

- the requirement for reporting against the “landscape strategy” which serves as the overarching framework for incorporating landscape and biodiversity interests in roadside improvement and management.

Although little is specified relating to biodiversity, contractors are obliged to meet their general legal obligations relating to biodiversity, and the main guidance on this is deemed to be found in “Cost effective landscape – learning from nature”⁹ and the “Design manual for Roads and Bridges”. In addition, part of the remit of the Operating Companies is to identify and record areas of ecological importance as they develop their maintenance strategies for the routes under their responsibility. As long as the variation does not impact on the safety of road users, this provides the opportunity to adjust the timing and/or extent of the specified maintenance operations for that area in order to safeguard the ecological resource.

A more prescriptive approach to biodiversity is seen as problematic and to some extent counter to the principles of “working with nature” which emphasises understanding of local context and opportunity. For example, there are usually significant differences of perspective relating to the planting of trees (e.g. between road users and those living nearby), and major differences of opportunity. Attracting fauna may be desirable in some locations, but a safety hazard (to both animals and traffic) in others.

Transport Scotland have not so far been engaged in any higher level initiatives to create or enhance habitat networks, and would see that as primarily an issue for the major contractors. However, sitting close to central government, Transport Scotland is relatively responsive to the higher level policy framework (such as the NPF) and would in all likelihood respond positively to initiatives which sought to strengthen the contribution of roads to a NEN.

The overall perspective of Transport Scotland appears to be that appropriate policy and guidance relating to biodiversity is broadly in place, that ecological standards (as an integral part of landscape design and management) for new roads/improvements are high, and that the key is flexibility to allow for local opportunity. The problem, if any, is lack of resources for any more sophisticated management.

5.4 Local authority transport department

Roadside maintenance of all roads below the trunk road level are the responsibility of local authorities - typically the transport department, in some cases in association with Lands and Parks or equivalent. The local government policy steer in relation to biodiversity is typically rather weak, relying on the higher level policies of Transport Scotland, general obligations with regard to biodiversity, and in a few cases, the Local Biodiversity Action Plan.

Roadside maintenance is being squeezed. The priority is undoubtedly maintenance of the roads themselves and winter treatments. Given the economic climate the approach is highly pragmatic: do what is necessary to maintain a 1m service verge and sight lines; and keep the general public happy as far as possible. If other problems arise (e.g. out of control scrub) tackle it on a needs basis. Except in those cases where biodiversity officers or others have highlighted special interests, or where a designated site is involved, active biodiversity management comes low down the list of priorities.

Local authorities are fully aware of the practical and cost constraints on the management regime. They are also responsive to public demands. With respect to roadside verges, the

⁹ Scottish Office 1998. Cost effective landscape-learning from nature. Landscape design and management policy A roads, bridges and traffic in the countryside initiative

most common demand is for them to be kept “neat and tidy”– i.e. cut on a regular basis. Most people prefer a lawn to rank vegetation.

5.5 Major contractors BEAR, AMEY etc.

The major contractors (operating companies) bid for contracts for the maintenance of the trunk road system (let for major areas such as NW, NE, SW, SE), and may also service local authority needs. They tend to subcontract local machinery operators as required to meet contract demands, and operate primarily as maintenance managers rather than implementers.

Operating companies are heavily cost and practice/logistics constrained. Although there was not total consensus, most of the contractors we talked to were of the view that regular cutting is more cost effective than less regular cutting. It is not good practice to *“let the grass get away”* and they would wish to cut a minimum of 2 to 3 times a year to keep the job manageable. They are also highly constrained by logistics. *“We start in May, do the area, and come back to the beginning for a second cut 4-8 weeks later. Simple as that. We couldn’t do it any other way.”*

The main contractors (operating companies) see their obligations in relation to biodiversity as relatively limited and defined in simple terms in the contract (e.g. *“something along the lines of meeting obligations relating to biodiversity or natural heritage”*). They are not averse to the idea of management for enhanced biodiversity along roadside verges, and indeed would like to do more. But they are pragmatists: *“It has to be remembered that the primary function of verges is to complement the function of a road. You can’t have people stopping their cars to look at Orchids”*. Those we talked to (2 major contractors) said they had never contacted SNH/SWT/FWAG etc. for advice – but they were not in any way averse to the idea.

In terms of possible future initiatives relating to biodiversity, one of the main operating companies was relatively positive: e.g. *“you need to identify areas of biodiversity value – perhaps which meet some basic criteria. And then you come up with something simple, and/or raise awareness/do a bit of training of operators, and alert them to what’s on the route. You could ping them on the tom tom”*. But this operator was strongly of the view that prioritisation and selection would be essential: *“no way can we implement carte blanche prescriptions across the whole area”*.

In more general terms there is some concern amongst operating companies about the state of roadside management in Scotland as a result of year on year cuts: *“the heart has been ripped out of landscape management skills in Scotland”*.

The published policies of some contractors are relatively positive and serve as an excellent starting point for biodiversity conservation of our verges (box 2).

Box 2: Example of major contractor's policy relating to verge maintenance

"Amey is responsible for maintaining a total of 33,644 km of highway in the UK, comprising all classifications of roads. The majority of highway networks are fringed, at least in part, by wildlife diverse verges and hedge lines, some of which are protected under varying levels of designations. Although roadside verges can provide valuable habitats in their own right, they are much more effective at being links to otherwise fragmentary habitats, and buffer zones to adjacent habitats like hedgerows, meadows and ditches.

Bespoke landscape strategies, compiled by specialists in the field, ensure priority species and habitats are conserved, not only to prevent negative impact but to enhance the network where possible.

All operatives who work on the highways undertake a half day Environmental Training, which includes awareness of protected species, invasive species and injurious weeds. Regular tool box talks and training ensure information is kept up-to-date and current.

Design

From feasibility through to site management and monitoring, Amey's Consulting Business division supports all stages of a project lifecycle in line with local and national environmental policies and guidance. Working in multidisciplinary teams on major road, rail and other schemes ensures effective consideration of biodiversity is taken from design right through to maintenance works with the sole purpose of being as sympathetic to the environment and biodiversity as possible.

Collaboration

Amey is keen to extend our contribution to biodiversity conservation and enhancement beyond our client requirements. Amey is a corporate member of a number of Local Wildlife Trusts throughout the UK."

Local initiative

Amey highways stewards have excellent knowledge of their local areas and are employed specifically to carry out small scale works and any issues reported to Highways hotlines. This can include issues such as weeding, emergency pothole repairs and cutting back vegetation..." And ...near Cockermouth on the A66, we created three ponds with varying exposure to sunlight, and therefore potential for optimum biodiversity.

The major contractors (Operating Companies) are, like local authorities and their contractors, highly constrained by cost, logistics and key road safety priorities. Nonetheless they operate under significant obligations relating to biodiversity and are broadly positive about doing more, especially in respect of identifying special or high value areas and adjusting management if necessary. More widespread changes in practice would be less desirable because of the cost and logistical implications.

5.6 Local contractors

5.6.1 Objectives

Local contractors – whether they work as subcontractors to the major companies on trunk roads, or more directly to local government, are practical people doing a job increasingly constrained by tight budgets. This relates to the general reduction in government spend on road maintenance, the additional costs and limitations imposed by safety at work requirements, and the highly competitive bidding for the major contracts by the large operating companies. The “competitive” pricing is passed down to subcontractors who must then deliver verge maintenance at extremely low cost.

Local or sub-contractors are a relatively diverse group of people/small companies. For example, at least one company has diversified out of farming or farm equipment hire; another specialises in rehabilitating prisoners; yet another is effectively a landscape gardening company. The levels of skill, interest and motivation are highly variable, but increasingly limited: *“there is not much training and not much pride out there.”*

Despite this diversity our discussions suggest that most contractors have three primary objectives:

- To make the verges *“neat and tidy”*;
- To minimise risks to drivers and wear and tear on machines;
- To comply with the contract at minimum cost.

It was suggested that the specification they receive from the major contractors is rather vague, although we are unclear as to how widespread this is, and the examples we have examined suggest otherwise.

Some of these contractors lament the reduced funding and the very limited nature of current roadside maintenance.

Some are concerned about wildlife: “it’s great to get the verges short so the wee boy can see the rabbits”; and “if we don’t keep it short we can’t see the animals and they get killed”.

Tractor drivers have to juggle time constraints and constant safety monitoring, and their approach is driven primarily by the need to get the job done as quickly and easily as possible. Some of them *“just want to drive the machine”*.

5.6.2 Practical constraints

Contractors are heavily resource constrained. They will have the minimum equipment to do the job well. If for example they have two tractors and two drivers they will seek to use them continuously through the growing season. They start in the area of fastest growth, cover the other areas, and then return to the start for a second (and sometimes a 3rd cut). They will find it very difficult to concentrate the cutting to particular times of year without buying or hiring more equipment and operators.

In any case they may not be keen to let grass *“get away”*. Longer grass is much more difficult to cut, clogs machines, causes wear and tear, is a safety hazard (hidden roadside debris) and uses more fuel. Two contractors specifically stated that one or two cuts a year were more costly than three when time, fuel costs and wear and tear are all taken into account.

Local contractors or sub-contractors see their job as primarily keeping verges neat and tidy as far as possible within a diminishing budget. Tight budgets and associated logistical constraints mean they have little room for manoeuvre; delaying or advancing a cut in a particular location – or more generally – is likely to have logistical and cost consequences. Attitudes to biodiversity are likely to be highly variable.

5.7 Sustrans

This extract from Sustrans, a green organisation, gives an insight into the way track designers think about verges:

*"In order to avoid future maintenance problems it may be worth thinking about certain issues from the very start. This is particularly important when it comes to greenways due to the prevalence of mown verges. These verges can often be resource rich, providing a launch pad for plants that can rapidly root through and beneath the path, causing damage to the surface."*¹⁰

It goes on to provide an excellent description of the verge maintenance needed to protect the prime function of the path. This indicates how even an environmental organisation has to prioritise sustainability of function over enhancing biodiversity. Road designers face the same issues.

¹⁰ Appendix C. Details of the Routine Management and Maintenance of Greenways or <http://www.sustrans.org.uk/assets/files/connect2/appendix c.pdf>

6. ROADSIDE VERGE MANAGEMENT: STANDARD PRACTICE AND CONTRACTUAL REQUIREMENTS

This section summarizes and reviews the standard guidance, protocols and contractual requirements for normal roadside management in the UK. Section 8 deals with exceptional practice designed specifically to conserve and enhance biodiversity.

6.1 History and trends

In the past verges were grazed by livestock, either in unfenced areas or whilst being driven to market. Their significance as a biodiversity resource matches the development of more intensive land use since WW2. A current Botanical Society of the British Isles project aims to compare data from around 1970 with the situation now. The project website http://www.bsbi.org.uk/road_verges.html says this:

"With the gradual loss, since the 2nd World War, of the 'linesmen' who had responsibility for the state of hedgerows, ditches and verges of an area and were the last exponents of many traditional skills, our road verges have become gradually poorer in the variety of plants they support. Weeds tolerant of high levels of nutrients in the soil have flourished, encouraged not just by vehicle emissions but by the type of verge maintenance which superseded the traditional 'linesman'. Cutting by mowing and latterly with flails, when cut vegetation was allowed to lie uncleared, made ground suitable for the Nettles, Docks and Ragwort which are now the dominant large herbs of many previously varied and well-managed verges. Ironically, to remove such vigorous plants a more frequent cut would have been needed, making things worse. At the other extreme, some 'protected verges' were not cut at all and scrubbed over rapidly. Such situations were often further compounded through lack of understanding by local authorities and naturalists alike of the factors involved. Except for the widespread adoption of 'outsourcing' for labour and machines and the general cessation of spraying outside urban areas this basic system of road verge management seems to have continued largely unchanged over much of the country for at least fifty years."

However, there are some benefits associated with the historic trend to rationalize roadside management, as the following quote from Way (1970) reveals:

"It has been a common policy with many Councils in the past year or so to maintain the front of the verge next to the road to a higher standard than the back of the verge. From a wildlife point of view this is excellent as it leads to a range of different habitats and encourages diversity of plant and animal species. In this respect the interests of wildlife conservationists and of Highway Authorities may well be the same, although for different reasons. In fact, in very broad verges it is hoped that a multi-zone system of management could be applied by County Authorities with the intensity of management falling off in zones as one goes further back from the road itself."

But there are some caveats.....

"...On the other hand, widely changing methods and intensity of management in a short period often lead to rapid successional changes because no one plant community has an opportunity to develop; a concomitant result of this is often poor diversity of species and low grade wildlife habitat. However, there is much to be said for having different management regimes in neighbouring places - thus on one verge a flail might be used once in the season, on another a cutter bar several times, on another a chemical growth retarder such as Maleic Hydrazide. In this way in adjacent areas a range of plant communities differing in detail might be built up over a period of time."

Needless to say, there has been a major shift from the use of skilled workmen with hand tools to almost exclusive use of machinery. The overall impact of this on wildlife is unclear –

though unlikely to be positive. A colloquial insight into some of these historic changes is offered by a post on a South Devon news/information site¹¹, lamenting the loss of the council workmen who kept the ditches clean and the lanes free from floods.

Since the 70s the trend to increasingly rationalized (minimal compatible with safety) and mechanized roadside maintenance has continued, with varied results. However, on the positive side biodiversity has become a significant issue in the design of new roads or major upgrades of existing roads, and significant efforts are now made to accommodate, and in some case exploit, biodiversity concerns and opportunities.

Verge management has not changed radically in nature over the last few decades, though machines have replaced men, and overall there is probably somewhat less intensive management, with more scrub and rank vegetation allowed. The obligations relating to biodiversity on the trunk road system have probably increased.

6.2 National level policy and associated guidance

The policy and guidance framework in respect of trunk roads and motorways is overseen by Transport Scotland and comprises several levels as already described in more detail in section 5 and summarised below:

National Transport Policy

- no reference to roadside biodiversity

Cost effective landscape – learning from nature

- requirement to “make a positive contribution to landscape character, natural vegetation and wildlife habitats”; and “exploit ecological potential” including some more specific recommendations.

Design Manual for Roads and Bridges (Vol 10 and 11) (UK wide)

- relatively detailed guidance relating to habitat creation and enhancement and important species and habitats.

In practical terms this guidance is passed on to the major contractors who maintain the trunk road system through “3G” and “4G” regional maintenance contracts. The guidance is also used by relevant transport/roads departments in local authorities.

The roads authorities (i.e. Transport Scotland and the Local Authorities) have a legal obligation to maintain roads in a safe condition. The roads authority is responsible for the verge and ditch. In law the adjacent landowner is responsible for the hedge, but the transport authority may take action to have it cut if it is deemed a safety issue.

¹¹ <http://www.thisissouthdevon.co.uk/Buddle-buddies-familiar-sight-days/story-11689580-detail/story.html>

6.3 Trunk roads

6.3.1 *Standard practice*

The key management variable for all roads is the timing and frequency of cutting. Contracts rarely specify timing but often specify frequency and/or height of vegetation.

Under the third generation (3G) contracts (now coming up for renewal in NW and SW) contractors are required to undertake a standard 1.2m cut from the verge, and cut all sight lines a minimum of two and usually three times per year, though rough heath and moorland may not require any cuts.

