Making B-Lines

A report on the practicalities of developing a B-Lines network

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1. **Summary**

This report represents a summary of the practical issues and challenges involved in the development of a B-Lines network. It is informed by experience gained from working with Yorkshire-based organisations (under The Co-operative's Plan Bee Campaign www.co-operative.coop/Plan-Bee funded 'Bee Roads' project) and from discussions/consultation with a wider range of national partners. It also draws upon information and expertise provided at a national B-Lines Initiative workshop held in York in October 2011 (see www.buglife.org.uk). A series of recommendations are made throughout the report and a list of 'Guiding Principles' are provided which can be used by other organisations, partners and individuals to help contribute towards the creation of a coherent B-Lines network across the country.

The B-Lines Initiative is proposed as an imaginative solution to the problem of the loss of flowers and pollinators; proposing action at a landscape-scale as advocated in 'The Natural Choice; securing the value of nature[1]'. The loss of wildflower-rich grassland has been well documented; a 97%[2] loss since 1930s which has played a major part in dramatic declines to our native pollinators (e.g. 66% large moths have declined[3], three quarters of butterfly species are in decline[4] and there have been significant contraction in the ranges of wild bumblebees[5]). The B-Lines networks are promoted as a new approach to help restore populations of insect pollinators and to assist with the dispersal and movement in response to climate and wider environmental change.

B-Lines are wide strips of permanent wildflower-rich habitat. They will link existing wildlife areas together creating a network of wildflower-rich habitats that will weave across the British countryside. They have the potential to:

- Restore and create permanent high quality wildflower-rich grasslands (and other wildflower-rich habitats), increasing the overall area of habitat and helping conserve and enhance populations of a wide range of invertebrates
- Reduce habitat fragmentation across our landscapes and improve habitat connectivity and species movement/dispersal across Britain
- Contribute towards a number of ecosystem services, including pollination, carbon sequestration and water resource management

This report outlines a landscape-scale approach to pollinator delivery, promoting the maintenance and enhancement of large areas of habitat, alongside targeted habitat restoration/creation to improve the ecological connectivity between our best wildlife areas. It is suggested that this new habitat should be delivered as part of a more integrated pollinator conservation delivery programme, working with and alongside existing 'pollinator friendly' management measures.

The practicalities of developing a network of wildflower-rich habitats are discussed and a recommendation is made for the identification and creation of wide habitat-enriched linear zones, within which key habitat 'stepping stones' will be developed, working towards a long-term aspiration to develop more continuous strips of habitat. Simple guidelines are proposed as to the make-up of these linear zones, although it is recognised that further development of the evidence-base, in particular with regards to the proportions and

[1] HM Government, 2011. The Natural Choice; securing the value of nature
[2] Fuller, R.M., 1987. The change, extent and conservation interest of lowland grasslands in England and Wales; a review of grassland surveys 1930-1984. Biological Conservation 40: 281-300.
[3] Fox R., Conrad, K. F., Parsons M.S., Warren M.S., and Woiwod, I.P., (2006). The state of Britain's larger moths. Butterfly Conservation and Rothamsted Research, Wareham, Dorset.
[4] Butterfly Conservation. The State of the UK's Butterflies 2011.
[5] Goulson, D., et al., 2008. Decline and conservation of bumblebees. Annual Review of Entomology 53: 191- 208.

spatial arrangements of individual habitat components of the B-Lines (and wider landscape), is needed. It is recognised that there is no 'one size fits all' approach, as the composition of the individual stretches of B-Lines must reflect local landscape character and biodiversity interests/value. This includes the need for B-Lines to work within our large urban environments, learning from, and developing existing urban pollinator/grassland initiatives.

The identification and mapping of the B-Lines is crucial to the development of the overall network and a simple pragmatic approach is proposed. The recognition of B-Lines within local development planning work, either independently or as part of wider ecological networks, is considered important as this will help both afford them a degree of protection from development and also ensure they are considered a high priority for future funding, for example through Biodiversity Offsetting measures.

The report suggests that the development of the B-Lines will require improved targeting of conservation interventions and either increased, or redirection of some existing conservation effort, including:

- A partial re-focussing of agri-environment and other conservation resources away from the delivery of lower value temporary 'habitat', towards the creation of higher value permanent wildflower-rich grassland/habitat (i.e. a rebalancing of efforts from the so called 'broad and shallow' approach to a more strategic targeted approach)
- Additional resources above and beyond agri-environment, including options surrounding biodiversity offsetting, branding/marketing of farm products and conservation sponsorship
- Better integration of publically funded programmes with those originating from the charitable or business sector and innovative ways of combining resource will be needed to ensure that complex habitat creation programmes become financially viable.

Finally it is recognised that ultimately the development of the B-Lines will depend on the support and goodwill of a large number of land owners/managers. It will rely on a co-ordinated effort to ensure that the desired connectivity between habitat areas is achieved across the country, which will require integrated delivery between individual farm work, local wildlife projects and national delivery programmes. To allow this to happen mechanisms will need to be put in place to allow greater collaboration and co-ordination between landholdings, and funding must allow for realistic/competitive compensation and incentive payments.

2. Introduction and Background to B-Lines

2.1 The key issues and the need for action - the decline in pollinators and the associated loss of habitat

More than two thirds of Britain's pollinators are in decline, including many species of bumblebees, butterflies, hoverflies and moths[6]. This is a matter of serious concern; our native wild pollinators are a key part of Britain's wildlife resource and are responsible for up to 90% of crop pollination[6]. It has been calculated that one out of every three mouthfuls of the food we eat depends on pollination and the annual benefits of insect pollinators to the British Economy have been valued at £510 million[6].
The dramatic loss in flower-rich habitat in Britain since the 1930s has had a major impact on the wildlife it supports, including bees, butterflies and hoverflies. Over 97% (3,000,000 hectares) of flower-rich grassland has been lost and although farmers in England have helped put back around 10,000 hectares (< 0.2% of that which has been lost) through agri-environmental measures[7] [8] a lot more is needed. In contrast, in 2010 alone the USA created 16,600 ha of wildflower rich habitat[9].

Option	Option Code	Area (hectares)
ELS Options		
Nectar Flower mix	EF4	3052
HLS 'more of the same' options		
Nectar Flower mix	HF4	2909
HLS options		
Creation of species-rich semi-natural grassland	HK8	4271

Figure 1: Uptake of key ELS/HLS 'wildflower-rich' habitat creation options March 2012 – Natural England

The decline of pollinators in our landscapes is currently being tackled through the creation of temporary flower-rich strips or patches of land, delivered both under agri-environmental measures and as part of the Campaign for the Farmed Environment. This approach appears to have been only partially successful in conserving insect pollinator species. It has no doubt helped increase food supply (pollen and nectar) for many insects, however it has probably not provided all of the necessary habitat niches required for the maintenance of insect pollinator populations. It is also short term and intensive to maintain – often reverting back to species poor grassland due to high nutrients or lack of management[10] [11].

In addition to the decline in wildflower-rich grasslands, the fragmentation of the remaining habitat areas also provides a real challenge to insect pollinators and other wildlife. Much of the remaining grassland exists as small fragments, isolated from each other by wider expanses of intensively managed farmland. This is particularly an issue where species need to move around the countryside in response to pressures imposed by environmental change and it widely recognised that climate change represents a major threat to biodiversity in a highly fragmented environment. There is a recognised and

[6] Breeze, T.D., et al., University of Reading 2012: The decline of England's Bees – Policy Review and Recommendations
[7] Natural England 2008. Agri-environment schemes in England 2009; a review of results and effectiveness
[8] Campaign for the Farmed Environment. Annual Report (July 2011)
[9] The Xerces Society for Invertebrate Conservation, pers.comm.
[10] Pywell et al., 2006. Effectiveness of new agri-environment schemes in providing foraging resources for bumblebees in intensively farmed landscapes. Biological Conservation, 129: 192-206
[11] Smith, B.M. and Everett, S., 2010: Maintaining diversity in flower enriched margins. Aspects of Applied Biology, 100: 133-140

urgent need to improve the permeability of the landscape to assist species in their attempts to adapt.

In our view only a radical approach restoring and creating very significant new areas of habitat area, and making this habitat better connected across our landscapes can help reverse the declines in our native insect pollinators. This needs to be achieved through a more strategic and better targeted approach, expanding and improving connections between the best existing wildlife areas as promoted in 'Making Space for Nature' [12].

2.2 The B-Lines Concept

B-Lines proposes a network of wildflower-rich grassland (rivers of flowers) across Britain, secured in perpetuity, that sustains bees and other pollinators along with our wider biodiversity resource, and enables it to adapt to climate change.

B-Lines are a series of connected 'lines' of meadows and blossoming pastures ideally about 300 metres wide (although of variable width depending on the land/landscape). The lines will join up to form a network of flower rich grassland across the country. To achieve this network B-Lines would create or retain at least 150,000 ha of wildflower-rich habitat, initially as a series of stepping stones but with the longer-term aspiration of a more continuous strip of habitat.

B-Lines are highly visible and can capture the public's imagination in a way that small fragments of wildflower habitat scattered around on farmland cannot achieve. It may be possible to secure access agreements with land owners on B-Lines so that they form a new network of public access routes linking wildlife sites and residential areas together via beautiful, flower rich countryside.

2.3 The Potential Benefits of B-Lines

The B-Lines initiative has the potential to provide a wide range of benefits to both wildlife and agriculture. Many of these benefits are highlighted specifically in 'Biodiversity 2020: A strategy for England's Wildlife and Ecosystem Services'[13] including:

i) **Making significant contributions towards the UK Biodiversity Action Plan targets (habitats and species) in a strategic and joined up manner, reducing fragmentation in our wildlife resource and creating landscapes more resilient to climate change**

The England strategy proposes increasing the overall extent of priority habitat by at least 200,000 ha by 2020. This is a major challenge which will require substantial co-ordinated action undertaken through major new habitat creation initiatives. As outlined in the strategy this action must be integrated and joined up and must assist in the development of a coherent ecological networks.

ii) **Providing a range of ecosystem services, in particular the conservation of pollinator services and the benefits these bring to our farming sector**

The importance and value of ecosystem services[14] is well documented and the need to safeguard these services through the protection and enhancement of our natural

[12] Lawton et al., 2010: Making Space for Nature: a review of England's wildlife sites and ecological network. Defra
[13] Biodiversity 2020: A strategy for England's Wildlife and ecosystem services – Defra 2012

environment is now recognised as a key priority[13]. Work to identify the contribution of different habitats to each of the key ecosystem services has highlighted the major role of semi-natural grasslands (see Figure 2) and species richness is increasingly being identified as being important in underpinning ecosystem services[15].

Ecosystem Service	Neutral Grassland	Calcareous Grassland	Agricultural arable/pastoral
Climate regulation	2	3	- / 2
Pollination	4	5	2 / 2
Pest control	4	2	1 / -
Water regulation	3		- / 2
Water quality	2	5	- / 2
Erosion prevention	3	4	- / 1
Food production	3	3	5 / 4
Potable water supply	3	4	- / 2
Genetic resource	3	4	3 / -
Raw materials	2	2	5 / -
Recreation	4	3	2 / 2
Aesthetics	4	5	3 / 3
Heritage	4	3	2 / 2

Figure 2: The importance of habitat in delivering Ecosystem Services in Yorkshire [16] (1=low, 5= very high) – a comparison of the value of core B-Lines habitats with wider arable and improved pasture management.

iii) **Bringing nature to people in a highly visible form**

The need to engage significantly more people in biodiversity is highlighted in the England Strategy[13]. The disconnection between people and wildlife is damaging health and environmental awareness levels, causing unhappiness, costs and increased risk of environmental degradation and disaster[17]. We will need to explore new and more highly visible, dramatic and meaningful ways of achieving this into the future as our society becomes more and more urbanised and remote from our natural world.

iv) **Bringing together partners working around the country to deliver a truly landscape-scale initiative**

The need for more integrated and joined up working was promoted through the development of 'Integrated Biodiversity Delivery Areas' (IBDAs) and is now being taken forward through the twelve pilot 'Nature Improvement Areas' (NIAs). It is an imperative that we move quickly to find more common ground, more integration and more effective join up of biodiversity delivery.

[14] UK National Ecosystem Assessment 2011. The UK National Ecosystem Assessment: understanding nature's value to society. UNEP-WCMC, Cambridge
[15] Isbell F., et al.,2011. High plant diversity is needed to maintain ecosystem services. Research letter 10.1038/nature10282
[16] Applying an ecosystems services approach in Yorkshire and Humber – University of York/URSUS Consulting/Yorkshire Futures 2010
[17] England Biodiversity Group, 2011: ThinkBig – How and why landscape conservation benefits wildlife, people and the wider economy.

2.4 Brief summary of evidence relating to the habitat needs of insect pollinators and habitat conservation priorities (and as relating to the B-Lines Initiative)

There is a substantial amount of complex evidence relating both to the ecological requirements of insect pollinators (at both individual site and landscape-scale) and to the effectiveness of current conservation management. As much of the current conservation delivery for pollinators is through agri-environment schemes, substantial proportions of available scientific research/evidence relates to these measures. The evidence relating to agri-environmental measures, identifies beneficial impacts of existing measures, but also highlights many shortcomings in both uptake and delivery.

The following section of this report details some of the current evidence which in our view supports the need for a revised approach to pollinator conservation, and how this relates to the B-Lines concept; it is not meant to represent a complete scientific justification for the B-Lines approach nor does it attempt to offer a comprehensive literature review.

2.4.1 Current agri-environment delivery; some key issues

There is a plethora of evidence relating to the effectiveness of agri-environment schemes, as they relate to pollinator conservation, some of which is summarised below. A comprehensive review of the various management options both in the UK and across Europe has been carried out by Haaland et al.[18].

Several key studies report on the high uptake of lost cost and low maintenance agri-environment scheme options, particularly low cost grass mixes which produce species-poor vegetation with relatively small benefits to invertebrate populations (Pywell et al.[19], 2011; Pywell et al., 2006[20]; Pywell et al.,2007[21]). There has been much lower uptake of the more beneficial wildflower-rich strips/margins which are widely recognised as providing more valuable pollinator habitat than grass margins (Pywell et al., 2006[22]; Pywell et al., 2007; Pywell et al., 2011; Smith & Everett, 2010[23]; Vickery et al., 2009[24]). Basic pollen and nectar mixes also provide a useful pollen/nectar resource, however these can be of limited value as they generally have relatively short flowering seasons and as they are often only effective for 3-4 years (Pywell et al., 2011) need constant replacement.

Sowing of wildflower mixes is clearly an effective way of creating foraging habitat for bees and pollinators (Pywell et al., 2007[25]) and can lead to positive shifts in the functional composition and diversity of both plant and invertebrate communities (Pywell et al., 2011[26]). Wildflower margins are therefore a useful option, and can maintain their value into the longer-term, so clearly have a continuing role to play in insect pollinator conservation. However these more valued margins are generally poorly managed (Pywell et al., 2006) and costly/difficult to maintain (Smith & Everett, 2010), often

[18] Haaland C., et al., 2011. Sown wildflower strips for insect conservation: a review. Insect Conservation and Diversity 4. 60-80.
[19] Pywell et al., 2011. Management to enhance pollen and nectar resources for bumblebees and butterflies within intensively farmed landscapes. Journal of Insect Conservation, vol. 15, no.6, 853-864
[20] Pywell et al., 2006. Effectiveness of new agri-environment schemes in providing foraging resources for bumblebees in intensively farmed landscapes. Biological Conservation, 129: 192-206
[21] Pywell et al., 2007. The Buzz project: biodiversity enhancement on arable land under the new agri-environment schemes. Aspects of Applied Bioloogy, 81: 61-68
[22] Pywell et al., 2006. Declines in forage availability for bumblebees at a national scale. Biological Conservation, 132: 481-489
[23] Smith, B.M. and Everett, S., 2010: Maintaining diversity in flower enriched margins. Aspects of Applied Biology, 100: 133-140
[24] Vickery et al., 2009. Arable field margins managed for biodiversity conservation: A review of food resource provision for farmland birds. Agriculture, Ecosystems and the Environment, 133: 123-133
[25] Pywell et al., 2007. The SAFFIE project: enhancing the value of arable field margins for pollinating insects. Aspects of Applied Biology 81, 239-246
[26] Pywell et al., 2011. Ecological restoration on farmland can drive beneficial functional responses in plant and invertebrate communities. Agriculture, Ecosystems and the Environment, 140: 62-7

reverting back to species poor habitats due to high nutrients or lack of management. Many established margins are therefore found to be poor in wildflower diversity (Smith & Everett, 2010).

Improved targeting of agri-environment measures is required in preference to the more normal, untargeted and diffuse uptake. This will help increase landscape connectivity and permeability assisting the dispersal of species through the landscape (Merckx 2009[27]).

The traditional approach of agri-environment schemes - creating small patches and thin strips of wildflowers for pollinators (often stand alone and untargeted options) - has had limited success, because the habitat is scattered across the countryside and is short term. Clearly well established and managed wildflower margins and pollen and nectar mixes are of benefit to insect pollinator conservation (and may be the only option in intensively managed agricultural landscapes) however we believe that new options and additional good quality permanent habitat is required to complement the existing measures.

Recommendation 1: B-Lines should learn from experience gained through past delivery of agri-environmental measures and invest in long-term solutions for recovery of pollinator populations – looking for ecologically viable solutions through the maintenance, restoration and creation of permanent habitat features which are integrated more fully with smaller-scale habitat features.

2.4.2 The benefits of permanent semi-natural habitat

High quality semi-natural vegetation, with its diversity of wildflowers and grasses, and the abundance of refuges and overwintering sites is widely considered of higher value to pollinators and other invertebrates than temporary habitats (Kohler et al., 2008[28]; Pywell et al.,2005[29]). Established semi-natural grasslands support a wider range and higher abundance of pollinators, herbivorous insects and arthropod predators. The majority of bumblebee forage plants are nectariferous perennials or biennials, often only found in established semi-natural vegetation receiving intermediate disturbance (Carvell 2006[30]). Recent reports (Smith 2010) have suggested that the most desired outcome from wildflower seeding in the farmed landscape is to create something that resembles a lowland species-rich grassland and to manage this through grassland management (cutting and grazing). Pywell (2007 & 2011) also suggests that sowing more complex and costly wildflower mixes will result in more stable provision of foraging resources in the longer-term than more short-lived wildflower habitats. Even though more expensive to create, in the longer-term management of larger areas of permanent grassland may be more sustainable and cheaper to manage than smaller scattered field margins/pollen & nectar mixes.

Recommendation 2: B-Lines should aim to increase the area of permanent wildflower-rich habitats to complement and help increase the benefits of more commonly used temporary habitat creation activities.

[27] Merckx et al., 2009. Optimizing the biodiversity gain from agri-environment schemes. Agriculture, Ecosystems and the Environment 130: 177-182
[28] Kohler et al., 2008. At what spatial scale do high-quality habitats enhance the diversity of forbs and pollinators in intensively farmed landscapes. Journal of Applied Ecology 45: 753-762
[29] Pywell et al., 2005. Providing foraging resources for bumblebees in intensively farmed landscapes. Biological Conservation 121: 479-494
[30] Carvell et al, 2006. Declines in forage availability for bumblebees at a national scale. Biological Conservation 132: 481-489

2.4.3 Landscape-scale delivery for pollinators

It is widely accepted that habitat fragmentation is an existing and growing cause of habitat degradation and biodiversity loss in the UK and elsewhere (Institute for European Environmental policy, 2007[31]). Small areas of habitat cannot support viable populations of species and the fragmentation of semi-natural habitats restricts the movement of species (dispersal, foraging and breeding) across our landscapes. Fragmentation of habitats also presents a significant threat to species as they will find it increasingly more difficult to colonise new areas as our climate changes. It is known that rates of expansion are faster where more habitat is available (Hill et al., 2001[32]) and that where there is more continuous habitat, species are able to spread faster than where habitats are fragmented (Warren et al., 2001[33]). Improving habitat connections has been demonstrated to be a valuable strategy for facilitating species population expansions in fragmented landscapes in a study in Yorkshire (Hodgson et al., 2011[34]); linking clusters of habitat patches was shown to be particularly important for fragmented grassland patches.

Habitat fragmentation and the intensification of agriculture are considered to be a threat to pollinators (Ockinger & Smith 2007[35]). Agricultural intensification across landscapes, which has resulted in an increase in arable land area and the associated loss and fragmentation of semi-natural habitats is thought to be a key driver of pollinator loss (Carre et al., 2009[36]). In order to sustain the abundance /diversity of insect pollinators the preservation of existing fragments, and the re-creation of new semi-natural wildflower-rich grasslands is therefore considered to be of the highest priority. Studies clearly demonstrate that habitat heterogeneity in the form of semi-natural grasslands are key to maintaining farmland biodiversity (Ockinger & Smith 2007) and that grasslands act as principle source habitats for bumblebees, butterflies and other important pollinators. The maintenance of viable populations of pollinators in farmland may therefore depend on the preservation of more or less permanent semi-natural habitats in agricultural landscapes (Tscharntke et al.,2005[37]) and the preservation and creation of semi-natural habitats should be prioritised within agri-environment delivery (Feon et al., 2010[38]). The desire to increase the permeability of the landscape to assist species movements is a clear priority outlined in the Lawton review and should include a range of approaches such as the development of connectivity zones, networks of narrow corridors and landscapes with a high density of small semi-natural landscape-elements (Opdam & Wascher 2004[39]).

Recommendation 3: B-Lines should promote a more strategic landscape-scale approach to pollinator conservation, planning for and delivering new permanent wildflower-rich habitats to improve habitat connectivity. This work should be integrated with and delivered alongside better targeted and more effectively managed wildflower strips/margins and other important habitat features.