Other areas may be cut or cleared once every three years, but much is not touched at all unless scrub clearance is required for sight lines.

Scrub is managed primarily to keep sight lines clear. Hedges are not the responsibility of the councils, but landowners may be requested to cut them where there is a sight line or other safety issue.

Standard road verge maintenance involves 2-3 cuts a year of a 0.8-1.2m verge and all sight-lines. Scrub is cleared as required to maintain sightlines. Ditches are cleared as required to maintain free flow.

6.3.2 *Maintenance contracts*

These are major contracts let to large contractors such as AMEY and BEAR. They are complex and wide ranging with significant provision for wildlife conservation and management.

Schedule 5, part 1 of 3G contracts requires contractors to have a quality management system (QMS) in place, including, inter alia, environmental objectives, and environmental statement, an environmental and Health and Safety manual, and written procedures for control of sub-contractors relating to the environment. The contractor must also have effective environmental management of operations and works, and regular internal audit.

The most recent report by auditors for trunk road operating companies states that "The quality, environmental and health and safety management systems were operated successfully by all OCs (operating companies)"¹². In practice these provisions do not relate strongly to biodiversity. For example, the external auditor carried out two Environmental Management System (EMS) audits involving site and depot visits. These focused on environmental legislation relating to waste management and pollution control.

Schedule 5, Part 2 sets down requirements in terms of record keeping (in particular to ensure continuity between contractors) but does not specifically refer to biodiversity. Schedule 5 part 3 relates to reporting, and includes a set of standard performance criteria which may be published. None of these relate to biodiversity as such, although audited implementation of QMS represents a possible lever.

¹² <http://www.performanceauditgroup.co.uk/pubrep11/04.htm>

Schedule 7, Part 5 offers much more opportunity from a biodiversity perspective. This requires the appointment of a chartered landscape architect, and the preparation of:

- A 5 year landscape maintenance and management strategy;
- a landscape development plan;
- a landscape maintenance review;
- a 3 year landscape improvement plan
- a pesticide reduction plan
- an annual landscape report.



Figure 11. Trunk road verges

The landscape maintenance and management strategy shall be prepared on a route by route basis, with more detail relating to “areas of specific and varied character”. The requirements are set down in Box 3.

Box 3: Five Year Landscape Management and Maintenance Strategy for Trunk Roads

(from Schedule 7, Part 5 of 3G Contract for the management of the trunk road network)

The strategy shall include but not be limited to the following:

- (i) clear cross-referencing with the Routine Maintenance and Management System landscape inventory
- (ii) location plans showing the routes and areas under review
- (iii) brief descriptions of the routes and areas under review highlighting
 - (a) the general character of the location
 - (b) the appearance and value
 - (c) comments on the quality of the landscape and
 - (d) any ecological elements which may impact on or be affected by the maintenance and management of the Landscape Areas
- (iv) a range of photographs typical of the various character zones
- (v) perceived main issues relating to the continued management of the Landscape Areas in this location taking into account topics such as
 - (a) safety
 - (b) visual aspects
 - (c) general amenity
 - (d) biodiversity
- (vi) consideration of any relevant related studies plans or strategies for the location including but not limited to
 - (a) route action plans
 - (b) route accident reduction plans
- (vii) general proposals for the future development of the environment related to the Trunk Road.

The **landscape development plan** should include a maintenance review, three year landscape improvement plan and a pesticide reduction plan and should be developed in conformity with Cost Effective Landscape: Learning from Nature; the Trunk Roads Biodiversity Action Plan (both of which have been discussed in section 5); the Scottish Biodiversity Strategy (Scottish Executive 2004); and the Inventory of Wildlife Mitigation Measures (Scottish Executive 2000).

There is also a requirement for a **landscape maintenance review** to identify areas which could be improved by alternate maintenance regimes to meet amenity, efficiency and biodiversity requirements. On the basis of this the Director (i.e. Transport Scotland) may issue an order for alternate cyclic maintenance arrangements.

The three year **landscape improvement plan** includes provision/proposals for fully costed planting initiatives to improve amenity, efficiency and biodiversity.

The **annual landscaping report** shall address general condition of landscape areas, effectiveness of cyclic and alternative cyclic maintenance activities, progress with landscape development plan and condition of planting areas, and details on progress with herbicide reduction.

Box 4: Landscape reporting by trunk road contractor to Transport Scotland – sample extracts relating to “landscape areas” and biodiversity

a) From Amey SW Annual Landscape Report Year 5

Wildflower Areas

- Some species-rich verges have been identified and it is proposed to continue to monitor these areas and carry out surveys where necessary and introduce grassland management to identify and improve these. There are also areas with good woodland flora where management operations have been adapted to suit individual conditions.

General effectiveness of cyclic maintenance and alternative cyclic maintenance activities

- This has been generally effective and in accordance with the contract. No alternative cyclic maintenance activities are required. Cyclic maintenance has been generally effective and in accordance with the contract. Minimum maintenance grass areas have been reclassified as “Scrub” and these proposals are awaiting consent from the client.

b) From Amey SW Annual Landscape Management and Maintenance Report year 6

Biodiversity (all routes)

- The collection of records of wild mammal road deaths (mainly deer, badger and otter) applies to all routes.
- Areas of species-rich grassland are recorded on the inventory when noted with a view to monitoring.

General proposals for future development of the environment as identified in 2006 (all routes)

- Vegetation on the route will be managed in accordance with the guidance contained in the draft ‘Trunk Road Biodiversity Action Plan’, ‘Cost Effective Landscaping: Learning from Nature’, and any other advice issued by the Scottish Executive. The objective is to work towards sustainable landscapes fitting their environment.
- Planning and strategy to achieve the objective will be developed in consultation with Local Biodiversity Officers and local conservation interest groups where these exist.

Biodiversity (2009 additions. A75).

- Review verge categories with the local biodiversity officer and implement specialist maintenance regimes where required.
- Monitor protected species road deaths particularly in the Glen and seek opportunities to provide mitigation.

Despite all these provisions, specialized management for biodiversity is not a feature of these contracts, and indeed may require a variation: bringing in local expertise to provide more specialized management, should that be judged worthwhile, would require a variation and would need to be known to the Performance Audit Group (PAG) for their auditing role. (A75 3G contract)

The latest (Fourth Generation or 4G) contracts seek to further strengthen the inventory database through a standard geographically referenced database. This includes defined “area items” such as grassed areas, wetland, woodland, invasive species and wildlife mitigation items including specific structures such as wildlife related fencing or passages, wildlife signs and e.g. wildlife inspired planting. In all cases details should be recorded

relating to location (GIS polygon) ownership, management, features of interest etc. These represent a notable opportunity for wider engagement in and advice on biodiversity management.

Maintenance contracts are relatively demanding, and require amongst other things a three year landscape improvement plan and an annual landscape report. These plans and reports are detailed and usually address local biodiversity as well as landscape issues. They offer a major opportunity to influence verge management for biodiversity

6.3.3 Construction and upgrading procedures and contracts

Significant road upgrades and new build require screening or standard appraisal, and once approved in principle require full environmental assessment (EA).

Appraisal requires that potentially affected designated sites and protected species be listed¹³. EAs are undertaken by specialist EA contractors and document in some detail potential impacts on wildlife and the mitigation required. For example the chapter Ecology and Nature Conservation in the Environmental Statement (ES) for the A96 Threapland Junction improvement¹⁴, runs to over 50 pages (although much of this is allocated to standard methodology). The underlying work included major public consultation, Phase 1 habitat survey, an otter survey, and detailed consideration of effects on water vole, bats, red squirrel, and breeding birds. These assessments have particular regard for designated sites, various listed habitats and species.

Mitigation measures proposed include the employment of a scheme ecologist (“ecological clerk of works”) for on site advice relating to all operations, awareness raising and briefing of workers; pre-construction checks in relation to particular species; protected species licenses; marking of routes to avoid damage to sensitive area; and implementation of specific mitigation measures related to a neighbouring SSSI and local watercourses (including application of SUDS principles); minimal tree removal and other more specific measures relating to identified interests. Positive measures are also envisaged *“The trees, scrub and any grassland mixes specified will be native species and have local provenance, in accordance with best practice”*.

The EA process required for any significant road upgrade allows for substantial “design for biodiversity” and may be a significant tool for enhancing roadside verge biodiversity

6.4 Other Roads

6.4.1 Standard practice

There is no standard guidance on LA verge maintenance in Scotland, but the booklet “The Management of roadside verges in Devon”¹⁵ offers an insight into the perspectives and priorities of a Local Authority in the UK. Although the booklet appears to be highly wildlife friendly with plenty of images of wildflowers, the actual objectives of grass cutting are set down in box 4. Wildlife here is not a primary objective, but rather a constraint on higher priority objectives.

^{13A} [http://www.transportscotland.gov.uk/files/STAG Appraisal Summary Tables ASTs Part 2 updated April 2009.pdf](http://www.transportscotland.gov.uk/files/STAG_Appraisal_Summary_Tables_ASTs_Part_2_updated_April_2009.pdf)

¹⁴ <http://www.transportscotland.gov.uk/strategy-and-research/publications-and-consultations/a96-threapland-junction-improvements-environmental-statement>

^{15A} <http://www.devon.gov.uk/vergesbooklet.pdf>

In practice in Scotland at the present time there continues to be a serious backlog of road surface repair work required.¹⁶ This now normal situation puts managers under pressure to make savings where they can.

Over time a basic approach has developed:

- Two or (occasionally) three cuts each growing season of 0.8 to 1.2m width along the roadside (A&B roads) to maintain the “grass service pavement” at less than 30cm¹⁷.
- Two or three cuts of more extensive grassland areas to maintain clear sightlines(A&B roads) – again keeping grass to less than 30cm.
- Verges on “C” and “U” class are often cut just once per year, however some “C” and “U” class roads, which carry large volumes of local and tourist traffic, may be given two cuts per year.
- Ditch and culvert clearance as required to ensure free flowing water and minimize risk of flooding on the roads
- Cut of the “hinterland” perhaps once in three years, and cutting of scrub as required or when people complain.

Box 5. Devon County Council: objectives for grass cutting

- To maintain visibility splays for highway users;
- To obviate any fire risk;
- To control brushwood/scrub;
- To control harmful weeds;
- To facilitate maintenance work including ditch cleaning etc;
- cutting around structures etc to allow their correct functioning;
- to provide a refuge for pedestrians/equestrians where no footway exists;
- cutting around street furniture to provide forward visibility to signs etc.

Cutting is limited to achieving these objectives whilst not jeopardising the interests of wildlife.

Extract from The Management of roadside verges in Devon.

<http://www.devon.gov.uk/vergesbooklet.pdf>

South Lanarkshire’s policy is summarised for the public on their [website](#):

“How often we cut the grass on road verges depends on where they are, the speed limit of the road and the weather”.

“As a guide, rural verges are cut twice a year with certain junctions cut up to six times a year. Urban verges with a speed limit of 50mph, or the national speed limit, are cut six times a year and sometimes lanes are closed to allow this”.

“Urban verges in residential areas are scheduled to be cut up to 18 times a year, weather permitting. This work is generally done from April through to October”.

¹⁶see Maintaining Scotland’s roads - Prepared for the Auditor General for Scotland and the Accounts Commission February 2011.

http://www.audit-scotland.gov.uk/docs/central/2010/nr_110216_road_maintenance.pdf

¹⁷ 30cm was mentioned a couple of times as the maximum acceptable length and appears to be the length at which heads begin to develop, which is presumably associated with the much harder stems which develop, making cutting more difficult and causing more wear and tear on machines.

“Grass cuttings are not lifted, except in areas where landscaping projects are underway”.¹⁸

Standard practice for LA maintained roads is similar to that for the trunk road system, though much more intensive cutting is usually practiced in or near urban areas.

6.4.2 Maintenance contracts

An example of a contract specification from West Lothian Council is provided in and shows in some detail how codes and objectives are translated into instructions. The following summarizes some of the key relevant provisions in this contract:

- the engineer reserves the right to alter starting dates for the cutting programme; instruct the contractor to cease cutting (e.g. because of weather and slow growth); or to modify cutting in response to complaints from the general public relating for example to sight lines).
- Operators must attend an induction programme;
- The cutting cycle should be 8 weeks, corresponding to 2 machines (i.e. to complete the work within the specified cycle).
- The cutting should be carried out in a sequential manner as defined in route sheets; and time sheets shall be submitted;
- Cutting shall be to a height of 40-50mm;
- Cutting of the grass shall be to an even height across the entire area and shall include all flower and seed stalks for which different machinery and a separate operation may be required.
- Heavy deposits of clippings in heaps or windrows will not be acceptable
- Width of cut on A,B,C and U roads is 1m
- Do not cut roadside verges identified by the Scottish Wildlife Trust as of conservation value until and unless instructed accordingly by the Engineer. A schedule of such locations will be made available to the Contractor (list, not map, supplied).

The reference to flower/seed stalks is notable and corresponds with comments from contractors that flowering stalks represent a problem – they are hard – and from their perspective it is better to get in and cut before they develop.

Aberdeenshire Council’s website provides a similar level of information, informing of a decision to reduce the amount of cutting and indicating this will also benefit biodiversity:

“The (new) regime will consist of one full cut of the entire network, with a possible second treatment at junctions and some identified visibility splays where this is deemed necessary. The commencement date for the grass cutting has been set to maximise the control of the vegetation height.

“The maintenance regime and schedule is as follows:

- *One full cut (visibility/junction/verge swathe cut) - early June-mid July*
- *Further cutting to junction/visibility as instructed - August-September*
- *The full width verge cutting regime will be carried out over a 6 year rolling programme.*

¹⁸ Not lifting the grass cuttings is one widespread practice that limits the biodiversity value of routine operations. The cuttings help keep nutrient levels higher than the level at which our native grassland species would be competitive and also lower the chance of seeds germinating. It has also been suggested that scarification associated with removal may also enhance conditions for herbs. The logistics of lifting them significantly add to the cost of cutting.

“This regime is intended to reduce the quantity of cutting, without compromising road safety. An additional benefit is that this will support our on-going commitment to increase maintenance regimes that improve biodiversity. The impact of the regime will be closely monitored.”

In practice it is not clear that a single full cut June to mid-July will benefit biodiversity, and this may represent an opportunity for SNH or LBAP to monitor the wildlife impacts of this change.

Some councils invite reporting of untidy verges, signalling a willingness to deal with concerns raised by members of the public. Without corresponding information explaining why a verge might be untidy, that tactic is likely to favour certain perceptions of amenity over a varied vegetation structure for biodiversity.

Broadly speaking contracts for roadside maintenance issued by local authorities are less demanding than those for the trunk road system, but also more closely supervised by the LA engineer. Although biodiversity is rarely specified there is substantial flexibility and opportunity for significant influence from a biodiversity officer or SNH. However – following on from safety and cost, meeting public demand is the main priority.

6.5 Costs associated with existing management practice and sensitivity to change

Typical local authority budgets for roadside maintenance are very limited. For example, that of East Lothian is £35,000pa. That of Moray is £110,000 for roughly 1,000m of road - in other words roughly £110/mile.