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[31] Institute for European Environmental Policy, 2007. Guidance on the maintenance of landscape connectivity features of major importance for wild flora and fauna.
[32] Hill et al., 2001. Impacts of landscape structure on butterfly range expansion. Ecology Letter 2:313-321
[33] Warren et al., 2001. Rapid responses of British butterflies to opposing forces of climate change and habitat change. Nature 414:65-69
[34] Hodgson et al., 2011. Habitat re-creation strategies for promoting adaptation of species to climate change. Conservation Letters 00:1-9
[35] Ockinger & Smith 2007. Semi-natural grasslands as population sources for pollinating insects in agricultural landscapes. Journal of Applied Ecology 44:50-59
[36] Carre et al., 2009. Landscape context and habitat type as drivers of bee diversity in European annual crops. Agriculture, Ecosystems and Environment 133: 40-47

[37] Tscharntke et al., 2005. Landscape perspectives on agricultural intensification and biodiversity ecosystem service management
[38] Feon et al., 2010. Intensification of agricultural, landscape composition and wild bee communities: A large scale study in four European countries. Agriculture, Ecosystems and Environment 137: 143-150
[39]Opdam & Wascher, 2004. Climate change meets habitat fragmentation: linking landscape and bio-geographical scale levels in research and conservation. Biological Conservation 117: 285-297

3. The Yorkshire pilot project – 'Bee Roads'

The B-Lines approach was tested as a real on-the-ground pilot project in Yorkshire (covering North Yorkshire, West Yorkshire, South Yorkshire and the East Riding). The pilot project, know as 'Bee Roads' was funded through The Co-operative's Plan Bee Campaign www.co-operative.coop/Plan-Bee and was delivered over the period May 2011-March 2012. The aim of the pilot was to trial all aspects of the B-Lines approach in a specified geographical context (Yorkshire), working with a wide range of partner organisations to assess the practicalities of mapping/ identifying a B-Lines network, and initiate delivery on the ground, both directly and through partner projects and programmes. In addition 'Bee Roads' provided an opportunity to start developing a consensus around, and wider ownership of, the B-Lines concept.

The Bee Roads project was guided and supported by a 'Project Implementation Group' on which local authorities, BAP groups, the Wildlife Trusts, statutory agencies and farming groups were all represented (see Annex 2). This group provided a range of expertise and knowledge of conservation/farming issues and ensured representation from across the geographical extent of the Yorkshire 'region'. It was supported through a communications network which allowed engagement with wider range of individuals, organisations and groups.

The key outcomes of Bee Roads included:

- The mapping of B-Lines across Yorkshire
- Widespread engagement and development of support for the initiative
- Production of guidance materials
- Direct wildflower-rich grassland creation and wider delivery through partner projects and programmes

The experience gained through the Bee Roads project forms the basis of this report.

A list of organisations who assisted with the project, or who were consulted on various aspects of the work is shown in Annex 3.

4. The B-Lines Initiative; what are B-Lines and what are their constituent parts?

The B-Lines Initiative aims to develop a connected network of wildflower-rich habitats extending across the whole of Britain, by maintaining, restoring and creating large areas of habitat. It is recognised that it may not be technically possible practical or even appropriate to attempt to create a physically connected network of habitat across all areas and it is therefore proposed that the make-up of B-Lines may need to be flexible in its approach. Furthermore as Britain is famous for the diversity of its landscapes, and associated geology, wildlife and land use patterns, the implementation of the B-Lines vision will need to be sensitive to and respond to the changing nature of land through which the individual B-Lines pass. It is therefore accepted that the actual make up and appearance of the B-Lines will vary both at a micro and macro scale.

As a Britain-wide initiative, the success of B-Lines will rely on co-ordinated effort to ensure that the desired connectivity of habitats is achieved, and that local implementation can be linked with national delivery programmes. It is essential that the B-Lines are identified and designed in such a manner so as to achieve the necessary linkages between individual wildlife areas and to ensure that the underlying vision and aims of B-Lines are delivered and maintained into the longer-term.

The future realisation of the B-Lines vision, and the benefits that this will bring to a wide range of wildlife will depend on more joined up and integrated delivery of individual farm work, local wildlife projects, community-led initiatives, landscape-scale projects and national agri-environmental measures. It will require a shared understanding and long-term vision, alongside a commonality of approach and long-term commitment to achieving the overall B-Lines network. Over time success of B-Lines will also be dependent on its ability to learn from its actions and to respond in a co-ordinated manner to new environmental pressures and/or new ecological/ land management evidence.

The following generic guidance is provided to guide the development of the B-Lines network in a consistent, yet flexible manner, allowing it to be delivered through a wide range of partners and partnerships. These are summarised in Annex 1 – '***Delivering the B-Lines; our guiding principles'.***

4.1 B-Lines: Developing Connected Lines within habitat-enriched zones

The primary aim of B-Lines is the creation of a series of connected 'lines' of habitat, linking together the most valuable of our current wildflower-rich habitats; the existing wildlife sites which provide the core of the B-Lines network benefiting both from increased habitat area and improved habitat connectivity.

A continuum of habitat is considered as being the best approach to assist species dispersal across the countryside - a high priority for B-Lines. This is particularly true in landscapes where a relatively small percentage of the landscape is made up of suitable wildflower-rich habitat and it is difficult for species with low dispersal capacity to move between individual habitat patches.

However, although there are clear ecological benefits in creating a continuous network of habitat (i.e. helping species dispersal), it is also recognised that this may not always be of the immediate/highest biodiversity priority in all areas of the country, and it may also be very difficult to achieve, for example land manager/owner aspirations, land use, urban

conurbations and other potential physical barriers may all prevent the development of a continuous habitat strip. It is therefore proposed that the continuous B-Line should be identified as part of a wider 'habitat-enriched' linear zone, where a range of habitat maintenance, restoration and creation options could be considered. Working within such a linear zone is likely to present more opportunities for habitat restoration and creation, and therefore may offer more immediate opportunities for species dispersal in the short to medium term.

There is a wealth of research and experience with regards to habitat requirements, foraging and colonisation of invertebrates (see Figure 3), however it is probably unwise to try and interpret this into a detailed model for species/habitat conservation.

Foraging Distances:

Foraging distances for insect pollinators vary considerably, for example:

- Bumblebees average 400-900m[40,41,42]
- Solitary bees generally forage within 100-600m [43]
- Butterflies may range over several 100s of metres[44]
- Moths respond to beneficial habitats within 250m[45]

Colonisation:

- Virtually all species of butterfly readily colonise new habitat patches within 500-1,000m over a few years, given good source populations and suitable high quality target habitat.
- Bumblebees may colonise new areas over 10s km[46].
- Orthoptera may struggle with few species moving further than 100m[47]

Figure 3: Foraging and colonisations ranges of insect pollinators

A simple set of delivery guidelines are therefore outlined, supported by some simple evidence/assumptions (see Figure 4).

- It is proposed that B-Lines should be identified as 3km wide linear zones within which the long-term aim should be to work towards a continuous, wide (averaging c.300m wide but with thinner and thicker areas) strip of permanent wildflower-rich habitats, encompassing and linking together the best and most extensive areas of existing wildflower-rich habitat. The 3km wide zones will allow for flexibility as to where, in the longer-term, continuous lines can be agreed with, and developed by landowners.

[40] Carvell, C., et al., 2011. Molecular and spatial analyses reveal links between colony-specific foraging distance and landscape-level resource availability in two bumblebee species. Oikos 10.1111/j.1600-0706.2011.19832.x
[41] Goulson, D., and Osborne, J.L., (2010) Foraging Economics. In: Goulson, D. (ed) Bumblebees: behaviour, ecology and conservaiton. Oxford University Press, Oxford, UK, pp. 96.
[42] Connop, S., et al., 2011. Microsatellite analysis reveals the spatial dynamics of *Bombus humilis* and *Bombus sylvarum. Insect Conservation and Diversity, Vo 4, Issue 3: 212-221*
[43] Gathmann, A. & Tscharntke, T., 2002. Foraging ranges of solitary bees. Journal of Animal Ecology, Vol 71, No 5: 757-764.
[44] Cant, E.T., et al., 2004. Tracking butterfly flight paths across the landscape with harmonic radar. Proceedings of the Royal Society. doi:10.1098/rspb.2004.3002
[45] Fuentes-Montemayor E., et al., 2010. The effectiveness of agri-environment schemes for the conservation of farmland moths: assessing the importance of a landscape-scale management approach. Journal of Applied Ecology, Vol 48, Issue 3: 532-432
[46] Goulson, D. Conservation of bumblebees (Bombus spp) in the UK. Case studies on conservation of pollinator services as a component of agricultural biological diversity. www.internationalpollinatorsinitiative.org/uploads
[47] Walters, R.J., et al., 2006. Modelling dispersal of a temporate insect in a changing climate. Proc Bio Sci. 273(1597), 2017-2023.

- Within the 3km linear zones priority should be given to habitat restoration/creation opportunities which will extend/buffer existing wildlife sites and create strategically placed 'stepping stones' between them. The aim of the 'stepping stones' should be to ensure that the distance between individual habitat patches is no greater than 0.5km (see Figure 3). It would seem very important, particularly for more specialist species and those with poor dispersal, that the overall network does not have too many larger gaps between individual habitat patches.

- Where a continuous strip of habitat is not practical/achievable, many of the benefits of B-Lines could be delivered through the maintenance/restoration/creation of large blocks of permanent wildflower-rich habitat extending to a minimum of 10% of the identified 3km linear zones (i.e. 300 ha of newly restored/created habitat per 10km length of the network). It is suggested that a minimum habitat patch area be prescribed which is capable of supporting viable insect pollinator populations, and as a simple guide a 2 hectare minimum patch size is recommended (Individual high quality habitat patches of 1-2 ha being expected to support a semi-independent population of butterflies for a number of years).

- In addition to the restoration of key habitat areas, opportunities for wider wildlife/enhancements should also be taken within the B-Line linear zones to improve the overall environmental quality of the landscape, for example targeting of other agri-environment options, including hedgerow management/planting, management of banks/ditches, and where appropriate the creation of floristically enhanced margins, pollen and nectar mixes etc.

Factor	Principle	Guidelines for wide range of pollinator species
Habitat patch size and quality	Local population persistence	> 2ha habitat patches where possible, smaller if high quality
Landscape-wide habitat availability	Medium-term viability of populations and dispersal success	At least 10% habitat within each 3km stretch of the 3km wide B-Line
Long-distance route design	Populations that can respond to environment change and re-colonise following disasters	B-Line routes should connect up major "hotspots" of biodiversity (e.g. but not exclusively large SSSI, National Parks, NIA etc). Aiming for no absolute gaps in the route of > 0.5-1km

Figure 4: Main principles and guidelines of the B-lines approach, developed in consultation with Jenny Hodgson and Chris Thomas, Department of Biology, University of York

Recommendation 4: Development of a continuum of habitat should be a long-term aim, but habitat-enriched linear zones will provide major improvements in species dispersal, so long as the size of gaps is kept to a minimum (this is of particular relevance to more specialised species).

4.2 B-Lines: What are the key Habitat Components?

The focus of B-Lines should be on restoring and creating wildflower-rich habitats which will benefit both insect pollinators and other wildlife. Although a range of habitats have a role to play in the ecological functionality of individual landscapes (and in the conservation of insect pollinators), it is proposed that the primary focus of habitat restoration and creation activities with the B-Lines should be wildflower-rich grasslands, heathlands and lowland fens. This should not preclude from, or negate the importance of other habitats in the B-Lines; habitats such as scrub, scattered trees, hedgerows and wetland areas all clearly have a role in the ecological functioning of the B-Lines and the landscapes within they sit.

- Wildflower-rich grasslands appropriate to the locality will provide the core of the B-Lines, however other habitat types which reflect local landscape character and wildlife interests should also be included.

- Core habitat components should include wildflower-rich semi-natural grassland types, lowland heathland/grassland mosaics, lowland fen, wood pasture and parkland.

- Other habitat features which provide useful shelter, nesting and food supply, such as scattered scrub, woodland edge habitats and species-rich hedgerows, banks and ditches should also form an integral part of the habitat mix.

4.3 B-Lines: The quality and type of constituent habitats

The ecological make-up of the B-Lines should aim to reflect local wildlife interests and landscape character, and should therefore be guided by local strategies/ plans, including Local Biodiversity Action Plans and National Character Area assessments Of the highest importance is the need to develop habitat of a high quality, both in terms of its species composition and habitat structure, as otherwise new species will be unable to colonise and reproduce successfully.

- Permanent high quality wildflower-rich habitats typical of individual geographic locations (and appropriate for soil types, soil conditions, altitude and other important environmental factors) should be the focus of habitat restoration and creation activity.

- The priority should be to maintain/restore, and when necessary create high quality semi-natural habitat types that fulfil the requirements of pollinators and other invertebrates by promoting a range of plant species for food sources and suitable habitat for foraging and nesting areas.

- 'Artificial' grassland/habitat types should not be created in the countryside[48]; habitat creation should be guided, although not constrained by the National Vegetation Classification (NVC[49]).

- It is recognised that the creation of appropriate wildflower-rich habitats may be a challenge in some locations, for example on greatly modified/enriched soils. In these areas the gradual development of floristically-rich habitats will be encouraged, alongside the use of more temporary pollen/nectar rich strips (which will partially help to fill gaps in the B-Lines network in the short-term).

[48] Flora Locale, 2009: Go native! Guidelines for planting projects in the countryside

[49] www.jncc.defra.gov.uk/page-4259

As much of our wildlife resource is now represented by small isolated fragments in a more intensive agricultural or built environment, it is recognised that B-Lines will create zones of enhanced wildlife value, which may well be out of character with the surrounding modified landscape. In these situations B-Lines will work within existing geographical, topographical, and edaphic features to restore appropriate semi-natural habitats in a manner which reflects local landscape character.

Recommendation 5: The core focus of the B-Lines should be high quality semi-natural wildflower-rich plant communities which will benefit both insect pollinators and other wildlife. Quality of habitat is key; this needs to be of high enough ecological value to allow the species it supports to survive and develop new populations.

4.4 Interaction and integration with the wider countryside (and wider pollinator conservation delivery)

The existing evidence suggests that a more strategic landscape-scale approach to pollinator conservation is required. It is proposed that a core part of any new approach should be to increase the area of permanent wildflower-rich habitat, which will in turn help improve habitat connectivity and increase wider landscape permeability. The restoration and creation of more permanent wildflower-rich habitats should be carried out alongside, and therefore complement the benefits of commonly used 'temporary' habitat creation activities, as currently promoted under agri-environmental measures (e.g. wildflower-rich margins, pollen and nectar mixes, arable plant margins, hedgerow management etc). It should also work with, and contribute towards wider semi-natural habitat and species conservation activities.

- B-Lines have the potential to act as a core habitat resource/framework around which other invertebrate friendly activities (e.g. agri-environment options) can be targeted, for example locating wildflower-rich habitat strips in a more strategic and ecologically valuable manner. This could include the identification of smaller scale B-Line strips extending out in the wider countryside to connect with other important wildlife sites, important pollinator-dependent cropping areas and/or local villages/towns.

- B-Lines should be fully integrated with, and support wider landscape-scale biodiversity delivery, including the management of protected sites, priority habitats and species.

- The B-Line linear zones should be used to promote and target wider 'pollinator-friendly' agri-environment measures, for example floristically enhanced margins, pollen and nectar mixes, hedgerow management etc.

- The B-Lines linear zones should be used to target habitat restoration and creation through biodiversity offsetting and other wildlife projects/initiatives, ensuring the wildlife supported by the core habitat strip is benefited further by this wider 'enriched zone'.

Further work is required to define appropriate proportions of individual 'temporary' habitat features, consider how these relate to permanent semi-natural habitats and identify how best these should be located in the landscape to assist insect movements across the countryside. However it is suggested that there is a wide breadth of experience from both agri-environmental measures, wildlife/farming initiatives such as Conservation Grade, and from scientific research to develop broad guidelines as to the percentage of,

and make up of individual habitat features in the landscape. What may be less clear is as to how best these individual features should be spatially arranged across a landscape, and how this should relate both to existing semi-natural habitat and new habitats in the proposed B-Line networks.

Recommendation 6: Further engagement is required with key researchers and initiatives to develop evidence-based guidelines concerning the proportions and spatial arrangements of the individual habitat components of the B-Lines.

4.5 B-Lines: The Urban Context

The UK is a highly urbanised country, which places considerable constraints on any plans for the creation of a connected network of wildlife areas. However it also presents real opportunities for bringing wildlife into the lives of large sections of our population, providing major health and 'happiness' benefits[17]. One of B-Lines stated aims is to make wildlife more easy accessible and visible to people and the communities in which they live, so it is essential that we promote and develop meadow grasslands right into the heart of our urban areas. Initiatives such as 'Rivers of Flowers'[50] have shown the way in terms of planting of urban meadows in 'green corridors' or 'pollination streams' and there is lots to be learnt from many other initiatives including those run by Landlife[51]. Developing B-Lines into the centre of towns and cities will provide major opportunities to increase public engagement with insect pollinator and wildflower conservation, and to link urban conservation measures directly with those in the surrounding countryside.

Within these urban areas the aim should be to promote the creation of flower-enriched linear zones, in a similar fashion to those that are being proposed in the wider B-Lines network. However much in the way that a mix of permanent wildflower-rich grasslands and more temporary habitat is being proposed in the countryside, B-Lines in urban situations should aim to develop a mix of native wildflower-rich habitats alongside other more 'urban plantings' (which could include non-native plantings).

In order to create an effective B-Line, and to gain support from the large number of stakeholders found in the urban environment, it will be very important to develop a degree of ownership of each stretch of B-Line found within the individual town or city, and a sense of the importance of the communities' role in contributing towards the development of the overall network.

- Where mapping of B-Lines clearly identifies a route passing through an urban conurbation, B-Lines will aim to deliver it core aims both within the urban context and in surrounding/adjacent countryside.

- Opportunities should be taken to work with unitary authorities and local communities to develop 'rivers of flowers' type initiatives throughout the urban environments.

- Unitary authorities, local communities and developers should be encouraged to deliver B-Lines through green infrastructure initiatives, enhancing existing community green space and council-owned land, and looking for new opportunities such as living roof initiatives and innovative planting schemes.

- To ensure ecological continuity of the national network of B-Lines, in addition to working within the urban environment itself, it may also be appropriate and

[50] www.riverofflowers.org/
[51] " www.wildflower.co.uk/"

ecologically valuable to identify and develop a B-Line comprising semi-natural habitat around the outside of the built up areas.

- Villages/communities within the more rural stretches of the B-Lines could also be encouraged to participate in the initiative through appropriate garden planting, management of community areas, churchyards, roadside verges etc

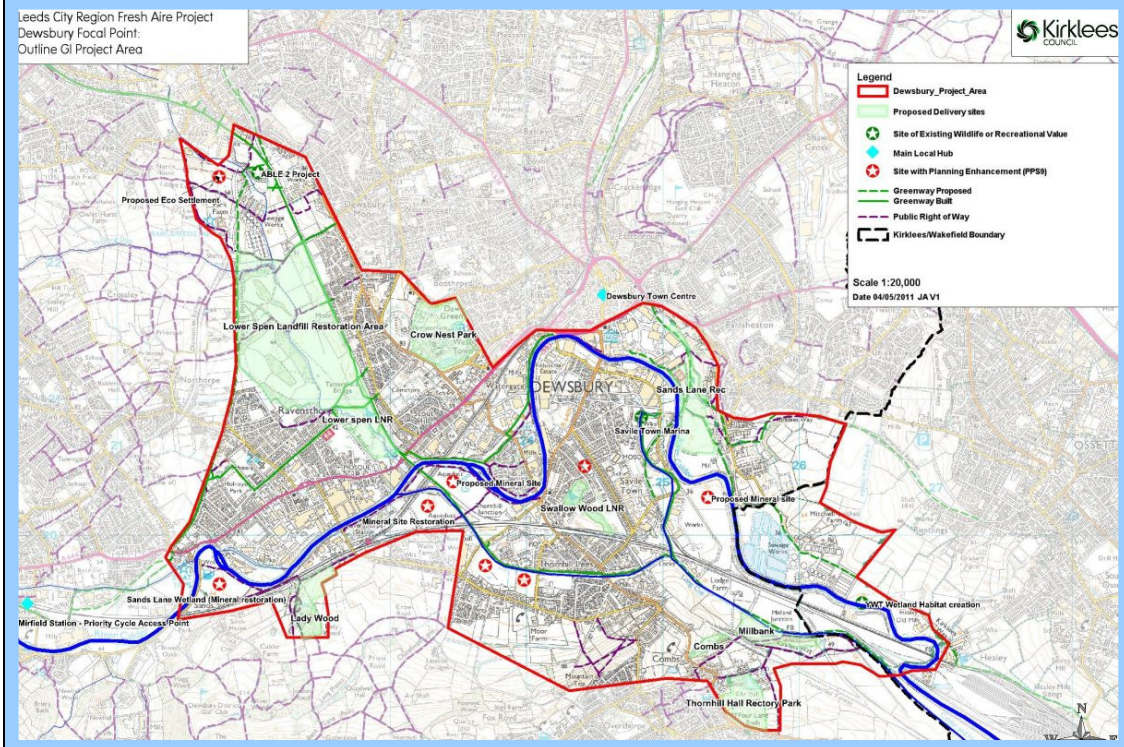
Recommendation 7: There is a need to work with existing urban pollinator/meadow initiatives to develop 'flagship' urban projects and to further refine evidence and related guidelines with relation to B-Lines delivery in urban environments.

Case Study 1: B-Lines working within an urban setting

Dewsbury: Biodiversity and Green Infrastructure Exemplar Project

Background

This project, managed by Kirklees Council, is piloting the development of biodiversity and green infrastructure (GI) enhancement within and around the West Yorkshire town of Dewsbury. This aspect of the work is funded by Natural England as one of its Biodiversity and GI Exemplar Projects programme. The project is also part of the wider Fresh Aire initiative which aims to develop the river corridors of the Leeds City Region as a linear park and GI network. Dewsbury is one of 6 linear park 'core areas' identified along the River Calder which also encompasses the districts of Wakefield and Calderdale. It is, therefore, part of a much wider ecological GI network.



The Dewsbury Biodiversity and Green Infrastructure Pilot Area – part of a wider sub-regional network

Biodiversity Networks
Within its Local Development Framework (LDF) Kirklees has identified the river corridors as an important east-west (and altitudinal) ecological network and aims to improve the value of this network for a range of species associated with the habitats found there (for priority species and habitats and Biodiversity Opportunity Zones see www.kirkees.gov.uk/biodiversity). To improve the functioning of the ecological network, the key objective is to ensure a range of habitats are present in large enough quantities to both support and assist a wide range of species to survive and move more freely around the countryside.

It is accepted that the network will inevitably vary in extent (width) and quality given the urban nature of the area. Nonetheless, more extensive core habitat areas will be identified, developed and managed to function as reservoirs for species. Between these core areas we will explore how the ecological connectivity can be enhanced, reviewing the role and function of the transport and waterways' corridors alongside smaller-scale features such as wildflower grassland creation in parks and gardens.