All those we talked to highlighted the reduced budgets and the correspondingly reduced level of maintenance. Cutting is now limited in most cases to the operational zone (0.8 to 1.2m from the kerb) and sight lines. Rank vegetation and/or scrub is increasing in the “hinterland” and is often only tackled once in 10 years. Drainage ditch clearance is often done only on a needs basis, and flooding of roads is increasing.

The following comments from contractors and managers provide some insights into the possible impact of changes in practice to accommodate biodiversity interests:

- “We have a four month cutting season. If we tried to do it all in two months it would double the costs”
- “If we had to move ditch spoil away from the verge, it would increase costs by a factor of perhaps 8: we would need another vehicle; another man; and it would be classified as waste so we would need permits.....”
- “If we let the grass “get away” or “head” it is more difficult to cut and costs more in the end”

The primary factor affecting costs of roadside maintenance relates to logistical efficiencies – how can X men and Y machines be deployed to undertake two cuts over a 6 month growing season along Z miles of road. For most LAs or OCs it is simply not possible to make two cuts at the optimal (for biodiversity) time for anything more than a very small proportion of the roadside verge “estate”.

7. MANAGEMENT TO CONSERVE AND ENHANCE BIODIVERSITY

This section reviews the rationale and scientific basis for interventions in verge management to promote biodiversity, and summarizes the most common prescriptions. It also summarizes and reviews existing initiatives, their objectives, and associated guidance/recommendations specifically designed to conserve and enhance biodiversity - drawing on examples from Europe, the UK and Scotland.

7.1 The scientific basis

The biodiversity quality and ecosystem service value of roadside verges is influenced by a variety of factors including:

- Soils, climate, aspect and wider ecosystem context;
- History, including planting/seeding/fertilizer and chemical use;
- Run-off, fertilisation;
- Pollution including salt and emissions;
- Grazing (not just by large herbivores);
- Mowing regime (frequency, length);
- Ditch management regime;
- Hedge/scrub clearance regime.

The **mowing regime** is widely regarded as a critical factor in the management of verges for biodiversity. However, an informed choice of mowing regime will depend on more specific biodiversity objectives. For example, in the Netherlands it has been shown that cutting and removing roadside vegetation twice a year, compared with less frequent mowing, results in more species of small mammals, reptiles, amphibians, and insects. However, mowing once every 3-5 years results in more bird's nests (Forman and Alexander 1998). The timing of cutting is also critical – but this varies between phyla and to a lesser extent species.

Parr and Way (1988) compared the effects of 11 cutting treatments on roadside verges in Cambridgeshire over a period of 18 years. The treatments were combinations of cutting date, cutting frequency, cutting machine and leaving or removing cuttings. Vascular plant species-richness was lowest in the uncut plots and highest in plots cut twice per annum. Removing cuttings led to an increase in plant species-richness, mainly due to an increase in herbs. Measurements of nutrients led to the conclusion that the increase in species-richness was not due to reduced levels of soil nutrients, but was probably associated with the disturbance and scarification which accompanied the removal of cuttings by hand raking, and with the alleviation of the smothering effect caused by leaving cut vegetation on the verges.

Valtonen *et al* (2006)¹⁹ compared the Lepidoptera communities on road verges subject to three different mowing regimes in terms of timing and intensity of mowing (mowing mid-summer; mowing late summer; and partial mowing (a narrow strip next to the road). They showed that the mid-summer mown verges had “lower species richness and abundance of butterflies and lower species richness and diversity of diurnal moths compared to the late summer and partially mown verges”. They suggested that “by delaying the annual mowing until late summer or promoting mosaic-like mowing regimes, such as partial mowing, the quality of road verges as habitats for butterflies and diurnal moths can be improved”.

Noordijk *et al* (2009) found that mowing twice a year with hay removal resulted in the highest numbers of herb species and flowers (correlated also with species richness), and the highest numbers of insects and flower visits. An early summer cut benefited insects as a result of

¹⁹ <http://www.raco.cat/index.php/ABC/article/viewFile/56070/66067>

reflowering later in the season. The authors were of the view that rotational mowing (i.e. leaving some vegetation refuges intact after mowing events) might compensate for the loss of flowers straight after mowing and further increase insect abundance. However there are dangers associated with varying the mowing regime, since most well established plant communities depend upon consistency of management.

In a more comprehensive study Noordijk *et al* (2010) compared the effects of five mowing regimes on beetles, weevils, ants and ground-dwelling spiders in low, medium and highly productive verges. Mowing twice per year with hay removal resulted in higher insect abundance and, in the case of medium and high productive sites, highest arthropod species richness. Low diversity and low abundance was associated with no management. They also noted that the number of flowering plant species and total flower abundance appeared to represent useful indicators of arthropod diversity.

A recent investigation into the effects of road verge management on invertebrate populations²⁰ in Worcestershire gave ambiguous results, suggesting some invertebrates benefited from significant management; others did better in a neglected plot. It was concluded that, broadly speaking, some cutting is good (neglect tends to result in rank nettles, or docks, or brambles) but over-management (very short grass) is not good.

Studies in Holland have shown that the **width** of the verge, or indeed the width of actively managed verge, may also be an important factor affecting not only the species present, their movement and dispersal, but also their susceptibility to roadkill (Vermeulen 1993, 1994; Vermeulen & Opdam 1995).

Planting/presence of shrubs and trees has been shown to benefit particular forms of biodiversity, especially birds (Forman and Alexander 1998) but may reduce the extent or quality of (for example) herb-rich grassland. On the other hand Le Viol *et al* (2008) showed that hedgerows on highway verges were associated with significantly higher plant richness, but similar spider richness. The presence of planted hedgerows was also associated with increased biodiversity at the landscape level for both plants and spiders. Their results suggested that a mosaic of planted hedgerows and grassland habitats is crucial for the maintenance of biodiversity at a landscape scale. Trees and scrub close to roads does however represent a hazard to birds. Orłowski (2008) showed that close proximity of trees and shrubs to roads was associated with increased road mortality.



Figure 12. Roadside trees and shrubs

The science is broadly consistent. Overall species diversity (plants and invertebrates) is likely to be higher with two cuts a year and removal of hay, though the actual timing may be

²⁰ Invertebrates and road verge management. Worcestershire Record No. 27 November 2009 pp. 14-16

quite critical for some species. The effect of mowing regime on small mammals is unclear, although it is self-evident that regular short mowing would represent a threat. Hedgerows are likely to generate benefits overall, though they may have local negative impacts on herb rich grassland. Research relating to ditch and scrub management is very limited.

7.2 The Guidance

7.2.1 SNH

SNH has produced an advisory leaflet on roadside verges²¹ “Management of roadside verges for nature conservation”. This advises two cuts: at the end April/beginning of May and again at the end of August/beginning of September. It suggests allowing hedges to grow thicker and taller wherever possible, and replanting to fill gaps as necessary. Ditches should be cleared a little often, preferably one side at a time allowing vegetation to recover. It suggests contacting a local conservation organisation to survey possible valuable verges and directs readers to advice from FWAG, BTCV, SWT. It was notable that none of the contractors we talked to were familiar with this leaflet.

SNH is also currently on the steering group for the revision/updating of the basic guidance document “Cost effective landscape – working with nature” – although as we have previously noted this is targeted more at road construction and upgrades rather than routine maintenance.

7.2.2 JNCC

JNCC offers good basic advice on “common standards” for assessing and monitoring lowland grassland and ditch systems (JNCC 2004, 2005). These are detailed, but also include warnings about the difficulties of making judgements about condition, suggesting it really needs to be done by a specialist rather than relying on presence of positive indicators and absence of negative ones.

7.2.3 Flora Locale

Flora Locale “promotes the restoration of wild plants and habitats for the benefit of biodiversity” and has produced a leaflet “Flowers on the verge: planting on countryside road verges”.²² It notes that planting trees and flowers on roadside verges is increasingly popular, and offers general advice on consultation, maintenance issues, site assessment, health and safety, and selecting trees and flowers to plant – emphasising the need to use only native species. It also provides advice on sourcing, ground preparation and maintenance.

7.2.4 The North Yorkshire Biodiversity Action Group

The North Yorkshire Biodiversity Action Group has produced an advice note “Special Interest Verge Management”. Key recommendations here are summarized in Box 6. This advice may be regarded as typical of currently accepted “best practice”. While it is broadly consistent with the science as reviewed above, it goes somewhat further in its precise definition of mowing dates. For example some studies have shown that an early summer cut (rather than the Spring cut recommended here) can be effective in stimulating re-flowering and supporting diverse insect populations (Noordijk *et al* 2009). It should also be noted that the nutrient effects of hay removal may be less significant than other factors associated with removal, such as scarification and lack of smothering (Way, 1970).

²¹ <http://www.snh.org.uk/pdfs/publications/heritagemanagement/roadsideverges.pdf>
²² www.floralocale.org/do_download.asp?did=23981

Box 6. North Yorkshire BAG Verge management for biodiversity

- Avoid cutting whilst the verge is still flowering.
- If the verge is to be cut only once, cut later in the year, to allow the flowers to set seed (approx. August / September),
- For verges requiring two cuts (usually for safety reasons), make the first cut prior to flowering (approx. March / April), then allowing the verge to flower, making the second cut after seed has set.
- To prevent the loss of structural diversity an area of verge should be left uncut. On wide verges this can be a strip at the back of the verge. On narrow verges consider leaving short sections or bays at intervals along the stretch of road. Every few years (approx. 3-5), a full width cut should be made late in the year, to encourage species diversity and prevent scrub and saplings growing.
- Following the cut, verge cuttings should be removed from the verge, either by bailer or by hand. Removal of these cuttings will prevent enrichment of the soil and a build up of a mat of vegetation, which would lead to the loss of wildflowers.
- Where possible, the sustainable after-use of verge cuttings is advocated. For example, cuttings rich in wildflower seed can be used as green hay to benefit other local verges or grasslands or cuttings can be composted locally.
- Avoid leaving hay or silage bales on verges – these will rot down and enrich the soil, leading to a reduction in biodiversity .
- Avoid the use herbicides and/or pesticides.
- Management of hedgerows and scrub on a rotational basis is necessary to prevent shading out of wildflowers. Following the management, any cuttings should be removed from the verge.
- Where management of adjacent ditches is required, avoid depositing the spoil on the verge, as this can smother vegetation and lead to nutrient enrichment.
- Avoid carrying out management to adjacent features in wet conditions as machinery will rut the verge

7.2.5 Sustrans

Sustrans has recently developed a technical information note on grass verge management²³. Although primarily directed at the verges of cycleways, this is interesting for two reasons – firstly because the objectives are not purely biodiversity related (the primary objective is a national cycle network), and secondly because there is much more attention given to the desirability of a variety of management interventions to create natural progressions, habitat mosaics and structural diversity. Some key aspects of the advice include:

- 2 cuts a year of a 1m verge (sometimes 1); height of cut 10-15cm; allow orchids to seed
- 1 late cut per year of other grassland (remove cuttings), but leaving some sections uncut
- Remainder of verge managed to create a mosaic – patches of scrub and brambles; patches of long vegetation

²³ <http://www.sustrans.org.uk/assets/files/design%20and%20construction/Ecology%20Note-02%20-%20Grass%20Verge%20Management.pdf>

7.2.6 *The Scottish Rural Development Programme (SRDP)*

The SRDP, though it does not specifically address roadside verges, does give prescriptions for a “grassland strip” around arable fields which might serve as guide to what might lead to improvement of grassland strips along roads:

- Strip is between 1.5 m and 6 m in or around arable field
- Width is at least 3 m if for the benefit of hen harrier, corn bunting, barn owl or kestrel
- Suitable grass seed mix has been sown;
- No application of fertiliser/ FYM/Slurry
- No scrub control has taken place without prior written agreement from Scottish Ministers
- No use of pesticides except as authorised by Scottish Ministers for activities such as control of non-native plants or injurious weeds
- Not grazed or topped to less than 100 mm

7.3 Initiative and Action in Scotland

7.3.1 *Local authorities and biodiversity action plans*

Local authorities are the primary custodians of Local Biodiversity Action Plans and these usually contain something explicit on verge management – there may even be a specific verge management plan. Table 3 summarizes initiatives relating to roadside verge management in a range of LBAPs, and below we discuss in more detail some selected examples. Information is based on both published sources and telephone discussions with some LBAP officers.

Taken together these represent a significant level of awareness and commitment to action – in principle at least.

7.3.1.1 East Lothian²⁴

Some years ago, in partnership with the Scottish Wildlife Trust, the cutting of rural verges in East Lothian was amended to encourage wildflowers. Cutting was reduced to two cuts per year and the first cut was the single width of a flail. Specific, and generally small, stretches of flower-rich verge were also identified. These were cut once only, at the end of the summer. These verges were looked after successfully by volunteers but for various reasons the scheme is no longer effective.

Roadside verges may also be important walking routes for local communities. Consequently, a simplified cutting regime has been developed that encourages biodiversity, whilst also incorporating local walking routes. Details of the cutting contract are given in Annex 4.

7.3.1.2 Dumfries and Galloway

Dumfries and Galloway have since the 1990s managed a number of verges as part of implementing their draft Roadside Biodiversity Action Plan 2000. The current Biodiversity Officer inherited the plan. The general prescriptions are simple, basically:

- April/May - first cut of 1m swathe on A class roads
- June - only cut of 1m swathe on B, C and unclassified roads
- July/August - second cut of A class roads (and other roads in response to road safety issues/tourist routes)

²⁴ Information from Stuart McPherson, E Lothian Council

The LBAP Officer emphasised that the road engineers developed the plan themselves – subject to advice from wildlife staff. This negotiated potential interdepartmental issues and it is a widely recommended technique when current practice needs to address new objectives²⁵. He added a tale:

“The engineers were unwilling to look at any type of modified management in the one metre strip closest to the carriageway, no matter how important the biodiversity. This created a few problems on minor rural roads where the verge was seldom more than a metre wide anywhere along its length! However, my feeling was that in many cases this was more of a problem perceived by the public than a real one. I can think of one minor road verge where we received complaints that flowers were being cut in June whilst still in flower. However, given that they were next to a wood, they were woodland rather than grassland species that would have naturally died back as the canopy came into leaf. Having monitored the verge for the last 10 years or so of June cutting, I have been unable to detect any deterioration of the flora.”

There are also specifically tailored prescriptions for their Conservation Verges. That has not stopped them being forgotten about on at least one occasion; however the day-flying moths were still present the following year. This may be because the original routine treatment of that verge was generating a worthwhile biodiversity outcome – i.e. the additional conservation prescription was a “could do” or “should do” rather than a “must do”, which may often be the case with less understood species in our native biodiversity.

Countryside rangers help manage the Conservation Verges that the machine cannot get to (or would cause damage to the surface if they did). They do not attempt to involve local groups in this management due to the burden of risk assessment and mitigation for the dangers involved. This is unfortunate because engagement is a key dimension of their work. Whilst community engagement can highlight the importance of biodiversity, there is also a desire expressed by communities for the approach to their towns, districts and villages to look well cared for, meaning tidy – something the best biodiversity management may not deliver!