Integrating B-Lines and the Dewsbury Project

As part of the above pilot and the Fresh Aire project we are also exploring the potential to develop and add value to the B-Lines initiative. In particular, we will:

- Develop core areas of wildflower grassland which will serve as an important reservoir for invertebrate populations, including bees.
- Ensure wildflower grassland forms part of the habitat mosaic within ecological networks which connect core areas of habitat along the wider waterways corridor.

Areas for developing grassland and other habitats have already been identified for the pilot area.

Progress to date

To gain a better understanding of biodiversity and GI assets, opportunities, activities and constraints, the pilot project has so far undertaken detailed mapping. This information is being used to identify habitat development and management opportunities, in particular aimed at reinforcing ecological networks as identified in the Fresh Aire and the B-Lines project.

Further information: Jeff Keenlyside, Kirklees Council
(Jeff.keenlyside@kirklees.gov.uk)

5. Locating the B-Lines

5.1 Mapping B-Lines - the mapping minefield

Nature conservation bodies have increasingly been developing conservation actions outside of the protected sites series (SSSI, Local Wildlife Sites) and/or priority BAP habitats. In recent years there has been a rapidly accelerating shift towards conservation and restoration of biodiversity across whole landscapes. This shift in emphasis has been further promoted through the 'Making Space for Nature Report' and is gaining even more momentum following the publication of the Environment White Paper and the development of Nature Improvement Areas.

To assist with the targeting of restoration and enhancement at a landscape-scale a range of mapping exercises have been, and are continuing to be undertaken, including modelling and mapping of ecological networks, biodiversity opportunity areas, priority biodiversity areas/zones, The Wildlife Trusts' Living Landscapes and the RSPB's Futurescapes to name but a few. In response to this step change in the manner of biodiversity delivery, and also in an attempt to meet government/European planning guidance, many local and regional planning authorities have also developed a range of 'landscape-scale' maps. The introduction of 'green infrastructure' initiatives has also resulted in the identification of multi-functional 'corridors', many of which often have clear synergies with biodiversity mapping.

Unfortunately there has been no systematic approach to mapping ecological networks, green infrastructure or biodiversity opportunity areas across the UK, and hence there is no coherent or consistent approach/vision which can be used to develop a UK-wide landscape-scale initiative. Exceptions to this include the England Habitat Network (mapped by Natural England),and the Living Landscapes and Futurescapes mapping of the Wildlife Trusts and RSPB respectively which although not mapped through a consistent approach have ensured join up across the country and administrative boundaries. Local authority mapping and strategic regional mapping rarely extends or considers land out with their own boundaries. John Lawton in 'Making Space for Nature' recognises this issue and concludes that England (and probably the rest of the UK) does not have a coherent or resilient ecological network and highlights the need for more to be done to identify and agree core networks.

To summarise, this has led to a situation where there has been, and continues to be a plethora of mapping exercises initiated across both the biodiversity community and the development/forward planning sectors.

Recommendation 8: The B-Lines Initiative should work with, and through partners, wherever possible developing existing mapping approaches to minimise further duplication of effort and ensure increased join up of mapped priorities.

5.2 Building up a UK-wide B-Lines network

The B-Lines initiative envisages a Britain-wide network of wildflower-rich habitat. It is important that this national network is identified and mapped in such a manner as to be beneficial to wildlife and responsive to changing landscape character, but remain unconstrained by artificial man-made administrative or project boundaries. The identification of this national network will require unprecedented co-ordination and linking up between county/regional spatial planning within the overall national B-lines vision.

Appropriate linkages and agreements will need to be made between adjacent administrative areas, and local knowledge will need to be linked effectively with wider strategic planning/mapping.

To ensure the level of linkage required to develop a national B-Lines network, ideally mapping would be carried out at a national-scale. However the limitations of national datasets, the plethora of existing (and locally adopted) mapping work/methodologies and the desire to develop and foster local ownership of B-Lines, suggests that B-Lines mapping is best developed at a 'regional' or county scale (albeit it within a nationally identified framework).

To help build up a Britain-wide B-Lines network in a relatively consistent and joined-up manner, the following key principles are provided:

- Key B-Lines network 'nodes' should be identified and agreed on the edges of existing administrative (old regions or county) boundaries. These will provide an overarching national framework for B-Lines and ensure that overall connectivity of the network can be achieved. It is suggested that these 'nodes' be provisionally identified from nationally recognised grassland (and other) habitat networks[52] and the statutory site series. If this is not possible individual administrative bodies would need to agree these 'nodes' with adjacent administrations. Cross boundary discussion and work is essential.

- It is suggested that identification and mapping of individual B-Lines is best taken forward at a county/regional scale (within the framework of the network 'nodes'). As a minimum it is proposed that each county will have at least two B-Lines, one running approximately north-south and one east-west. The aim of this 'simplified' approach to ecological network is to provide a basic connected habitat structure which will help species movements across the country in response to climate and other environmental change. Clearly in areas with larger areas of fragmented habitat, it might seem appropriate to develop further B-Lines in addition to those proposed above.

- County/region-wide mapping should be refined at a more local level, using local data/knowledge (for example through Local Biodiversity Partnerships, Green Infrastructure Partnerships, local communities, Nature Improvement Areas partnerships etc).

- Within individual areas or sections of the B-Lines, key important wildflower-rich wildlife sites (SSSI, Local Wildlife Sites, nature reserves, BAP habitats) will always form the 'bones' of B-Lines (which will aim to increase overall habitat connectivity between them). The key aim is to link together the best of our existing wildflower-rich areas (see key habitats under 4.2).

- Existing ecological network mapping, green infrastructure and biodiversity opportunity mapping is likely to guide and underpin the identification of B-Lines. This will help ensure that B-Lines can contribute to these initiatives, both working within already identified priority areas and creating links between them.

Recommendation 9: The development of the B-Lines network should take place within a national framework, but refined and agreed using local data and stakeholder engagement.

[52] Catchpole, R., 2007. England Habitat Network – briefing note. English Nature.

5.3 B-Lines: Proposed approach to mapping within individual areas

A simple pragmatic approach to mapping B-Lines is recommended. This should be based on the core objective of improving connectivity between areas of priority habitat (in particular wildflower-rich grasslands and other habitat capable of supporting core pollinator populations). The mapping should aim to incorporate or abut the largest core areas of appropriate habitat (and their associated habitat networks) and identify the most realistic options for reducing fragmentation and improving connectivity. Ideally mapping should be practical, i.e. should consider areas where opportunities for habitat creations might be greatest and rejecting areas of constraint, whether these be of a physical (for example open water, woodland) or economic nature (for example Grade 1 agricultural land).

As outlined in section 5.1 of this report, B-Lines recommends working with existing mapping, organisations and partnerships to ensure that where possible B-Lines are integrated, or complementary with wider initiatives. As such B-Lines mapping should make full use of previous and ongoing mapping work (albeit developed to deliver the core B-Lines vision).

The proposed mapping approach advocated by the B-Lines Initiative consists of three phases of work (for further detail relating to the Yorkshire pilot - see the mapping methodology report[53]), notably:

Phase 1: Data collation - Defining the distribution of the current biodiversity resource, any significant constraints and wider factors which will influence the identification of B-Lines:

This phase requires the collation of existing data which locate both 'positive' and 'negative' factors which will influence the identification of B-Lines locations. These should be agreed 'locally' but should at a minimum use county/region-wide data including:

- Current biodiversity assets/resource - this requires the identification of the 'habitat components of B-Lines' (see 5.2).

- Potential 'constraints' or 'obstacles' - this could include a variety of datasets depending on a variety of geographic/ regional differences, however should include data on features which could prevent the B-Lines network being effectively delivered, for example woodland, open water, grade 1 agricultural land etc.

- 'Positive' factors - these include areas where opportunities for creating B-Lines may be greatest due to land ownership, land use etc and where conservation partners and/or local authorities have already invested time mapping landscapes, developing partnerships and delivering on the ground. These could include a number of key data-sets including Biodiversity Opportunity Areas, habitat networks, green infrastructure and Living Landscapes.

[53] The B-Lines Initiative: Mapping Yorkshire's B-Lines as part of the Bee Roads project.

Phase 2 – Identification of potential B-Lines areas

This aims to use the data collated in phase 1 to allow the Identification of broad areas/potential B-Line areas for more detailed mapping under phase 3 (local refinement). The primary aim is to produce a provisional B-Lines framework, thereby focussing in on potential areas which can then be assessed more fully with local knowledge/data.

In identifying these broad areas consideration should given to the following factors:

- Inclusion of the best and most extensive areas of existing core wildflower-rich biodiversity assets
- Inclusion of a high proportion of land supporting BAP habitats
- Relative proportion of new 'corridor' habitat required to develop B-Lines - i.e looking at shortest links
- Relative ease of creating links (e.g. existing grassland vs arable conversion)
- Synergies with existing mapping and/or biodiversity initiatives

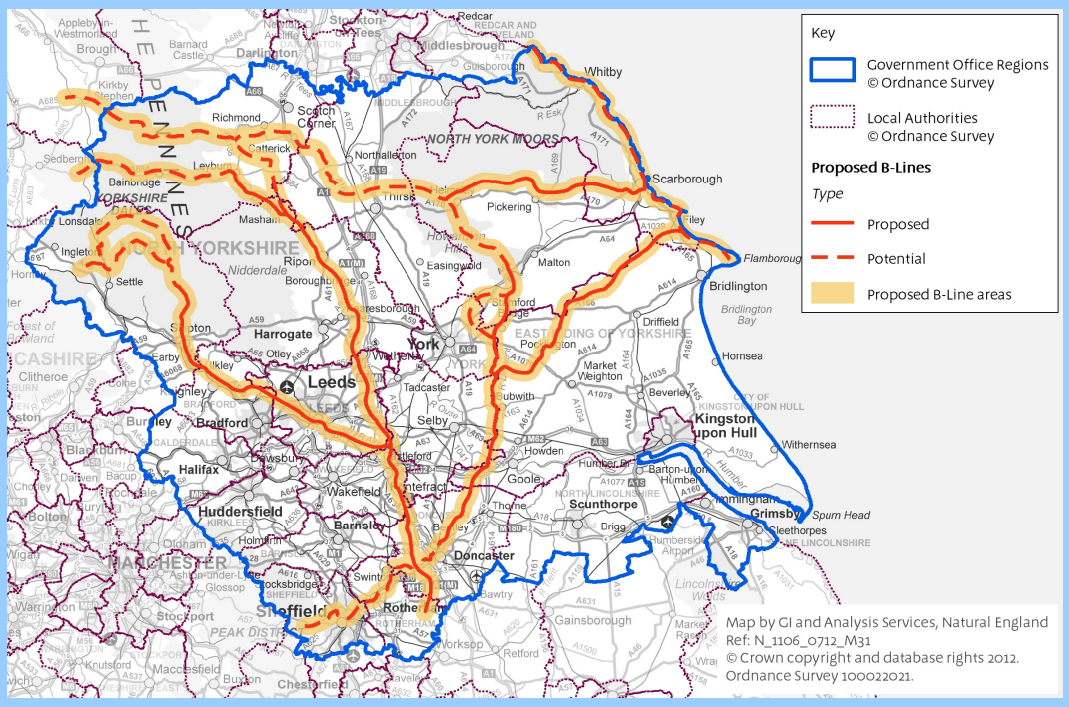
Phase 3 – Detailed mapping, analysis and confirmation of B-Lines

This phase of the work looks to identify agreed B-Lines by working with a range of stakeholders. This phase of mapping entails a more detailed look at, within and immediately around the areas agreed from phase 2 to identify B-Lines which connect and encompass the highest quality/value habitats. This phase enables the use of local stakeholder knowledge, local datasets, aerial photography etc to refine the provisionally identified areas. The approach taken is likely to vary depending on the quality and availability of local data/stakeholder knowledge, and between individual stretches of the B-Lines. However by using local data and knowledge it ensures that the best quality information is utilised (within a broadly identified framework) and will promote greater local ownership of the final B-Lines network.