7.3.1.3 Orkney Conservation verges

Following public debate about verge mowing, thirty-six verges were identified by the council in the late 90s and monitored to establish whether the no-cut regime applied to them was working. They soon showed reductions in species richness. The local SNH Officer wrote in [SNH's magazine](#).²⁶

“It took only a couple of years to see the changes. Orkney's elite no-cut verges began to look troubled. Once famed for their floral fineness, the conservation verges were starting to show signs of going downhill. More galling was that some of the frequently cut verges were looking better than the conservation ones.”

A detailed survey was undertaken (Crossley, 2010)²⁷ which resulted in revised prescriptions: Recommendations for future management chiefly comprise:

- annual mowing of most of the Conservation Verges;

²⁵ All the copies of this pre-electronic document have now been given away to other UK councils keen to emulate their experience so we are unable to provide a link.

²⁶ SNH – The Nature of Scotland issue 5, Autumn 2009

²⁷ http://www.snh.org.uk/pdfs/publications/commissioned_reports/367.pdf

- mowing less often, or avoiding mowing altogether, exceptional vegetation that would not benefit or would be harmed: this chiefly comprises naturally very short, herb-rich grassland; dwarf shrub; and dune grassland;
- twice-annual mowing of some of the most overgrown Conservation Verges.

The recommendations may be implemented by a change in management that will apply to all Conservation Verges except those supporting vegetation of exceptional quality and the most overgrown ones. Management other than the norm may be implemented in two ways:

- by specific management instructions for some longer and more distinct sections, (identified in this report); and
- more generally, and applying to verges of more mixed quality, by instructions to mower operators as to how to recognise vegetation that should be treated differently.

The report goes on to emphasise the desirability of removing cuttings but adds:

“Removal also has the great longer-term benefit of reducing soil nutrient levels and with them the vigour of coarse and less desirable species. It is recognised that the cost of removing cuttings from all Conservation Verges is unlikely to be acceptable, but it is recommended that it be carried out on selected Conservation Verges as a pilot project.”

These new prescriptions are in line with advice from elsewhere. More detail, including the assessment skills expected of operators so they can determine which cutting prescription to use as they go along, is available in the report, and background and objectives are also given in Orkney Local Biodiversity Action Plan (LBAP)²⁸ (p.14). The Orkney verges are probably the most comprehensively studied in Scotland and may also be the simplest in terms of origin, structure and context. Verge managers from other areas should benefit from updates on the success or otherwise of their prescriptions.

Box 7. Orkney initiative – key findings/management needs

1. Most verges benefit from annual mowing.
2. Some require less mowing, especially short herb rich grassland.
3. Some overgrown ones require more.
4. In all cases it is better to remove mowings – but expensive.
5. Specific instructions for some verges with particular qualities and needs?
6. General training on how to recognise special vegetation

7.3.1.4 Other LBAP and local council initiatives in Scotland and the UK

The various opportunities identified by LBAPs in Scotland relating to roadside verges, and associated proposed actions or initiatives are summarized in Annex 5. Practical actions proposed include:

- Awareness raising
- Liaison/discussions with verge managers
- Establish demonstration sites
- Use of locally appropriate grass and flower mix
- Seed collection by children for use in reseeded verges
- Encouragement to use bee friendly seed mixes
- Create urban wildlife flower meadows on verges

²⁸ http://www.orkney.gov.uk/Files/Planning/Biodiversity/Local_Biodiversity_Action_Plan_2008-2011.pdf

- Survey of the roadside verges, hedges, trees and ditches
- Identification of special “conservation” verges
- Use of conservation verge markers
- Negotiation of verge cutting schedules
- Encouragement for later cutting
- Specific cutting regime for identified conservation verges (e.g. 2 cuts (2nd cut late); or 1 (late summer) only; or none depending on nature of interest)
- Reduced cutting of hedges
- Less deep clearance of ditches
- Specific measures for priority species
- Manage of invasives
- Increase the number, continuity, visual interaction and functionality of wildlife corridors
- Develop sustainable transport projects
- Establish working group
- Possible inclusion of biodiversity specifications in contracts
- Training of contractors
- Develop a roadside verges Habitat Action Plan (HAP)

Broadly speaking these are also similar to the provisions relating to verges in LBAP initiatives in England.²⁹

7.3.2 *Volunteers in wildlife groups*

Scottish Wildlife Trust, although not alone, have over the years been central to discussions on raising awareness about the biodiversity value of verges. As a membership organisation they have supplied volunteers for a number of projects.

The verge conservation work in East Lothian in particular was motivated by active SWT volunteers and when they moved on that momentum was missed.

SWT has also worked with Midlothian Council to identify special verges with notable species. Verges were then marked by the Council to ensure that they were not cut prior to 1st August, but received a full cut after this date. At least nine stretches of verge were involved in this project. Due to a variety of factors this project has not been continued.

Box 8. SWT treatment of verges with the hemi-parasite yellow rattle

We have treated verges by the side of cycle path with the hemi-parasite yellow rattle. By siphoning off nutrients from its host grasses it cuts their height by at least a half. On the track concerned it may do away with the need for cutting all together. It also had a remarkable impact on biodiversity and both Northern Marsh orchid and Broad Leaved Helleborine have invaded. We gathered the seed from local populations and simply broadcast it thinly over the verges. Amazingly there has been a remarkable establishment rate and users of the track are slowly carrying the seeds along its length. *This plant would seem to have great potential for cutting the cost of verge cutting and at the same time increasing biodiversity.*

²⁹ <http://www.whatdotheyknow.com/request/10647/response/27803/attach/4/Bedfordshire%20Road%20Verge%20Nature%20Reserves%20October%202002.pdf>
[http://www.somerset.gov.uk/irj/go/km/docs/CouncilDocuments/SCC/Documents/Environment/Country side%20and%20Coast/Somerset%20Roadside%20Verges%20%26%20Green%20Lanes%20HAP.pdf](http://www.somerset.gov.uk/irj/go/km/docs/CouncilDocuments/SCC/Documents/Environment/Country%20side%20and%20Coast/Somerset%20Roadside%20Verges%20%26%20Green%20Lanes%20HAP.pdf)

Currently the corporate level of SWT sees their reserves as the priority and does not have any active involvement with verge projects but some local groups still do. Roy Sexton, Chairman, Stirling Member Centre SWT and a volunteer, provided an account of their treatment of verges with yellow rattle (Box 8) and their campaign to protect orchids on an embankment from succumbing to scrub succession (Box 9). These both highlight the advantage for local authorities if they consciously listen and respond to interest groups containing people with high levels of survey and management expertise and willing to provide that on a voluntary basis.

Box 9: Example of direct intervention to conserve a “special verge”

Some six years ago the Stirling Member Centre of SWT became concerned that a large orchid rich embankment on the A9 was slowly getting covered in scrub. A count by our members established that there were 2,565 northern marsh and common spotted orchids as well as hundreds of plants of the rare adders tongue fern. We offered help to the Ranger Service who had undertaken in the Local BAP to “Encourage local communities to identify verge habitats of biodiversity importance and facilitate participation in the management of these”. Over the next three years little happened except the hawthorn and birch continued to grow together with our impatience. Apparently the project had stalled over a failure to establish site ownership. Eventually we intervened by writing to the likely owners and established that the Council’s Roads Department was responsible! Since then Stirling Member Centre have provided volunteers on four work days and cut back the hawthorn and birch scrub under Ranger Service supervision so by this November the site was eventually cleared.

From Roy Sexton, SWT

Generic guidance for enhanced verge biodiversity usually recommends a standard two cut mowing regime with cuts in early spring and late summer; or a single cut late summer (with removal of hay if possible in both cases). Variants of this may specify the height of the cut or require a height gradient (for example see Annex 4). Sustrans guidance goes somewhat further in seeking to promote diversity of structure and habitat mosaics. Some initiatives have developed tailored management regimes for specific conservation interests. Rather little guidance is offered on ditches, hedges and scrub beyond not cutting hedges every year.

7.4 Habitat Networks

There has been substantial interest in landscape level approaches to nature conservation and the delivery of ecosystem services for some time, and the Scottish Biodiversity Strategy has a specific objective relating to landscapes and ecosystems. The 2030 outcome for this objective envisages *“the overall pattern of land and water use in both urban and rural environments supports a rich and varied array of wildlife. Organisms can move, feed, reproduce and disperse effectively, and are better able to adapt to changing circumstances of land-use and climate change”*.

Bennet and Mulongoy (2006) provide a useful review of global experience with ecological networks, corridors and buffer zones. SNH provides a valuable summary of references (and commitments) to habitat networks in Policy at European, UK and Scottish levels.³⁰ Of particular note is that the new Scottish Planning Policy states that authorities should take:

³⁰ <http://www.snh.gov.uk/land-and-sea/managing-the-land/spatial-ecology/policy-and-legislation/strategic-and-dev-mgrs/>

"A strategic approach to natural heritage in which wildlife sites, landscape features and other areas of open space are linked together in an integrated habitat network can make an important contribution to the maintenance and enhancement of local biodiversity. Planning authorities should seek to prevent further fragmentation or isolation of habitats and identify opportunities to restore links which have been broken."

Several factors are driving increased interest in integrated habitat networks:

- The increasing use of geographical information systems (GIS) in local planning, and the availability of GIS based approaches to habitat network analysis;
- The desire on the part of many councils to demonstrate that they are improving the overall quality of the natural and living environment, and strengthening "green infrastructure";
- The ascendancy of the ecosystem approach and awareness of the importance of ecosystem services;
- They offer a focus for LBAP activity which reinforces rather than duplicates the work of SNH;
- Interest in more practical approaches to Integrated Coastal Zone Management and Integrated River Basin Management
- The high policy profile of climate change and the associated concept of resilience.

7.4.1 Modelling and analysis

An early example of seeking to identify opportunities for network enhancement was that of Quadrat Scotland (2002). This did not however identify any opportunities related to roadside verges.

Over the last decade there have been significant advances in the development of methodologies to identify and improve habitat networks, mainly based on an understanding of the needs of "focal species". The most commonly used methodology in Scotland to date has been the "beetle model" (Biological and Environmental Evaluation Tools for Landscape Ecology) developed by Forest Research (see for example Watts *et al* 2005; Humphrey *et al* 2005). These include tools for manipulating land cover data, tools for measuring landscape structure, and tools for assessing landscape function and connectivity. SNH has produced guidance on best practice in applying the approach (Briers undated a³¹, b)) and the UK Government has also sought to raise awareness of the opportunities (Parliamentary Office of Science and Technology 2008).

The "beetle analysis" has been applied in several case studies (Ray & Moseley; Moseley *et al* 2008), but we are aware of only one example where the analysis was followed by the introduction of specific financial incentives and/or planning constraints to promote network enhancement (West Lothian Council 2006).³² It is notable that none of these identify roadside verges as a significant network enhancement opportunity – but this may be related to the "focal species" focus. Furthermore, Phase 1 survey data on semi-natural habitat is the main data requirement for beetle modelling – and roadside verges are unlikely to be classified as semi-natural.

7.4.2 Promotion and initiative

There are several more practical NGO driven initiatives including for example Lothians and Fife Green Network Partnership, the Central Scotland Green Network, and the Glasgow and

³¹ <http://www.snh.gov.uk/docs/B692517.pdf>

³² http://www.westlothian.gov.uk/media/downloadoc/1799514/1842967/forest_habitat_network

Clyde Valley Green Network. There are moves to use the Beetle model or similar as a tool for development masterplanning – for example in locations such as East Kilbride³³.

“Ecological network modelling is being piloted by Highland Council and SNH for the A96 Corridor Green Network east of Inverness. Habitat networking, and awareness of the values of particular habitats and species, is a core feature in the development planning approach for the area. To ensure this priority is delivered, developer requirements will be written into the appropriate plan or planning decisions to ensure these habitats and species are protected when master planning the site. It is important to bear in mind that even if there are no protected species on site, the site may be part of a network for that species.

*We recommend that all developers consult with the Council as early as possible to consider how a development in this area can meet the aims of the green network and actively contribute towards its consolidation. One of the most effective ways of doing this is through the Council's Pre-Application Advice Service”.*³⁴

The proposals at the present time do not appear to include strategic incentives or constraints to enhance connectivity (although the incorporation of tunnels, ducts or bridges into roads projects to allow for the presence and movement of animals is specifically referred to). As far as we are aware there are no specific initiatives relating to roadside verges.

7.4.3 Scottish Rural Development Programme (SRDP)

The Regional Proposal Assessment Committees (RPACs) under SRDP have now highlighted the need for Rural Development Contract (RDC) grant applications to demonstrate ecological connectivity of habitats. As a result, some agri-environment measures are likely to be spatially targeted in the future. This raises particular opportunities to include roadside verges – and adjacent farmland – in networking initiatives, although this would require significant coordination of funding sources.

7.4.4 Climate change Strategic Environmental Assessment (SEA)

Climate change concerns have become a major driver of research and evolving policy, and the need to enhance connectivity to facilitate wildlife adaptation to climate change has risen steadily up the agenda.

The Strategic Environmental Assessment for Scottish Climate Change Bill proposals³⁵ suggests the following in relation to habitat networks:

- Publish further guidance on establishing habitat networks and adaptive management of protected sites.
- SNH Publish and disseminate the results of SNH's "Long March – spatial adaptation to climate change" study which will inform future advice on ecological networks:
- 2011. Web-based decision-support tool -Beta version 2010/11, Web publication 2011/12.
- SNH is part of the ,Steering Group for DEFRA-led project CR0439 - Protected sites, priority habitats and climate change which includes Scottish case studies and will report in 2011.
- Guidance on habitat networks published on SNH's website March 2010.

³³ http://elfhnp.org.uk/projects/integrated_habitats.html

³⁴ <http://www.highland.gov.uk/yourenvironment/planning/developmentplans/localplans/A96corridorGNPriority2.htm>

³⁵ <http://www.scotland.gov.uk/Resource/Doc/212093/0056424.pdf>

We assume that this last bullet has been met through the SNH guidance referred to above.

7.4.5 National Ecological Network (NEN)

The National Ecological Network initiative has been referred to briefly in the introduction to this report. SNH is likely to be a lead partner in further development this idea. As noted in a Board paper on NEN:

“Development of a National Ecological Network has the potential to deliver healthy and resilient ecosystems from which ecosystem services assured and enhanced. It could provide a framework within which much of SNH's work can be coherently drawn together, as well as being a basis for integrating SNH's objectives with those of other stakeholders, notably SEPA, FCS, developers and land managers.”

It is seen as a possible practical expression of “the ecosystem approach”, an important contributor to the further development of “green infrastructure”, and a response to the threats to biodiversity associated with climate change and land-use change.

A number of key landscape-scale policy drivers are encouraging the adoption of integrated habitat networks (IHN). These include:

- Planning strategies: Including SESPlan (for Edinburgh and South East Scotland) and Local Development Plans
- Biodiversity conservation strategies: BAP and LBAP
- Water Framework directive: River Basin Management Plans
- Climate change: Resilient landscapes

There has been substantial research on habitat networks, in particular forest habitat networks underpinned by the “beetle” analytical tools. There has also been substantial interest in green networks or green infrastructure in more built up areas. Roadside verges have hardly figured in these initiatives to date, presumably because of their limited width, constrained management and unsuitability for much wildlife. The NEN has had limited impact to date.

7.5 Unmanaged for biodiversity

By definition the current biodiversity value of roadside verges is the result of past and current management regimes, and it is arguable therefore that the current range of practice is likely to broadly underpin the current range of biodiversity values. In other words there is no reason to act to conserve this biodiversity unless it is clearly being seriously degraded.

Though perfectly valid this argument does not undermine the argument for enhancement, nor does it address the possibility that management changes due to financial constraints may be reducing biodiversity value.



Figure 13. Unmanaged verge apart from narrow cut edge

8. SUMMARY AND DISCUSSION

This section draws on the understanding developed in previous sections to summarize the value and status of the verge resource, the strengths and weaknesses of the existing management regime, and the constraints and opportunities for enhanced management for biodiversity and connectivity. It goes on to discuss the strengths and weaknesses of possible ways forward for SNH and other stakeholders.

8.1 Value and potential

8.1.1 Value and relative value

Verges have come to attention as outposts for biodiversity in an ever more intensely managed landscape, and they are a natural consideration as part of a National Ecological Network initiative. Their chief characteristic is that they are almost infinitely varied – exceptionally so because of the range of geographic and ecological context and the varied management practice applied. However, the most common form of management – one or more cuts each year – partially mimics that of hay meadows and certain forms of pasture. As such they may be regarded as relics or refugia of a declining habitat.

Historic management for roadside functions of sight lines, access and safety are in large measure responsible for present biodiversity values. This is strikingly demonstrated in the case of Orkney, where an initiative to reduce the cutting of verges with high conservation value resulted in a rapid decline in that value.

The functional value of verges as wildlife corridors and stepping stones is more equivocal, and limited significantly by their proximity to noise, pollution and direct physical danger. Limited width, bottlenecks, and varied or inconsistent management also limits their value as wildlife corridors in many places; and it is notable that they have hardly figured in the integrated habitat network initiatives which have been undertaken to date – although this is partly a reflection of the woodland and “focus-species” focus of most of these initiatives.

It should be emphasised however that connectivity value is highly context dependent, and some stretches of verge may have exceptional qualities – or potential qualities in this regard.

It is important also to consider relative value in terms of the total area of grass verge relative to, for example, SSSI in Scotland. Based on some very rough estimates the area of relatively high quality roadside verges is likely to be a very small proportion of the area of SSSI, or the significant areas of farmland that can benefit from conservation management under agri-environment programmes.

8.1.2 Current status and practice – strengths and weaknesses

8.1.2.1 Routine maintenance

As we have already noted the current interest is largely the result of past practice, and this has not changed significantly for many years, although there has been a general tendency to reduce both the extent and the intensity of cutting. The extent and effect of this change is impossible to determine, since the timing of cutting is as critical as the number of cuts.

Broadly speaking current normal practice– two cuts a year on verge edges and visibility splays for rural roads – is also best practice to maximise biodiversity value on a typical neutral grassland verge. The recommended height of the cut is also usually adequate to allow for reasonable survival of amphibians, reptiles and at least some small mammals.

The regime is however sub-optimal in at least two respects: the practice of leaving cut grass on site³⁶ and the actual timing of cutting.

While some verges will receive their cut relatively late in the year (dependent on their position in the cutting sequence), others will be cut before flowering/seeding, and if such practice is consistent the diversity of herbs and associated fauna is likely to be reduced at some sites.

Although this problem might be addressed by varying the cutting route sequence, this would introduce unpredictability into the cutting regime to which some species will not be able to adapt. It is unclear therefore whether such a practice would be beneficial overall.

Aberdeen Council has recently reduced its cutting to once each year, primarily to reduce costs, but also (according to the Council) to favour biodiversity. It is unclear that this will be the case. Most of the science suggests that two cuts each year is optimal (along with hay removal) although as already been noted much depends on the timing. Although one late cut should be fine, it depends how late, and whether a fleet of machines and operators can be mobilized to mow over a relatively short period in late summer/early autumn.

There are also exceptions to the standard regime described above. In their desire to keep verges neat and tidy (sometimes in response to specific complaints from the public) verges may be “overcut” resulting in greater expense and negative impacts on biodiversity. This applies especially to verges close to residential areas.

Hedges are not usually the responsibility of roads authorities and action is only likely where safety (e.g. site lines) is compromised.

Ditches are typically cleared fully using machines, and spoil is usually compacted on the bank. This tends to increase nutrient levels to the detriment of plant diversity.

8.1.2.2 Road building and improvement

Biodiversity is an evident consideration in the road design and management documents we have seen. There are examples of motorway embankments being designed so they are naturally colonised by native grassland species, complex cutting regimes on appropriate zones of an interchange, road straightening schemes leaving behind strips and islands of semi-natural grassland and woodland, and long-standing “conservation verges” where cutting is timed to favour the wildlife there. In-house or bought-in landscape professionals and ecologists keep the big companies and roads authorities compliant with codes and contract specifications. Where appropriate, environmental assessment processes ensure stakeholders views are sought.

Broadly speaking therefore we would say that current practice is appropriate, and that biodiversity as part of landscape is a significant and reasonably well informed consideration in road improvement works.

8.1.3 *Enhanced management*

There are likely to be five main elements in an enhanced management regime:

- the timing of cutting;
- removal of hay;

³⁶ There is some uncertainty as to whether this practice reduces biodiversity because of nutrient enrichment or smothering, or whether clearing the hay is associated with beneficial scarification (Way 1977).

- management for a mosaic of habitats (short grass; long grass/herbs; scrub; hedgerows; trees);
- management to maximise habitat connectivity;
- more frequent and less drastic ditch clearance with removal of spoil from site;
- targeted conservation and management of verges with special conservation interest.

Several Local Biodiversity Partnerships are already engaged in initiatives to conserve and enhance the value of roadside verges, and verges are mentioned in many Local Biodiversity Action Plans. Local Biodiversity Officers are also engaged in a variety of initiatives, and may be consulted by roads authorities.

Voluntary groups/NGOs have been engaged historically in identifying “special” verges, influencing management of these verges by the relevant authority, and in some cases actively managing for biodiversity using voluntary labour.

8.2 Policy and legal context

There appears to be something of a gap in Scottish Government policy relating to verges at the highest level, with no mention of biodiversity of roadside verges in the National Transport Strategy. However, broad policy guidance relating to roadside management is well catered for in several major guidance documents, one of which is currently being updated with input from SNH.

At a more practical level, the 3G and 4G contracts for the trunk road system include significant provision for biodiversity considerations, and opportunities for enhanced management, mainly within a landscape context. Policy guidance and contractual requirements are less favourable in respect of the bulk of the roadside verge resource under the control of local authorities.

8.3 Practical constraints

The drivers and constraints are rather different at different levels in the road system and with respect to new build/upgrade and standard maintenance.

8.3.1 Priorities and attitudes

Because roadside verges are part of roads, management to enhance biodiversity must take account of a range of other objectives, and in most cases biodiversity objectives will be of lower priority than these other objectives. These include but are not limited to:

- Road safety, including:
 - maximising visibility
 - minimising distraction
 - minimising dangers associated with attracting wildlife and roadkill
- Services maintenance
- Cost minimisation
- Attractive landscape
- Noise reduction and visual screening

These are largely addressed in existing guidance, and biodiversity tends to come fairly low down the list. It is unlikely to shift up the list given the responsibilities of the roads maintenance authorities and the priorities of the general public.

It is also worth noting that verges are not widely regarded as a major nature conservation priority (e.g. by SNH or RSPB) although they are of considerably more interest to locally rooted organisations such as SWT.

8.6.2 Communications

Despite the generally favourable policy context some biodiversity officers appear to have trouble gaining influence over roads and transport departments in local authorities.

The extent of this problem and the reasons for it are difficult to assess, but probably relate to typical internal divisions, declining budgets for road maintenance, and the reluctance therefore on the part of those managing the process to engage in a dialogue that might result in increased complexity, lack of clarity and cost.

8.6.3 Knowledge and skills

The scientific underpinning of general verge management to maximise biodiversity is well established and widely known/understood by conservation professionals.

Knowledge of the location of and specific management needs associated with exceptional or special plant communities is relatively limited except in those few local authority areas where targeted survey has been undertaken.

Knowledge of general managers in major contracting firms is generally good, with ecologists employed by some.

Local biodiversity officers well placed to advise or influence local authority verge managers, usually have excellent relevant knowledge and contacts.

However, engineers, who typically manage local authority maintenance contracts, may have limited knowledge of or interest in biodiversity. Machine operators will rarely have significant knowledge or understanding of biodiversity, but they may well be interested and ready to learn. Increased knowledge of biodiversity may well enhance their work experience.

8.6.4 Work, cost and logistics

Budgets for road maintenance are under severe pressure at all levels, and the priority is undoubtedly the road itself, and the safety aspects of roadside verges. There is no prospect of even minor increases in budget to meet enhanced biodiversity objectives.

Furthermore, although enhanced management for biodiversity appears to require only minor changes to management regimes (such as later and/or earlier cutting dates; more regular and less deep ditch clearance etc.) these changes may in fact have significant associated costs. Cutting is typically undertaken with a minimum number of operators and machines over the whole growing season (April-October). A series of routes are cut sequentially on a standard cycle (of say 8 weeks). It would not normally be possible to cut all the verges at the same, optimal time. Some verges will be cut at favourable time; others will not. In order to cut more verges at favourable times, more machinery and operators would be required, and the work would be highly irregular. In other words significant logistical and cost constraints are likely to be associated with an ideal cutting regime.

Similarly removal of spoil from site during ditch clearance is not only more costly, but raises significant issues of where the mud is to be disposed. Once “off site” it becomes official waste, and must be disposed of according to waste management regulations. Clearing one side of ditches or one side of the road is also likely to result in significant logistical difficulties

and associated costs. The operators we talked to considered these recommended practices to be impractical.

There are also a range of other practical, safety and convenience factors that drive cutting behaviour which may undermine or limit the effectiveness of “enhanced” prescriptions:

- The need to keep grass sufficiently short to be able to see hazards (such as hubcaps and other metal/wood debris) which may damage the cutting machine;
- The desirability of keeping the herbage “soft” and relatively short to make mowing easier and minimise wear and tear on the machines. Several operators noted that they try to cut before hard (flowering) stalks develop.
- The need to meet the demands of the general public for “neat and tidy” verges (fitting well with the perceptions of many machine operators)



Figure 14. Road verge hazard to cutting machinery

Local authority staff holding a biodiversity remit are well aware of the practical limitations on their road design and management colleagues. Our sample were supportive of keeping to current practice except where the verge biodiversity is noticeably high and would benefit from a specific management prescription – and often this prescription would be to avoid management changes.

8.6.5 Overall

Verges are not really a priority in the biodiversity world and biodiversity is not really a priority in the verges world; and there are significant constraints to enhanced management. As a result, most biodiversity officers tend to aim for a result only on the places people (such as SWT) have identified.

8.4 Opportunities

We have already noted that relatively modest changes to the existing management regime could yield significant biodiversity benefits – at least locally.

8.4.1 Information and awareness

There have already been various initiatives to mark verge areas of high conservation value (for example in Shetland and East Lothian) and enhanced management – typically through negotiation between local biodiversity officer and roadside managers, and these may be regarded as broadly successful. Voluntary work may be further used to refine management where appropriate.

The on-going development by Transport Scotland of the national inventory of roads and associated features, being developed as a comprehensive GIS database already provides a system for recording defined “areas”, associated features and management prescription, particularly in respect of trunk roads. Ultimately this GIS will be available to machine operators, and will allow for management variations to accommodate features of interest.

There is an opportunity here for SNH and wildlife NGOs to provide information on special conservation areas and recommended management, preferably through local biodiversity officers. This might then be used, for example to inform the planning of cutting routes and cycles to optimise cutting dates, and perhaps introduce other minor variations to management where this is deemed practicable. As one operator put it “you’ll soon be able to ping them in the cab”.

Simple guidance on management of verges for biodiversity is already available, but not widely known (especially in respect of roads under the control of local authorities). This guidance could be updated, improved and made far more widely available. It could be included in training and briefing for managers and operators.

8.4.2 LBAPs and local conservation action

The orchid story (Box 9, section 7) highlights the advantage for local authorities if they consciously listen and respond to interest groups containing people with high levels of survey and management expertise and willing to provide that on a voluntary basis. There is a likelihood that their views will be partisan to a particular variety of biodiversity – plants in this case, but it could be birds or insects or amphibians or mammals. Nevertheless, the benefits of giving a skilled and motivated set of local experts the chance to test management prescriptions should bring benefits at the national biodiversity scale. That sort of experimentation, even if there are casualties (to other desirable species) is perhaps the most significant and straightforward way road verge management can enhance national biodiversity.

8.4.3 Habitat network initiatives

There is substantial interest in more ecological and functional approaches to land and water management throughout the world. A variety of closely related approaches are widely promoted at academic and policy levels including:

- The ecosystem approach;
- The (living) landscape approach;
- Integrated coastal and river basin planning and management;
- Spatial planning;
- Integrated habitat networks;
- Green infrastructure;
- National ecological networks.

All of these emphasise the need for sustainable development; the importance of understanding ecosystem processes, functions and services; the values associated with

these services; the interconnectedness of natural systems; and the overarching need for more inclusive and integrated planning and management for natural resources and the environment.

Roadside verges and ditches make a modest contribution to ecological functions and values as outlined in section 3, although their relative importance/potential compared with (for example) farmland and forest systems remains questionable. Nonetheless, there will undoubtedly be opportunities to identify these values, and develop management recommendations as appropriate, for specific areas of the road estate as part of these wider initiatives. It should be noted however that the existing analytical models and tools (for example Beetle) have so far been focused primarily on woodland and focal species, and to date have not highlighted significant opportunities related to the road network. Whether this is because of the limitations of roadside verges as connecting features (width, hazard, constraints on tree planting etc.) or whether the models/tools are too limited is unclear, and this warrants further investigation.

NPF Action 42 on NEN specifically envisages large strategic habitat restoration projects and associated plans and programmes, including guidance, partnerships and EA procedures. SNH/local biodiversity officers and local conservation organisations should have an opportunity to feed their knowledge of roadside verges into this process. Equally there may be an opportunity to draw on Transport Scotland's (and the contractors) national roads inventory and GIS, and in turn inform the management information held in this database.

8.5 Dilemmas and quandaries

8.5.1 Interests and objectives

Despite the generally positive state of the resource (given the necessary priorities) and the significant opportunities described above, there remain significant questions about overall objectives and approach.

When seeking to manage roadside verges to enhance biodiversity there may be differing and potentially competing objectives:

- Creating an environment in which biodiversity can flourish (e.g. increased overall species richness);
- Conserving rare or endangered species;
- Maximising ecological functions (such as connectivity) and other ecosystem services;
- Minimising the danger to wildlife from traffic and pollution and the danger to motorists from wildlife;
- Making verges more visually attractive and/or enhancing a sense of place and/or raising awareness of biodiversity(verges are highly visible)

There will also be difficult trade-offs between the degree of enhancement and the costs of management.