Case Study 2: Mapping the Yorkshire B-Lines (under the pilot 'Bee Roads' Project)

The Yorkshire B-Lines were identified utilising a range of national and regional data-sets. The geographical data was manipulated and analysed by Natural England and the work was co-ordinated by the 'Bee Roads' Project Implementation Group.

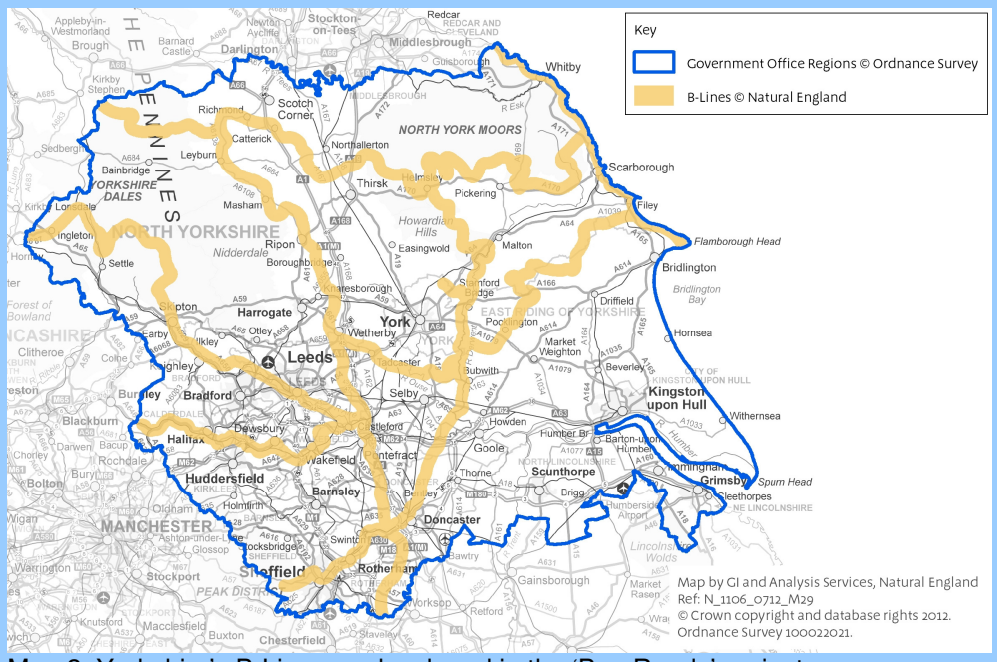
Phase 1 of the mapping work (see Yorkshire mapping methodology[53]) pulled together a range of data sets which helped identify a provisional B-Lines framework for Yorkshire. These areas were reviewed by the Project Implementation Group and then subject to consultation with wider stakeholders.



Map 1: Initial identification of B-Lines areas

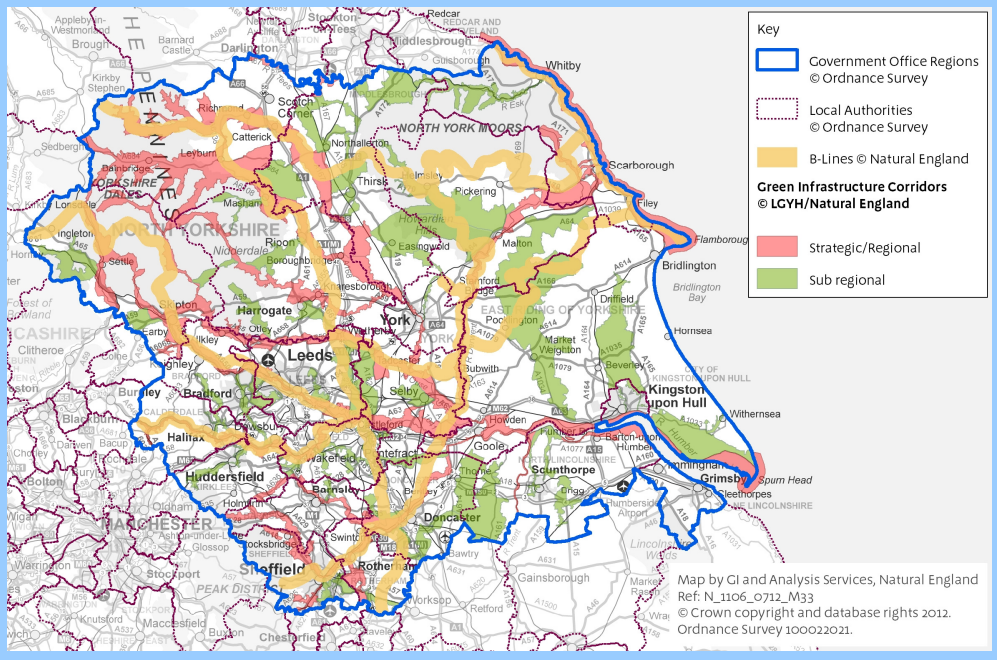
The provisional Yorkshire mapping was then reviewed at a local level using more up-to-date and accurate data sets, and through engagement with key stakeholders. This allowed refinement of the B-Lines, and consideration of smaller habitat features in the overall 'analysis'. High quality habitat mapping, ensured we confirmed the most appropriate locations for the B-Lines.

The Yorkshire B-Lines were confirmed early in 2012 and were circulated to key organisations in Yorkshire, including local authorities, biodiversity/farming groups and statutory agencies (map 3).



Map 2: Yorkshire's B-Lines as developed in the 'Bee Roads' project

As outlined elsewhere in this report, a number of existing biodiversity/green infrastructure mapping initiatives were considered within the B-Lines mapping work. This approach was taken both to reduce duplication of effort in the mapping process, and also to ensure B-Lines could make full use of these current programmes/initiatives within its future delivery. As well as having significant overlaps with current landscape-scale programmes, it is also clear that in making the links between existing wildflower-rich habitats the B-Lines also extend out into wider areas of the countryside. Map 3 demonstrates the synergies and differences between the agreed B-Lines and both Yorkshire's 'Green Infrastructure corridors'.



Map 3 : Yorkshire's B-Lines and its 'Green Infrastructure corridors'

5.4 Integrating with wider initiatives

Over recent years there has been some proactive work, for example within the regional/county Biodiversity Partnerships, to try and identify synergies between separate projects and to establish new more integrated delivery partnerships. However in many areas there is still a web of un-related projects and initiatives focussing on conserving/enhancing different elements of the area's biodiversity. B-Lines clearly has a role within this landscape-scale delivery agenda; it can play a key part both in restoring /expanding the habitat resource within existing project areas and also providing a more robust ecological framework and vital ecological links between them. B-Lines would appear to be the only current initiative that proposes a coherent joined up network and with the scale of ambition required.

Within the Yorkshire context, the mapping made a concerted effort to review existing biodiversity mapping initiatives and clearly identified significant stretches of the proposed B-Lines overlapping with areas already highlighted as being of high priority for action by the wider biodiversity community. As B-Lines develops into other areas of the country it is very likely that their will continue to be common ground between B-Lines and other landscape-scale initiatives.

Case study 3: Living Landscapes working with B-Lines

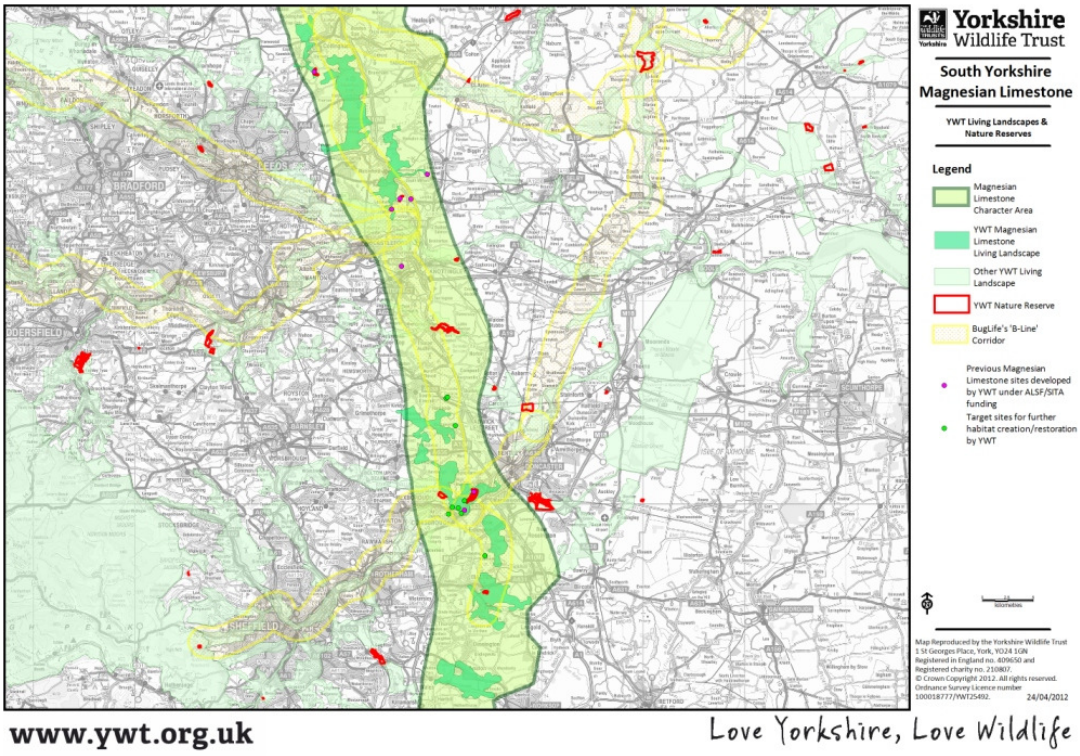
The Yorkshire 'Bee Roads' pilot project has made contact with a wider range of partnerships and initiatives across the four counties, and worked with may of these to develop mapping, and subsequent biodiversity delivery.

The Yorkshire Wildlife Trust's Magnesian Limestone Living Landscape - In 2008, Yorkshire Wildlife Trust (YWT) developed a suite of targeted landscape scale project areas in line with The Wildlife Trusts' vision of Living Landscapes. This included areas of magnesian limestone habitat where YWT and partners felt that a targeted approach of restoration of these habitats would reap significant biodiversity gain (see map).

Current conservation activity - In 2009, YWT developed the first funding bid for this Living Landscape and was subsequently successful in gaining funding from both ALSF and SITA Trust to restore 10ha and create 9ha of magnesian limestone grassland between 2009 and 2012, with works including; erecting new fencing and/or laying hedges and installing drinking sources to allow grassland to be grazed, removal of scrub to allow grassland to flourish and securing grazing resource to allow the sites to be managed in a sustainable manner into the future.

Living Landscape assisting B-Lines Mapping – Identifying Yorkshire's Living Landscape areas involved the analysis of many detailed habitat datasets by a number of local experts/stakeholders. The Yorkshire Wildlife Trust made this information available to the B-Lines, which ensured that best use was made of existing mapping products and that there was less duplication/repetition of effort.