In practice the management recommendations for a, b, and c (all of which may be loosely regarded as “enhancing biodiversity”) will differ according to the relative weight given to these subsidiary objectives, and according to the particular interests and knowledge of the “biodiversity” specialist brought in to advise. Management advice might range, for example, from “two cuts a year” and “try to leave patches of longer vegetation” (objective a) to precise management in terms of cutting dates, length of cut, clearance of adjacent scrub etc. designed to safeguard a particular species or community (objective b). As part of a habitat network initiative a section of wide verge might be partially planted with trees to complement

a similar initiative on the other side of the fence undertaken by a landowner to create a significant wildlife corridor – but this may destroy an emerging rich grassland community.

A lack of clarity about objectives and confusion about appropriate management represents a potential danger to the credibility of nature conservation interventions, and will require coordinated discussions between the various groups, and honesty about the various uncertainties.

An example is provided by the Worcestershire record (2009):

“The variations make it impossible to devise a mowing regime that will definitely encourage invertebrates in road verges, because different species have different requirements, and the requirements may well vary according to weather conditions and season.”

In cases such as this it may well be better to accept the status quo, unless there is very real evidence of damage associated with the current regime.

There are also unfortunate examples where cutting has been stopped to protect orchids...with the consequence that scrub has invaded.

8.5.2 Cutting routes

A typical council or major contractor will cut on a route by route basis, say twice a year. If the route sequence is consistent, the first route will get a very early cut and a mid-summer cut. This will allow some herbs to flower and seed but not many. The last route will receive a summer cut and an early autumn cut, and will probably be somewhat more favourable overall.

Clearly the logistics constrain the extent to which all the verges can receive the optimal cutting regime. One possible response to this might be to change the cutting sequence or cycle to optimise the cut for identified valuable communities, or to vary it so that more verges receive a favourable regime some of the time. But our level of understanding and our assessment of relative values of subtly differing communities suggests that variants on the two cut mowing regime may not be a bad thing, and indeed should be monitored in order to better understand the relationship between management and biodiversity value. Varying the mowing regime (i.e. changing route, sequence or timing) is likely to be detrimental, since plant communities may not be able to adapt.

8.5.3 Attracting wildlife to dangerous places

There is an obvious dilemma in enhancing plant biodiversity, and as a result attracting wildlife. There is a large body of guidance on the management of wildlife to minimise risks to both traffic and animals (for example in the Design Manual for Roads and Bridges, as well as a substantial literature relating to deer and road safety). These remain significant concerns, and should form a central part of practical deliberations on the design/enhancement of a national ecological network at local level. Such deliberations may lead to the conclusion that wherever possible *alternatives* to the road network should be used to enhance connectivity, and that the focus for any work within the road estate would be on the creation of underpasses, or corridors to lead animals away from roads.

8.6 The way forward

Roadside verge management may be sub-optimal from the perspective of biodiversity, but given the need for road managers to address higher priority objectives and the range of practical and cost constraints, is overall surprisingly favourable. There are furthermore significant opportunities to enhance biodiversity within the current policy and management regime.

Given the “battle hardened” nature of most roadside verges the question arises: Should the approach, forced to choose, be protecting the fragile from the activities that would damage them? Or should we have faith that the more robust but somewhat depleted plant assemblies will still provide food and structure for animals and pleasure for all but the most discriminating walkers even when repeatedly damaged by normal maintenance operations and general traffic?

The instincts of many conservationists would be to protect the fragile, in the SSSI tradition, rather than an agri-environment style “good-environmental-practice” model of applying standard prescriptions everywhere simple criteria are met. However, the latter approach, if implemented, might add more to Scotland's or a county's biodiversity inventory than the former, and not require specialist input, whether from staff or volunteers, to identify appealing bits of nature and prescribe appropriate management.

In more practical terms there are several possible ways forward (non-exclusive) that address these two enhancement models to a greater or lesser extent:

- Enhance guidance and training
- Development and promotion of generic “enhanced prescriptions” that might be applied at national or regional level, such as frequency and timing of cut, width of cut etc.
- More specific prescriptions tailored to broad classes of verge type
- Area and/or location specific prescriptions based on local survey and/or LBAP and/ or RDP local priorities, and/or SNH regional futures, and/or stakeholder/NGO interest, contextual issues
- Prescriptions developed in direct support of green infrastructure/NEN initiatives

In all cases there will be need to balance the quality of any management recommendations against likely uptake, taking full account of the constraints identified above.

8.6.1 *Enhanced guidance and training*

Given the generally favourable policy environment relating to biodiversity in roadside verges, and the clear interest of some of the managers and operators in biodiversity, improved and more effectively disseminated awareness raising and guidance materials, coupled with more specific training and briefing procedures (incorporated into existing training and briefing procedures) should be highly cost effective and a pre-requisite for any more sophisticated interventions.

SNH's existing guidance “The management of roadside verges for nature conservation”³⁷ is simple and straightforward (which is to be commended), but could be improved, and should be far more widely disseminated to both managers and operators.

- The recommendations with regard to drainage channels appear to be impractical. The contractors we talked to did not think clearing one side of a ditch at a time was feasible, nor is “little and often” likely to be cost effective where large machines are

³⁷ <http://www.snh.org.uk/pdfs/publications/heritagemanagement/roadsideverges.pdf>

involved. Removal of spoil off site was considered impractical and costly (time; waste disposal regulations).

- Recommendations on cutting need to demonstrate awareness of the logistical difficulties of cutting all verges at the same time of year, and therefore be somewhat less prescriptive.
- More information might be added on the benefits of cutting; on opportunities to create habitat progressions, gradients and mosaics; on opportunities for seeding with wildflower mix (and indeed using wildflowers as an alternative to cultivated bulbs); on the potential of seeding existing verges with yellow rattle.

These materials and associated briefing/training should not be too ambitious in terms of recognising biodiversity interest or the scope of management guidance – ample locally appropriate technical backup can be solicited from SNH, biodiversity officers, local wildlife trusts etc.

A relatively simple suggested approach to the assessment of the value of roadside verges is offered in Annex 6. A more comprehensive nationwide training initiative has also been considered and is roughly costed (Annex 7). Experience with such schemes is however mixed, and given the difficulties associated with generic guidance as discussed below is unlikely to be cost effective.

8.6.2 Enhanced standard prescriptions

We have explored and discussed the possibility of promoting national level “best practice” based on standard recommendations that might be incorporated in verge manager’s policy guidance, and possibly in standard contracts. Overall we doubt the value of such an approach. The outcomes and values associated with any particular management regime will be difficult to define for a range of reasons:

- The biodiversity values and management effects will depend on context
- Many of the effects will be unknown without detailed long term ecological studies
- The relative value of any particular outcome in any particular context will be perceived differently by different stakeholders (including within the ecological community)

Furthermore it is unclear that standard practices would result, overall, in improvement relative to the existing regimes. A strength of the existing regime is that many verges are already (by default) managed to a regime not far from that needed to optimise biodiversity (at least with respect to grass cutting on rural roads). Furthermore, the existing management variations may themselves contribute to overall biodiversity.

On a practical level, any standardisation is likely to lead to local problems and perverse consequences which would undermine broader efforts to raise awareness of and interest in biodiversity. Furthermore, routine verge management is now largely restricted to the “operational zone” with limited wildlife potential.

In conclusion, the costs of standardisation are unlikely to be justified by a limited and uncertain outcome.

8.6.3 Targeted initiatives relating to special verges

Road verges are managed through local authorities or Transport Scotland and are not subject to the generic prescriptions of EU agri-environment schemes or to the legal obligations applying to designated areas. A more opportunistic and specific management regime on chosen hotspots is therefore possible, which would protect and potentially boost their value.

Under this scenario, SNH would operate a supportive approach – simply raising awareness of opportunities, encouraging and facilitating flexible and adaptive initiative appropriate to local context. This approach would effectively build on and reinforce existing initiatives by LAs and LBAPs.

Management sensitive to the potential biodiversity they could theoretically support is not a realistic ambition without both detailed survey data and the ecological knowledge to develop objectives and prescriptions for mixed habitat types. There is therefore an argument for some form of survey to identify areas of biodiversity (including functional) value.

A nationwide survey would be expensive, and given the relatively low value and limited management opportunity related to most verges, probably not a good use of resources.

With sufficient awareness and will, there may however be significant opportunities to combine the resources of SNH, voluntary organisations and operators themselves to steadily build up an inventory of attractive and/or biodiverse verges, feeding into the existing Transport Scotland roads inventory/GIS database. Indeed, Transport Scotland, local authorities and road maintenance contractors are already obliged to identify such areas and make appropriate provision. With a little help from biodiversity officers, local NGOs, SNH etc, this database could be steadily built up and ultimately become a tool for enhanced management should this be required.

Some councils (such as East Lothian, Dumfries and Galloway, the Western Isles, Shetland, Orkney and West Lothian) have already undertaken survey and “marked” special conservation verges, and this has been done more widely in England. Several of the Scottish LBAPs also feature actions to identify special verges. All of these should be encouraged, and as far as possible integrated with the Transport Scotland or Local Authority GIS. The manner of such encouragement has and should vary from area to area according to opportunity, capacity and practical constraints. Some particular opportunities in this regard are identified in the submission from Roy Sexton of SWT presented in Annex 2.

Notwithstanding the desirability of such approaches, it is essential that a “survey, designate and protect” mentality does not develop. The approach must always be flexible: to identify management opportunities which are cost effective in terms of delivering both transport functions and wildlife value, and which take account of the practical incentives and constraints operating on managers and operational staff. An example might be an adjustment to the route or grass cutting sequence/cycle to ensure that the best areas receive the most favourable mowing regime. Equally, where verge managers are proposing to change verge management to the possible detriment of some biodiversity interest which has flourished under the established regime, it may be possible to persuade them to maintain the status quo, so long as there are not major safety or cost implications.

In some cases it may be possible to include provisions relating to locally appropriate management regimes in the contracts and/or sub-contracts issued to the operators, but it is important that any such provisions are agreed and understood by all stakeholders, are practical and not too onerous.

It may be argued that in order to support these initiatives a fund should be set up specifically to support local biodiversity initiatives relating to roadside verges. While this is attractive from a range of perspectives, it is unclear that verges are a conservation priority, and the case for a dedicated fund is weak. LBAPs and NGOS can already apply for funding for biodiversity/landscape etc. initiatives and if verges represent a local priority then these may be the subject for such bids.

8.6.4 Integration with habitat/green network initiatives

To date rather little notice has been taken of opportunities to enhance green infrastructure and habitat networks by linking in with roadside verges, and we have reviewed the reasons for this. Nonetheless, there will undoubtedly be stretches of roadside verge which could have potential, dependent upon width and opportunities for enhancing adjacent farmland under RDP or more targeted integrated habitat network (IHN) initiatives.

Assuming that these initiatives continue to develop under the NEN initiative those areas of road verge with potential in this regard will be identified – although as we have noted the models/analysis may need to be somewhat broader in scope. The roadside managers are already under an obligation to recognise and support these opportunities through appropriate management. The evolving Transport Scotland GIS should become an important resource for IHN analysis.

9. SUMMARY OF FINDINGS AND RECOMMENDATIONS

The roadside verges of Scotland probably represent a modest resource in terms of biodiversity value. The most common form of management – one or more cuts each year – partially mimics that of hay meadows and certain forms of pasture. As such they may be regarded as relics or refugia of a declining habitat, and if appropriately managed can be relatively herb rich and associated with a diverse invertebrate fauna. Trees, hedgerows, scrub and ditches may also contribute to a mosaic or gradient of habitats. As linear features verges may also be regarded as actually or potentially important as corridors for the dispersal and movement of wildlife, and could therefore contribute to a national ecological network (NEN).

Their value is however limited by relatively small area compared with similar habitats in the wider countryside; often limited width and frequent obstructions; proximity to a major hazard for wildlife; and significant practical and cost constraints on management.

There is significant provision for identifying important or sensitive areas and introducing appropriate management within the existing policy framework, especially as encompassed in the landscaping policy for the trunk road network. Upgrading works now typically take substantial account of opportunities to protect and enhance biodiversity. At local authority level several councils have shown themselves to be amenable to biodiversity initiatives relating to roadside verges, and local wildlife NGOs have also been effective in influencing management in some circumstances. Logistics and costs however limit the extent to which optimal cutting and clearing regimes can be applied more widely.

Little account seems to have been taken of the opportunity to include roadside verges in integrated habitat and green infrastructure initiatives to date. This probably relates to a woodland and focal species dominated approach to habitat network analysis and enhancement, and perhaps relates also to the generally narrow width of roadside verges, which significantly reduces their value in terms of connectivity. However, it is important that as the NEN initiative evolves, more account is taken of opportunities relating to grassland including roadside verges *and* adjacent farmland, which might benefit from RDP grants to enhance connectivity.

It is not possible, in general terms, to “recommend options for road verge management to optimise their contribution to the Network” – or at least, not as national prescriptions. This contribution – and appropriate feasible management - will have to take account of local potential as explored in habitat network analysis, coupled with an evaluation of feasible management options compatible with road safety and amenity. These opportunities can only be identified and developed through dialogue between local biodiversity specialists, habitat network analysts, road managers, and adjacent landowners. It is unclear that this level of integration has been achieved to date in local integrated habitat initiatives, but must be a major focus for activity if the NEN is to be developed.

With the emphasis increasingly on networks, the values and opportunities associated with “flowery verges” should not be forgotten, and there is ample opportunity for taking these forward in a flexible, pragmatic and opportunistic way at local level.

We recommend that SNH:

1. designates an SNH officer to coordinate and take forward initiatives relating to roadside verges;
2. ensures that SNH staff, local biodiversity officers, and others concerned with verge conservation are fully conversant with the practical and logistical considerations that constrain roadside managers and operators;
3. updates and improves its guidance leaflet, and perhaps supports it with a resource pack for briefing and training purposes. This guidance should be fed into all training for verge management operators, and efforts made to have reference made to it in both major 3G/4G contracts and Local Authority contracts;
4. continues to encourage and where possible support locally appropriate and flexible verge conservation initiatives on the part of LBAPS and local wildlife groups;
5. works with Transport Scotland and major contractors to include nature conservation values in their evolving GIS. Information on these values would be sought from local SNH staff, LBAP officers, SWT/BSBI/PLS etc.
6. engages strongly in local IHN initiatives with the ultimate objective of linking these together in support of a national ecological network, in which the need for grassland as well as woodland connectivity is fully recognised.

Finally, it should be recognised that when more than 10% of Scotland's surface is managed to a biodiversity objective (the SSSI series), and continual agri-environment programmes can fund added biodiversity on even the most intensively farmed land, the reasons for expecting road managers to add detailed biodiversity management practices to their clear safety and maintenance priorities need to be powerful.

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ANNEX 1: CONSULTTEES

Telephone interviews and email exchanges were undertaken with the following:

Contractors:

- Mark Gibson, Bear NE
- Michael Stretch, Growing Concern
- Gordon Kincaid, Balckwoodagri

Transport Scotland

- Stephen Thompson
- Angus Corby

Local Authority Roads maintenance departments

- Brian Stout, Highland Council
- Stephen Grant, Highland Council

Local Authority Planners

- Chris Alcorn, West Lothian Council

Biodiversity Officers

- Stuart McPherson, E Lothian Council
- Peter Norman, Dumfries and Galloway
- Joy Williams (Somerset CC)

Local Wildlife Groups/NGO

- Alan Anderson (SWT)
- Peter Gilbert (SWT)
- Nick Wright (SWT)
- Roy Sexton (local volunteer)

Lothian Wildlife Information Centre

- Graham Wilson

SNH

- Morag Milne

ANNEX 2: WRITTEN RESPONSE FROM ROY SEXTON (SWT VOLUNTEER)

Scottish Wildlife Trust, although not alone, have been central to discussions on raising awareness about the biodiversity value of verges. As a membership organisation they have supplied volunteers for a number of projects. East Lothian in particular was motivated by active SWT volunteers and when they moved on that momentum was missed. Roy Sexton, Chairman Stirling Member Centre SWT, provided this very informative story when asked by us about verge management (pictures available):

Background

In our area of Central Scotland there has been very little active conservation of vascular plants outside designated sites. The BSBI is largely concerned with plant geography and although it can provide locations for specific species it does not usually collect quantitative data of value in conservation. This attitude is slowly changing. The Perth Society of Natural Sciences has an active botany group which has done a lot of very useful surveying in this area. Although Plant Life is based in Stirling and its remit is plant conservation it is at present too small to be a relevant force in our area. The Scottish Wildlife Trust's interest in plants is largely limited to its reserves and sadly it doesn't have any national plant initiatives.

In our local Stirling branch of the SWT we have a number of botanists interested in conservation. We set up a PLANT group (Plant Local Action NeTwork) whose remit was to monitor local important plant populations and take action where they were threatened. Most of those involved in the PLANT programme are also members of the BSBI, SWT etc. We draw up a diary of about 30 sites to be monitored in the Spring and those involved sign up if they are interested.

Verges

Some road verges already contain rich assemblages of meadow plants. There are also significant areas down motor ways etc. that have great potential for increasing local biodiversity. If they are mowed annually (outside the flowering season) they can provide a much needed refuge for our persecuted grassland flowers and associated invertebrates.

Threats to biodiverse verges

- Meadow plants in some verges are dependent on annual cutting and as soon as this stops the sites get overgrown. Embankments are particularly susceptible (see case history the 'A9 orchid'). On the whole it is essential to keep cutting.
- Many verges are overcut seriously diminishing their biodiversity value.
- Cutting in late summer in particular removes flowers before the seeds mature. For instance the semi-parasite Yellow Rattle *Rhinanthus minor* keeps the grasses on verges dwarfed and allows meadow plants to flourish... I have seen it cut over large areas before it fruits. In our local area verge plants like Devils Bit Scabious *Succisa pratensis* and Common Knapweed (*Centaurea nigra*) are important nectaring plants for late season butterflies (Commas, Red Admirals, Painted Ladies, Peacocks, Tortoiseshells) again I have seen miles of verges cut when they were full of butterflies. There are also examples of ridiculous practice. In one dark beech wood about the only plants on the road side verges were Bluebells and Bird's Nest Orchid and these were cut in full flower.
- Verges are often scraped for road widening or footpaths. The replacement at Brig o' Turk of a verge containing Greater Butterfly orchid with a footpath was successfully fought by us together with the local community. There was a perfectly adequate footpath on the other side of the road.

- Road side salt piles can be damaging. Colonies of Bird's Nest Orchid and Masterwort both locally rare plants have been damaged by this practice.
- Verges along main roadsides are often planted with tracts of non-native species like daffodils. These contribute nothing to the local biodiversity and are visited by few if any insects. Just as spectacular displays can be achieved with native plants like the cowslips that are so successful round the south side of the Edinburgh ring road.
- I think that some verges along the A74 are still sprayed with herbicides.

How could verge biodiversity be improved:

- It would be great to have a national system of verge marker posts that indicate where priority verges should not be cut in the flowering period
- Sustainability: As a ratepayer I am upset to see how much pointless cutting of road verges takes place which is completely unjustifiable in terms of increased road visibility. It is detrimental to wildlife to say nothing of the size of the Council's carbon footprint. Many verges need only be cut once a year. Roadside hedgerows are similarly afflicted and may need only be cut once every two years.
- We have treated verges by the side of cycle path with the hemi-parasite yellow rattle. By siphoning off nutrients from its host grasses it cuts their height by at least a half. On the track concerned it may do away with the need for cutting all together. It also had a remarkable impact on biodiversity and both Northern Marsh orchid and Broad Leaved Helleborine have invaded. We gathered the seed from local populations and simply broadcast it thinly over the verges. Amazingly there has been a remarkable establishment rate and users of the track are slowly carrying the seeds along its length. This plant would seem to have great potential for cutting the cost of verge cutting and at the same time increasing biodiversity.
- Local authorities should be encouraged to plant new verges along road improvements etc. with native wildflower mixes which can produce spectacular results.
- Verge management by local volunteer groups would be facilitated by
- Some system of establishing verge ownership.
- Some system of liaising with those maintaining motorways.
- A clear formal set of safety instructions for use on main roads together with a means of implementing them. You can't expect volunteer groups to buy road signs etc.
- A system of reporting to local authorities the location of valuable verges.
- Far better liaison between local biodiversity officers and their colleagues in the roads department.

Lecropt orchid embankment: a case history

1. A relatively new embankment at Lecropt on the A9 just north of Bridge of Allan was covered with a form of Northern Marsh Orchid hybrid. We refer to it as the A9 orchid because it is found in similar patches as you go north. The site was admired by locals.
2. In 2005 the local SWT surveyed the site and found there 2565 orchids together with large numbers of the rare Adder's tongue fern (*Ophioglossum viride*). This turned out to be the largest colony in central Scotland.
3. It was clear that the site was slowly becoming overwhelmed by birch and hawthorn scrub and the orchid numbers started to fall.
4. We approached the local ranger service because in the Stirling Biodiversity Action Plan U&CH3 5.1 the Ranger Service had undertaken to "Encourage local communities to identify verge habitats (road and path) of biodiversity importance and facilitate participation in the management of these".
5. For several years we got nowhere apparently because the owners of this site could not be found. With the help of local people we wrote to potential owners and eventually the roads dept. put its hand up.

6. Since 2006 SWT have provided the volunteer labour; the Local Ranger Service organised tools, safety audits etc. and the Roads Dept. provided 2-3 men with a chipper and chainsaws. After three days work with 12 volunteers the site is almost cleared.
7. On two occasions we ran into safety issues that stopped the work. A failure to have appropriate men at work signs, winds that could carry branches onto the road.

Roy Sexton (Chairman Stirling Member Centre SWT)



Figure 15 Northern Marsh Orchid hybrid on Lecropt embankment, with SWT working party

ANNEX 3: EXAMPLES OF VERGE CUTTING SPECIFICATION

West Lothian Council kindly provided this contract specification and it shows how codes and intentions translate into clear instructions for contractors.

Specification for the cutting of rural highway verges

Definitions

- “Arisings” are the waste products of any contract operation including grass cutting and are the responsibility of the Contractor as soon as they are produced. Disposal of arisings shall be as determined elsewhere in the contract document.

Work programming

The Engineer reserves the right to: -

- Alter starting dates for the grass-cutting programme at the beginning of the grass-cutting season, as described in the Standards of Maintenance List. A minimum of seven days warning will be given if the Engineer requires work to be started at a different date to that stated unless otherwise agreed.
- Instruct the Contractor to cease cutting grass in any area or in total should weather conditions result in a reduction in the growth of the grass. In the event of any such instruction being given, no payment will be made to the Contractor for work undertaken in contravention of the instruction. Grass cutting shall only re-commence upon receipt of further Engineer's instruction.
- Make reasonable alterations to the programme in consultation with the Contractor to take into account periods of rapid grass growth and the need to address complaints and enquiries from the public about obscured sightlines within one working day of receipt.

General requirements & standard of finish

When arriving at rates for grass cutting, the Contractor shall allow for complying with the following general requirements: -

- Inspect all grass areas immediately prior to cutting and report excavations, damage or potential hazards to the Engineer.
- Carry out the work with due regard to the safety of the personnel, traffic and the public at large
- Keep the machinery and equipment well adjusted and the blades or teeth (as appropriate) well sharpened.

The choice of machinery to effect the cutting to the rural grassed verges is a matter for the Contractor, but subject to the continued approval of the Engineer. The criteria to be considered in approving equipment will be as follows. Should the criteria on which any approval is granted, change, the Engineer may seek remedial action or may withdraw his approval: -

- Outputs of the equipment where the rate has not been competitively sought.
- Safety considerations.
- The state of maintenance and adjustment of the machine.

Additional requirements

- Each grass cutting cycle should be completed within an 8 week period unless otherwise agreed with the engineer. This will normally require the provision of two tractor mounted flails or similar.
- Each cycle will be carried out in a sequential manner as per the provided route sheets unless otherwise instructed.
- The names of the tractor operators to be used on the contract are to be forwarded to the engineer for approval prior to commencement of the contract.
- The nominated operators will attend a short induction programme prior to the commencement of the contract at (council) premises, and any other operator whom the contractor wishes to use during the season.
- The contractor will submit completed, specific (council) verge cutting timesheets (provided) on a weekly basis to the engineer.
- The contractor will ensure that all operators are provided with a mobile phone to use in connection with the contract to report complications etc, and receive additional instructions from the engineer.
- The contractor will at his own cost, contact the engineer on a daily basis during the active cutting cycle to advise which roads have been cut on the previous day so that records can be updated daily.

Grass cutting - requirements and standard of finish

When arriving at rates for grass cutting, the Contractor shall allow for complying with the following specific requirements. Failure to observe requirements will result in the issue of a Dissatisfaction or Default notice: -

- Cutting to rural road verges shall be to a height of 40 - 50mm.
- Cutting must be to the full extent of the specified area and must include the perimeters of the area and around obstacles for which different machinery and thus a separate operation will be required.
- Cutting must accord with height requirements detailed. Cutting of the grass shall be to an even height across the entire area and shall include all flower and seed stalks for which different machinery and a separate operation may be required.
- Cutting shall be carried out to minimise the distribution of clippings onto adjoining surfaces. Heavy deposits of clippings in heaps or windrows will not be acceptable.
- Where clippings are spread inadvertently onto such surfaces and are identified as a problem, these shall be swept or blown back onto the area being cut or otherwise removed, leaving the adjoining surface in a clean, tidy condition.
- Any area not cut in accord with the standards specified shall be re-cut at the Contractor's own expense.
- Any damage caused as a result of the Contractor's actions to the turf, obstacles in the sward or to surrounding buildings, boundaries or other artefact or utility shall be made good to the satisfaction of the Engineer and at the Contractor's own expense.

Measurement

When arriving at rates for the cutting of roadside verges and central reservations (where applicable), the Contractor is advised that measurement for the purposes of payment will be based upon road length. The Contractor is advised that roads may have verges on both sides and in arriving at his rates he should allow for the following further requirements: -

Areas to be cut

Applies to the road verges outwith built up areas (30 & 40 mph sign) and those of footways where the footway forms part of the road structure or deviates from it.

- Where the footway runs more or less parallel to the road but remote from it, the full width of any dividing verge shall be cut and also a one-metre verge cut to the rear of the footway. This may result in a lesser cutting width than that stipulated for the class of road in question.
- Cut widths as above from the edge of the road, or up to any obstructions such as walls and fences if these are nearer to the road than the width stipulated for the class of road in question.
- Width of cut on each occasion according to the class of road shall be as follows:-

A Class Roads 1 Metre

B Class Roads 1 Metre

C & U Class Roads 1 Metre (where achievable)

- Cutting to include all unplanted areas of roundabouts on the route and all grassed directional splays not otherwise maintained as amenity grass.
- At junctions the grass shall be cut in a tapered line, including all cuttings and embankments. The measurements are taken back along the centre line of the minor road from the continuation line of the nearside edge of the major road and are to be projected to meet the stipulated cutting width for the major road in question.

Table 3. Verge cutting at junctions

<i>Type of Major Road On Which Junction is Located</i>	<i>Distance Back Along Centre Line of Minor Road or Other Point of Access</i>	<i>Distance to Project Along Length of Major Road At Either Side of Junction</i>
Dual Carriageways	9 Linear Metres	120 Linear Metres
Single Carriageways (60mph)	9 Linear Metres	90 Linear metres
Single carriageways (50mph)	4.5 Linear metres	70 Linear metres

Where these sightlines cannot be achieved, cutting shall provide and maintain the best attainable sight line within the geometry of the junction or bend in question.

- At bends which do not have clear visibility, cut the whole width of the verge on the inside of the bend (the sight line), including cuttings and embankments, or back to any walls etc. At each end, gradually taper to the stipulated width for the route in question.
- Cut around all obstructions, signs, road barriers, lampposts etc. No hand cutting by trimmer or similar is necessary except where sightlines require to be maintained.
- Do not cut roadside verges identified by the Scottish Wildlife Trust as of conservation value until and unless instructed accordingly by the Engineer. A schedule of such locations will be made available to the Contractor. (*Note – this is supplied as a list rather than a map*)

Programme

On any given section of road as determined by the route list and programme, the full stipulated width per route must be cut as one operation without interruption unless otherwise instructed by the Engineer.

Traffic, public & personnel safety

Grass cutting and follow up work to comply fully with the requirements of Chapter 8 of the Traffic Signs Manual published by HMSO on behalf of the Department's of Environment & Transport and to include all traffic, public and personnel safety measures detailed therein. The Contractor is advised that there will be a particular requirement for fixed lane closures to facilitate the cutting of central reservations (where applicable) on the routes in question.

ANNEX 4: EXAMPLE OF AN ENHANCED STANDARD ROADSIDE VERGE PRESCRIPTION

Grass cutting along roadside verges – East Lothian Council

Roadside verges along the rural road network are maintained by three tractor-mounted grass cutters. These are sub-contracted by Road Services each year to cut verges between May and September. The annual cost of this work is about £35,000. In addition, a small number of urban locations are cut to amenity standard by the Council's Amenity Services Division, on behalf of Transportation.

Cutting roadside verges is a necessity that inevitably prevents many plants from flowering properly. Some years ago, in partnership with the Scottish Wildlife Trust, the cutting of rural verges was amended to encourage wildflowers. Cutting was reduced to two cuts per year and the first cut was the single width of a flail. Specific, and generally small, stretches of flower-rich verge were also identified. These were cut once only, at the end of the summer. These verges were looked after successfully by volunteers but for various reasons the scheme is no longer effective.

Roadside verges may also be important walking routes for local communities. Consequently, a simplified cutting regime has been developed that encourages biodiversity, whilst also incorporating local walking routes. Details of the cutting contract are given below.

Specifications for general cutting regime

A-class roads: The first cut should be flat and one width of the flail only (reason: to provide a clearly defined road edge along main roads).

The second cut should be flat and extend over 80% - 90% of the road verge (reason: to leave a fringe of unmanaged habitat at the back of the verge).