B-Lines and Living Landscapes working together - The next phase of the Magnesian Limestone Living Landscape is to work with a number of partners, including Buglife and their B-Lines project, to develop an additional suite of sites for restoration. This will concentrate on the section of the Magnesian Limestone from Maltby in Rotherham Borough to Brodsworth in Doncaster Borough and, in addition to restoring areas of degraded limestone grassland, will include a focus on developing mosaic habitats of limestone woodland with species rich rides and glades.



Map 4: B-Lines and Living Landscapes

5.5 Taking Account of rare species?

The B-Lines Initiative's stated aim is to develop areas of habitat which can sustain populations of insect pollinators and other invertebrates. It promotes an approach aimed at large-scale habitat/species conservation which would suggest that the major beneficiaries are likely to be more widespread and generalist species associated with a range of wildflower-rich habitats. However it is highly likely that by extending and linking together the best of our existing wildlife areas, rarer more specialist species associated with these high quality habitats will also benefit. Although it would not seem appropriate for the mapping of B-Lines to be led, or guided by the distribution of rare invertebrate species, it would seem advisable for distribution data to be assessed in relation to the proposed B-Lines. This would ensure any obvious benefits to individual species could be identified and taken into account in the development and future delivery of the B-Lines.

Case Study 4: B-Lines taking account of rare species

Rare butterflies of the North Yorkshire Moors: Several clusters of limestone grasslands found along the southern edge of the North Yorkshire Moors National Park, support populations of two rare butterflies - the pearl-bordered fritillary and the Duke of Burgundy. Both these species are restricted to a relatively small number of sites; the pearl bordered fritillary numbering only three 'colonies' and the Duke of Burgundy approximately ten 'colonies'. Although they have differing habitat requirements, the pearl bordered caterpillars requiring violets growing in bracken-dominated grasslands and the Duke needing cowslips, the principle habitat for both species are wildflower-rich limestone grassland swards.

Current work to protect and enhance butterfly populations: Butterfly Conservation are working with a number of partner organisations (including the North York Moors National Park Authority) and land owners to carry out key habitat restoration works on thirty limestone grassland and woodland areas. The majority of these sites are small (<0.2 ha) fragments of wildflower-rich grasslands, isolated from each other and suffering from lack of management (in particular grazing). Most of the project work is concentrating on reducing areas of scrub and rank grassland vegetation, thereby encouraging an increase flowering of the grasslands wildflower species. In addition the project is looking at improving the condition of other degraded limestone grasslands sites in the area, with the hope that the two butterfly species will colonise these sites and establish new populations. Further work is starting to consider the development of new linkages between core habitat areas, for example widening grassland rides through woodland areas, helping to connect smaller fragments of limestone grasslands together.

Where does B-Lines fit in? The Yorkshire-wide mapping carried out under the pilot 'Bee Roads' project, identified the fragmented limestone grasslands of the south North York Moors as a key component of the overall Yorkshire B-Lines network. These are important species-rich grasslands, and therefore a priority to be included in the B-Lines, but in addition there was also a clear opportunity to promote the development of a more connected wildlife corridor. The local refinement of the county-wide mapping involved utilising local Phase 1 data and accessing expert knowledge from the National Park conservation team. This ensured smaller-scale grassland features, for example large woodland rides and roadside verges were identified alongside the larger grassland areas which had been identified at the Yorkshire-scale. It also ensured that potential opportunities for grassland restoration including the clusters of sites supporting the pearl bordered and Duke of Burgundy were included. This stretch of B-Lines therefore encompasses the main focus of the Butterfly Conservation species recovery work within what in the longer-term could be a much larger network of wildflower-rich limestone grasslands.

Recommendation 10: Although B-Lines sees itself as a broad-brush approach to insect pollinator conservation (as it aims to link together priority areas of wildflower-rich habitat in enriched linear zones), there will be significant opportunities to contribute towards the conservation of rare species. Key opportunities should be identified along the proposed B-Lines, and measures taken to ensure the needs/requirements of rare species are accounted for in both the location and 'design' of individual B-Lines stretches.

6 B-Lines helping to deliver national Landscape-scale objectives

6.1 B-Lines and the Lawton approach

The 'Making Space for Nature' (Lawton) review is recognised as being of primary importance in the future implementation of the UK's commitments to international biodiversity strategies and targets. It's headline conclusion that England does not have a coherent and resilient ecological network, and that the level of habitat fragmentation is high (particularly in lowland areas), is a major driver behind the revision of the England Biodiversity Strategy and its developing Delivery Plan. The Lawton review makes 24 recommendations, including the need to identify existing and potential ecological networks and the improved management of Local Wildlife Sites.

The B-Lines Initiative plans to identify/develop a suite of better connected networks/corridors of wildflower-rich habitat across Britain and therefore has the potential to play a core role in both increasing habitat area, increasing habitat connectivity and improving the permeability of the wider farmed landscape. As such B-Lines can make a significant contribution towards the delivery of a natural environment more resilient to environmental change as endorsed in the Lawton review.

B-Lines proposes the restoration and creation of c. 150,000 ha of wildflower-rich habitat, targeting this work in priority areas. There is therefore a primary role for B-Lines to help expand and buffer existing wildlife sites, while working to improve habitat connectivity within landscape-scale project areas (including the new Nature Improvement Areas), and also providing key habitat linkages between the separate areas.

The core aims of B-Lines clearly complement the findings of the Lawton review, however it is an imperative that the developing B-Lines concept continues to reflect these recommendations in the manner of its development and delivery, and that the identified B-Line 'corridors' play their part in the establishment of a coherent ecological network.

Recommendation 11: B-Lines should establish itself as a simple yet potentially very effective model to help deliver the core recommendations of the Lawton review as they relate to habitat protection and connectivity.

6.2 Integrating with, and helping to deliver other initiative and policies (e.g. protected sites, Water Framework Directive objectives etc)

The initial B-Lines concept clearly identifies the potential to deliver more than just its headline aims; it has the capacity to help with a range of other environmental priorities including water quality, erosion prevention and carbon sequestration to name but a few. By creating a network around a core of protected sites (SSSI, SAC and Local Wildlife Sites) it will also help secure their long-term future, by expanding the current habitat/species resource and providing buffers against detrimental external influences.

Of particular relevance is the potential of B-Lines to support and contribute towards the UK's obligations under the Water Framework Directive, as it is likely that substantial stretches of any mapped B-Lines will be situated along river valleys/floodplains. In these situations arable reversion and/or a reduction in the intensiveness of existing grassland management is likely to be one of the key solutions to tackle diffuse pollution problems.

In addition substantial levels of carbon could be locked-up (sequestrated) in soils subject to conversion from arable to permanent biodiverse grasslands[54].

Within the Yorkshire context, the proposed B-Lines link together some of the most important SSSI and SAC grassland and lowland heathland areas, including the Lower Derwent Valley, Skipwith Common, the coastal grasslands, and the large expanses on upland hay meadows and limestone grasslands (Craven Limestone Complex SAC and Ingleborough Complex SAC) in the Pennine uplands. In these locations we will be working with Natural England to promote the creation of new 'buffer' habitats around protected sites and starting to link up some of the smaller fragmented areas. In addition where B-Lines follow some of Yorkshire's most important river systems (including the River Aire, River Derwent and the River Don), by restoring and creating swathes of wildflower-rich floodplain grasslands we will work hand-in-hand with the many Water Framework Directive initiatives currently working to improve water quality.

Case Study 5: B-Lines working along the River Derwent

The Site: Yorkshire's River Derwent is a Site of Special Scientific Interest (SSSI) and also a European Special Area of Conservation (SAC). These designations reflect the importance of it's the plants and animals that it supports. However the quality of the habitat has been degraded as changes to land use in the adjacent area and the river channel have occurred over time. The ecological condition of the river is such that species such as river and sea lamprey, and the aquatic plants are being affected. Further down the river are the internationally renowned Lower Derwent Floodplain Meadows; one of the largest and most important area of traditional lowland hay meadow habitat in the UK (containing c. 8% of the national resource).

The major issues affecting the River SSSI: Four major issues which affect the condition of the river have been identified, which include 'excess fine sediment and deposition', 'channelisation', 'in-channel structures' and 'lack of bankside shelter'.

Solutions to tackle these issues have also been identified and these include enhancing riparian habitat, preserving existing habitats changing agricultural practices to manage fine sediment inputs. Progress is being made to implement these solutions through the implementation of a Restoration Plan for the River SSSI , but data provided in the River Derwent SSSI Diffuse Pollution Plan (2010) reveal that at that time only 70 ha of land in the immediate river catchment were under agri-environment options for 'reversion to grassland'. The local Rivers Trust have appointed a Project Officer to work with the many landowners and partners projects to achieve the wide ranging actions of the Restoration Plan. This in turn will achieve Water Framework Directive measures in the Humber River Basin Management Plan

[54] Guo, L.B. & Gifford, R.M., 2002. Soil carbon stocks and land use change: a meta analysis. Global Change Biology. Vol. 8, Issue 4, 345-360.

Where does B-Lines fit in? B-Lines is one of the projects which can help to achieve protected site and WFD measures in the Yorkshire Derwent catchment. One of the key north-south B-Lines mapped through Yorkshire follows the River Derwent from Duffield to Malton – a stretch of about 30 miles. By restoring and creating appropriate habitats, it aims to link the large areas of floodplain meadow of the Lower Derwent valley to the heathlands of Skipwith Common and northwards to the wildflower grasslands of the south North York Moors and the coastal grasslands to the east.

Around the Lower Derwent valley, in addition to improving ecological connectivity with other sites, the primary aim of B-Lines will be to develop a wide buffer of wildflower-rich pasture alongside the SSSI grasslands, providing both an increased area of habitat, protecting the SSSI interests and also providing additional habitats for invertebrates and other wildlife, particularly during periods of flooding or when the meadows are cut.

To the north, where a greater proportion of the floodplain and surrounding land is under arable crops, the primary focus of B-Lines is to restore existing fragments of grassland and create large areas of additional wildflower-rich grassland through arable reversion. In addition to the clear benefits of increasing the overall area of habitat and linking existing small fragments of habitat, the work of B-Lines will support ongoing efforts under river restoration and diffuse water pollution plans to help improve the condition of the river and help meet Water Framework Directive measure for the Humber River Basin Management Plan. Work to create wildflower-rich grasslands along this stretch of the river will help reduce sediment input into the river and will help create extensive stretches of valuable floodplain habitat.

7 Recognising the B-Lines in Planning and involvement of Local Authorities

7.1 Brief background to Local Authority protection and enhancement of ecological networks and biodiversity opportunity areas.

Biodiversity and wider environmental interests are afforded varying degrees of protection from development through recognition by local authorities in their Local Development Frameworks. Protected sites, Local Wildlife Sites and other biodiversity assets are generally protected through core policies and associated mapping. The key policy driver within local development planning is now the recently published National Policy Framework (2012)[55] which identifies the following key statements as to how the planning system should contribute towards the enhancement of biodiversity:

- "By minimising impacts on biodiversity and providing net gains in biodiversity where possible,….., including by establishing coherent ecological networks…"
- "Set(ting) our a strategic approach in their Local Plans, planning positively for the creation, protection, enhancement and management of networks of biodiversity and green infrastructure."