Other roads: The first cut should be at a 45 degree angle and one width of the flail only (as illustrated below)(reason: to define the road edge but allow wildflowers to grow and set seed).

The second cut should be flat and extend over 80% - 90% of the road verge (reason: to leave a fringe of unmanaged habitat at the back of the verge).

General: The management of junctions need for visibility or sight lines is not affected by the above specifications.

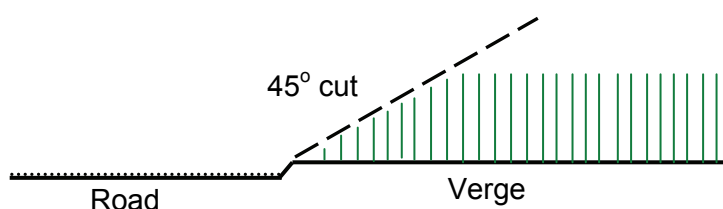


Figure 16. Diagram of verge cutting angle

Local community cutting agreements

Local communities use some roadside verges for walking and horse-riding. Other communities have expressed concern at the loss of wildflowers at the time of the first cut. Where communities express a need for a specific cutting regime, local alterations will be appended. These agreements will aim to satisfy the local need within a simple cutting regime. The general location of local agreements is marked with a red dot on the map and is detailed below (not included in this report is the list and map of eight locations where this prescription should be followed).

Of particular interest is the budget for cutting which is not large in relation to other road maintenance tasks.

ANNEX 5: LBAP AND LOCAL AUTHORITY INITIATIVES RELATING TO VERGE BIODIVERSITY AND CONNECTIVITY

Source: Published LBAPs and Annex 1 of the TOR

Location/LBAP	Opportunities, actions, initiatives and achievements
Skye and Lochalsh	<ul style="list-style-type: none"> • Awareness raising; • Promote later cutting; • Leave hedges uncut; • Manage invasives; • Training and assistance to maintenance contractors and crofters; • Include biodiversity in maintenance contracts; • Specific initiative to promote clouded yellow on common cat ear
Wester Ross	<ul style="list-style-type: none"> • Locally appropriate grass and wildflower mix • Negotiate verge cutting schedules; • Include biodiversity issues in future road, park and woodland maintenance contracts.
Sutherland	<ul style="list-style-type: none"> • Leave some grass areas long and uncut; • Leave some hedges untrimmed; • Raise awareness of benefits • Incorporate biodiversity elements into roadside maintenance specifications <p>Ragwort eradication programme?</p>
Caithness	<ul style="list-style-type: none"> • Develop a strategy for the cutting of roadside verges that does not reduce the biodiversity of this habitat, and implement it through verge maintenance contracts. • Reduce the depth to which roadside ditches are cleaned, to maintain ditch vegetation. • Control ragwort and other invasive plants, targeting areas worst affected. • Undertake an education project for road maintenance workers and contractors on the correct use of machinery and practices to most benefit biodiversity. • Undertake a survey of the roadside verges, hedges, trees and ditches in Caithness.
Orkney	<p>Current Practice</p> <ul style="list-style-type: none"> • OIC Technical Services Department has a policy in place to address its statutory duties on road safety and the control of injurious weeds, to maintain highways and a tidy appearance, and to conserve the biodiversity of verges where possible. • All main "A" Class roadside verges are cut three times per year and all other roads, with the exception of selected verges, known as

	<p>“Conservation Verges”, twice per year.</p> <ul style="list-style-type: none"> • The Conservation Verges are generally located adjacent to heathland, or may contain fine examples of a particular flower or, alternatively, may feature a wide range of flowers, and for these reasons they are generally left uncut to allow the plants to complete their annual growth cycle. • Certain Conservation Verges are subject to only one cut in late summer. • Lengths of no-cut verges are located in Orphir, Birsay, Evie, Harray, South Ronaldsay, Burray, Holm, Sandwick, Stenness, St Andrews, St Ola, Firth, Hoy, Rousay, Shapinsay and Eday. One-cut verges are in Egilsay, Eday and Papa Westray. • In North Ronaldsay there is discretionary cutting as agreed with the Community Council. <p>Future:</p> <ul style="list-style-type: none"> • Continue to raise awareness in Community Councils of the value of roadside verges: • Distribute Roadside Verge leaflet • Attend meetings to give a presentation indicating examples of successful verge management. • Introduce new, more visible and recognisable conservation verge markers and ensure the system of markers is on all conservation verges by the end of March 2009. • Establish a roadside verges working group which will meet to implement.
Comhairle nan Eilean LBAP	<p>Achievements</p> <ul style="list-style-type: none"> • In September 2002, primary school children in North Uist and Benbecula were involved in the collection of wildflower seeds such as red clover, yellow rattle and bird's foot trefoil. • The seeds were used to establish a seed bank for reseeding roadside verges when roads are upgraded. <p>Great yellow bumblebee SAP</p> <ul style="list-style-type: none"> • 3.5 Encourage community members to grow suitable 'bee friendly' flower seeds in their garden and roadside verges. • 4.3 Research the potential to seed roadside verges and other suitable habitat with species to attract bees. I • Investigate the use of existing seed stock held by CnES
Dumfries and Galloway LBAP (see case study)	<p>Achievements</p> <ul style="list-style-type: none"> • biodiversity has been integrated into roadside management by the local authority and the idea picked up nationally; • full analysis of the resource <p>Priority Action (RV1)</p> <ul style="list-style-type: none"> • Provide special management of roads and verges at sites known to be important for biodiversity through designation of new Conservation

	<p>Verges.</p> <ul style="list-style-type: none"> • Target: 10 new Conservation Verges by 2015.
Argyll and Bute	<ul style="list-style-type: none"> • Many of these corridors are incomplete, or provide a limited number of functions, so a key aim is to increase the number, continuity, visual interaction and functionality of these corridors; • A&B are approaching the end of an internal consultation on their Roadside Verge Biodiversity Action Plan which includes actions to protect and enhance biodiversity without compromising road safety. • The plan raises awareness and provides information on management and opportunities and also sets out to engage with communities in order to raise awareness about wildflowers, invasive non-native species reporting and a BEE NICE campaign (Annex 1 response)
Renfrewshire	<p>Annex 1 response.</p> <ul style="list-style-type: none"> • I have provided advice to Renfrewshire Council and they have incorporated it into their Local Transport Strategy. • We had a grass verge survey for all 3 LA areas conducted a few years ago. I don't think Inverclyde or East Ren have done much with this but Renfrewshire have looked at the areas to see which of the more diverse could be allowed to grow, unfortunately by the time they remove those who need to be cut for sight lines there's not many left.
Fife	<p>Annex 1 response.</p> <ul style="list-style-type: none"> • As it happens, as part of the LBAP work with Community services, I have managed to get one area alongside the Western avenue in Glenrothes planted with wildflower mixes from Scotia, since starting in post last year. • It's about half a km long, and about 10 wide. This was their first year, so they should look good next year. <p>I plan a verges HAP for 2010, and will be redoubling efforts to have contracts with contractors altered when practicable.</p>
Aberdeen (species rich habitat plan)	<ul style="list-style-type: none"> • Encourage good management practice at verge and riverbank sites • Establish a demonstration site on a roadside verge and a riverbank
East Lothian BAP and urban open space plan & greenspace networks	<p>Since 2003...</p> <ul style="list-style-type: none"> • Urban wildflower meadows created in parks, on roundabouts, roadside verges and in schools • Roadside verge cutting contract introduced to encourage wildflowers <p>Actions for 2008:</p> <ul style="list-style-type: none"> • Ensure that roadside verges are cut according to the biodiversity contract • Monitoring: survey wildflowers on key roadside verges and compare with historic data

Midlothian LBAP	<p>General:</p> <ul style="list-style-type: none"> • Improve the potential for biodiversity and wildlife links on verges • Whilst verges need to be kept short in some areas to give vehicles a clear line of sight, care should be taken not to over manage roadside verges and reduce their biodiversity value. • Delaying cutting verges until wildflowers have set seeds can improve the biodiversity value of verges. • Meet with various departments to review cutting regimes of paths and roadside verges • SWT has a roadside verges project to make sure certain stretches are managed appropriately so that wildflowers are able to set seed.
Edinburgh LBAP	<ul style="list-style-type: none"> • Use data from the CEC Open Space Strategy to identify open spaces which could be managed for the benefit of biodiversity, (e.g. roadside verges, roundabouts, CEC properties). • Analyse Open Space data to identify sites where changes to management would benefit biodiversity, by end 2012 • Identify a seed mix appropriate for undeveloped land or open spaces in Edinburgh, ideally incorporating Edinburgh LBAP priority plant species. Before end 2013
Falkirk	<ul style="list-style-type: none"> • Undertake a review of mowing regimes on grassland sites (e.g. road verges, openspace, parks) owned by Falkirk Council and implement a project at one site to pilot new regimes that will enhance biodiversity • Investigate the management of Council owned openspaces such as cemeteries, golf courses, road verges etc. and develop one pilot project to demonstrate how altered maintenance regimes can benefit biodiversity
Glasgow City Council	<ul style="list-style-type: none"> • We have recently carried out some grassland management at the Carmunnock Bypass • In the past have had meetings with Amey's Ecologist, Clare Darlaston, regarding verge management for biodiversity along the M8. . (Annex 1 response)
Dumbarton	<ul style="list-style-type: none"> • ensure sensitive management of verges and trees and Service implementation of appropriate survey and maintenance • incorporate new planting into existing and new roadside verges and hedges • reduce amount of hedgerow cutting (where it is safe to do so) • develop sustainable transport projects using urban woodland as part of footpath/cycle network
W Dumbarton	<ul style="list-style-type: none"> • The roads department is very well aware of biodiversity of roadside verges (it is included in their transport strategy), however ...we don't have the resources to buy machinery that will cut and lift the cut grass and to manage the areas for biodiversity.

ANNEX 6: BIODIVERSITY ASSESSMENT PROCESS FOR VERGES

The biggest contractors have in-house or on-call ecological expertise but where that is not available, the current biodiversity value of a roadside verge can be assessed for practical management purposes using three simple scales.

1. Landscape context (Essentially an estimate of contrast to surrounding land use, contribution to sense of place, and attractiveness)
 - Low: verge under the same management as the surrounding land (e.g. grazed by sheep or edge of urban park),
 - Medium: distinct from adjacent land but a frequent type of feature in that landscape.
 - High: most prominent wildlife feature in the landscape or last visible remnant of “unproductive” vegetation, or verge style is an acknowledged and valued part of the local character.
2. Habitat value
 - Low: non-native plants, limited structure - or invasive exotics;
 - Medium: some native plants, varied structure;
 - High: sample of a semi-natural habitat type (e.g. using Phase 1 Habitat Survey terms)
3. Species value (this requires some expertise in species ID and carried out at the right time of year – local wildlife groups should have that expertise)
 - Low: unlikely to be any specialist native wildlife present (typical native plants are sufficiently covered in the habitat assessment above),
 - Medium: specialist native wildlife likely to be present;
 - High: notable/scarse/rare native plant or animal identified

A high score in any area suggests management should be targeted to that. The judgements should be made by or in consultation with the local stakeholders especially as they may be needed to help with any identification, setting prescriptions, carrying them out or subsequent monitoring tasks.

ANNEX 7: EXAMPLE COSTS FOR ENHANCED MANAGEMENT OF BIODIVERSITY IN SCOTLAND'S ROADSIDE VERGES

The following are rough estimates for the costs associated with stronger support and training for verge related biodiversity initiatives.

Typical situation - a local authority with 8 operators and 2 managers plus a local SWT group with 5 volunteers (all figures are indicative pending discussion with relevant bodies)

Promotion of good practice - including advice

One day spent looking at what verges provide for wildlife and talking about how management affects that. Really a briefing rather than a training session though it may help if they learn some basic "quality assessment" skills as physical engagement is usually more persuasive than explanations or assertions of value. Costs above their paybill would be small: lunches, venue (if required) for discussion and presentations. Ideally, people would visit verges and find things. This would be in the middle of the cutting programme - early July - if plants were the local priority and good uncut examples remained. The expert surveyor may be volunteer local recorder(s) or SNH/SWT staff or a consultant supported by people with local knowledge). A mixture of local enthusiasts and operators is desirable as the enthusiasts will gain an understanding of what is reasonable and what is not from the operators.

May involve more than one department of LA - e.g. grounds, roads.

Briefing for the surveyors on approach to take. Potentially three surveyors could deliver 30 days around Scotland in July (dodging Trades fortnights of course if squads take them). £4k for preparation, e.g. speaking to locals about good verges to use and £8k for surveyor fees and T&S. For contractors, attendance could be written into their contract. Programme cost £12k excluding staff salary costs.

Environment staff time - probably biodiversity officer - £400/LA = £13k but this should not need a budget

Surveying verge biodiversity (who, what, when, where, how)

Identifying areas with actual or potential biodiversity value and providing LA with map and notes plus ongoing advice.

Mainly staff time from SNH/SWT but also from volunteer recorders (some of whom will be grant aided by SNH) and possibly contractors. Maybe SEPA also have a role given the drainage issues. Potentially £3k per LA (= £90k over x years for Scotland) but probably less. People will probably already know where the really good stuff is.

Use of the three scales approach: Landscape context; Habitat value; Species value. To prioritise verges for attention and set objectives

Timing operations

The verges that would most benefit from being cut at a particular time need to be identified on a mapping system. Ideally that map would be available to contractors and operators rather than just a list of roads with good verges as maps make route planning much simpler. The technology exists for operators to access maps on their phones and provide GIS alerts but a map with notes suggesting they cut after a date or to a particular profile would be all that is really necessary. At a minimum, operators could be provided with a marked-up map.

Develop a digital mapping system to record hotspots so monitoring processes can continue as the people involved change (SNH in house as long as operators and surveyors can access to download relevant places £10k?)

Training of managers, operators and surveyors

Whilst it would be feasible to train operators to recognise typical high-value situations and follow blanket prescriptions it may not be wise to do so given the very varied nature of verges. Local experts may be better placed to identify which potential conservation objectives should take priority and the management those require, and discuss with the operators whether that is possible. Surveyors and volunteers may need a budget for expenses for meetings etc to discuss their interests and share experience but it should be small, say £1k per LA/yr (£33k/yr?). If new techniques emerge they could be demonstrated to reps from each LA for them to pass on. A workshop for 30 people could cost £3k if it was necessary to hire machinery but more likely a local authority could host the day and provide all that.

Table 4. Example costs of improving road verge management

	Cost per item (staff costs in partnership not included)	Total per event	Total
Promotion of good practice - including advice	Surveyors' prep £4k Surveyors' fees for delivery £8k		£12k
Surveying verge biodiversity (who, what, when, where, how)	Identifying the best verges in Scotland – support for survey groups £3k per area identifying, £1.5k monitoring	£3k	£90k
Timing operations	Recording system capable of generating a map		£10k
Training of managers, operators and surveyors	Support meetings £1k/LA Workshop on new techniques £3k		£3k

These figures indicate that a management change to ensure that the best verges were safeguarded and those with potential were improved would cost in the region of £120k. This could, for most items, be spread over more than one year and between local authorities.

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