Over recent years in addition to the protected of core assets, and in line with the recent move towards landscape-scale biodiversity delivery, plans within Local Development Frameworks have now adopted or are developing a range of biodiversity opportunity and ecological network maps. The requirement to continue to identify and develop ecological networks is acknowledged in the National Planning Policy Framework which requires planning policies to:

- "Plan for biodiversity at a landscape-scale across local authority boundaries."
- "Identify and map components of the local ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity, wildlife corridors and stepping stones that connect them and areas identified by local partnerships for habitat restoration or creation."
- "Promote the preservation, restoration and re-creation of priority habitats, ecological networks…"

Further responsibilities are afforded by the Conservation (Natural Habitats, &c.) Regulations 1994 (Section 37) which requires development plans "*to include policies encouraging the management of features of the landscape which are of major importance for wild flora and fauna. Such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems of marking field boundaries) or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species.*"

In addition to the identification and protection of biodiversity assets within Local Development Frameworks, there has also been a major push to include green infrastructure mapping. These multi-functional corridors/networks are often underpinned by habitat mapping, and hence also offer substantial opportunities to enhance the biodiversity resource.

[55] National Planning Policy Framework 2012. Department for Communities and Local Government.

7.2 Recognising the B-Lines in Local Planning

Many Local Development Frameworks, and their associated maps are well developed after lengthy periods of consultation and have developed their own individual approaches to mapping biodiversity opportunity areas and/or ecological networks; utilising a range of biodiversity datasets and local stakeholder input. The National Planning Policy Framework now introduces a requirement to review Local Plans in line with policies identified in the Framework, albeit current policies are not necessarily considered out-of-date simply because they were produced prior to the publication of the Framework. However this represents a clear opportunity for getting B-Lines recognised in local planning. The recently promoted Nature Improvement Areas may also provide an opportunity to explore how a national programme could be adopted into Local Plan documents, and/or if primary legislation is needed to establish a duty on local authorities to identify, and in the longer-term help create landscape-scale biodiversity initiatives.

In addition by finding synergies with existing biodiversity and green infrastructure mapping, and influencing their delivery plans/programmes B-Lines can potentially be created and protected through this wider range of mechanisms. If biodiversity offsetting becomes an important funding/delivery mechanism, then local authorities will need to identify agreed 'receptor' areas within their existing mapped areas, and this may provide a major new opportunity for B-Lines to get itself recognised in the local planning arena.

Recommendation 12: B-Lines should aim to work with local authorities to ensure that existing maps and associated policies recognise the B-Lines networks, however where it is not possible to influence existing maps, core areas of overlaps should be identified.

7.3 Wider involvement of Local Authorities in the delivery of B-Lines

Local Authorities have a significant role to play in contributing towards landscape-scale biodiversity programmes. They have a statutory duty with respect to development planning, and a clear role both in terms of protecting habitat from development and in helping to establish ecological networks through the use of planning agreements and other compensation/mitigation mechanisms. Local authorities play a significant role in the establishment of Local Wildlife Sites Partnerships and the monitoring and implementation of positive management regimes on these important wildlife areas. In addition many local authorities have significant land holdings, both in urban and countryside locations which have the potential to be managed more sympathetically for wildlife. Other responsibilities, for example management of roadside verges also provide opportunities for making a positive contribution towards the enhancement of the environment at a landscape-scale.

Case Study 6: Working with North Yorkshire County Council (NYCC) to make the most of Local Wildlife Sites in the B-Lines

The Council has responsibility for co-ordinating the Local Wildlife Sites Panel (known as Sites of Importance for Nature Conservation - SINCs – in NorthYorkshire) which maintains up-to-date monitoring data the county's 750+ sites, and maintains contact with the individual site owners/managers. As part of this role they co-ordinate a rolling annual survey of the sites to enable reporting on the condition of the wildlife interests of overall Local Wildlife Sites series.

As part of the B-Lines pilot project, NYCC identified those Local Wildlife Sites which fall within the B-Line linear zones and produced maps and associated data (habitats, habitat condition) of this subset. This helped identify the current contribution of Local Wildlife Sites to the B-Lines network, as well as identifying sites were habitat restoration may be required. These Local Wildlife Sites often provide key habitat stepping stones in a more intensively managed agricultural landscape, and when in good management condition help provide 'the bones' of the B-Lines.

Further opportunities around local authority owned land, urban greenspace and roadside verges?

The North Yorkshire County Council is a major agricultural land owner, owning in the region of 1600 ha of land. In addition to this they own or have responsibility for substantial areas of amenity and recreation land, from school grounds to care homes, as well as managing the verges of over 5500 miles of road in the county.

NYCC's Ecology team is working with colleagues in NYCC Facilities Management to explore what changes can be made to NYCC school grounds to maximise wildflowers across these sites, creating networks for pollinating insects as well as creating an enhanced learning environment within the school itself.

The Ecology team is also working with colleagues in NYCC Highways Department to amend the bi-annual cutting regime, so that it minimises cutting of wildflowers in bloom whilst maximising the area of grassland being managed beneficially. Alongside this, the team works with NYCC Countryside Rangers and Countryside Volunteers to manage over 30 Special Interest Verges, which are some of the best wildflower verges in the county.

The team is keen to explore what added wildlife benefits can be brought onto the Council's tenant farms, and is exploring the promotion of key agri-environment options on these farms.

Current and future involvement of NYCC in B-Lines

B-Lines is currently working with the Council to identify Local Wildlife Sites where habitat management is required to restore wildflower and associated insect pollinator interest. Work is currently planned along the River Derwent Corridor east of York, where the Council and B-Lines are proposing to jointly survey key sites, and subject to availability of funding and landowner willingness carry out grassland restoration works over the coming few years. The aim on this stretch of B-Lines is to ensure that all of the Local Wildlife Sites with grassland and lowland fen interest are restored to a favourable management condition, and contribute fully towards the overall B-Lines network. In addition NYCC will aim to look at exploring options on their farms within the B-Lines across the county and seek opportunities for increasing/enhancing wildflower-rich areas.

8 Creating and Managing the B-Lines

Working at a landscape-scale to develop a connected network of wildflower-rich areas across Britain will necessitate the use of a range of habitat enhancement, restoration and creation activities. Overall B-Lines will aim to contribute towards the core aims identified in the 'Making Space for Nature' report, i.e. making sites bigger, better and more joined up. It will promote the restoration/creation of high quality semi-natural habitats, while ensuring that the maintenance of our most important wildflower-rich habitats is still of the highest priority.

8.1 Habitat restoration and creation objectives (what is B-Lines aiming to achieve?)

The establishment of the B-Lines will need the maintenance/enhancement of existing habitats, restoration of substantial areas of degraded habitat and the creation of extensive areas of newly created habitat. In line with current best practice:

- Priority should always be given to the enhancement of the quality of existing sites and restoration of degraded sites through changes/improvements to management, before any consideration of habitat creation.

- The formation of the B-Lines will, however, require new significant areas of wildflower-rich grassland creation and in these circumstances B-Lines must be sensitive to the conservation of our native flora, and use exclusively seed from native plant species, wherever possible sourcing this from local grassland habitats.

In the context of the two statements made above, the overall objective for habitat restoration and creation within the B-Lines can be expressed within the following:

- B-Lines should aim to maintain, restore and create high quality semi-natural habitat types (guided by the National Vegetation Classification[49]) that fulfil the requirements of pollinators and other invertebrates i.e. food, foraging, nesting and overwintering resources. **High quality habitat** is essential if B-Lines is to be successful in aiding the long-term dispersal of insect pollinators (and other wildlife).

- B-Lines should comprise a mosaic of wildflower-rich habitat types supported through a range of sensitive management regimes (i.e. hay making, ungrazed habitats, lightly grazed pastures).

- Important habitat features, which will be encouraged through appropriate management, include a wide range of flowering plant species (that provide a long continuous flowering period) and a range of other habitat attributes including bare ground and tussocky vegetation.

- Other habitat features such as scattered scrub and species-rich hedgerows, are seen as a core part of the habitat mix.

Recommendation 13: B-Lines should promote the need for restoration of large areas of habitat and ensure that any habitat creation meets the highest standards.

8.2 Standards and approaches for habitat restoration/creation

The delivery of B-Lines should be taken forward in line with the recently agreed Plant Link UK and Invertebrate Link document 'Creating habitat for pollinators in Britain and Ireland' (2011). Key parts of this guidance as they relate to the creation of B-Lines are provided below and will form part of the B-Lines standards:

i) Site restoration and natural regeneration

- Restoration of degraded sites through natural regeneration or changes to management, should be considered before seed or plants are introduced. Where restoration has been attempted and failed, or where changes to management is deemed unlikely to restore sites seed of native wildflower can be introduced.

- Opportunities should be taken to re-introduce characteristic native wildflower into species-poor semi-improved grasslands (with appropriately sourced seed).

- Seed from wildflowers which are widespread should be utilised in preference to rarer species (although rarer species could be introduced if from locally harvested seed).

ii) Local seed harvesting

- Wherever possible seed should be harvested locally, and/or green hay techniques utilised, as this will help ensure that scarcer and/or locally significant species are introduced into the grassland swards.

iii) Local Provenance seed

- Seed utilised in grassland restoration and creation works should come from British native-origin stock. Wherever possible source from a more precise location (e.g. north of England), particularly when working in ecologically 'sensitive' areas.

8.3 Overall objectives for management - A diversity of habitat types/condition

At a landscape-scale, B-Lines will look to achieve a diversity of habitat structure and function aimed at supporting the needs of invertebrates and other wildlife. A range of management regimes will therefore be required, promoted and designed to create a diverse natural environment and associated wildlife interests. As such no standard management guidelines are proposed. Habitat objectives and associated management should be considered in the context of the surrounding landscape and/or adjacent areas to B-Lines, for example in areas where hay meadows are the predominant grassland type, consideration should be given to creating habitats which can provide refuges and pollen/nectar to invertebrates displaced by hay cutting. Similarly new habitat should be developed to complement the habitat resource of existing SSSI and Local Wildlife Sites, for example extending the area of priority habitats or providing additional habitat diversity on adjacent land

Decisions on management regimes should be made on the basis of a number of key factors including the existing grassland interests (plants, invertebrates, birds etc), soil types and current/past management (as existing species interests are likely to be adapted to current management). Unless there are very rare species or important grassland types (e.g. upland/floodplain meadows) with specific management requirements, management of the B-Lines should aim to develop grasslands (and other target habitats) with a variety of vegetation structure. Only in exceptional circumstances should individual stretches of habitat be managed exclusively for individual rare species.

Further guidance on how these individual habitat components can help support healthy populations of insects is provided in Buglife's 'Managing Priority Habitats for Invertebrates' fact sheets[56].

Recommendation 14: B-Lines must relate management of individual parcels of land/habitat to that in the surrounding landscape. It should aim to achieve a diverse and complementary range of habitat type and conditions across the proposed linear zones and into the wider countryside

8.4 Practical approaches, collective management etc

The implementation of B-Lines will involve an unprecedented level of joined up planning and delivery on the ground. Clear and consistent messages will need to be provided to the farmers and landowners, and time invested in developing practical implementation plans for sections of the B-Lines network. Delivery of B-Lines will necessitate a wide range of farmers, landowners, wildlife organisations, government agencies, business and local authorities delivering parts of the network in a co-ordinated fashion. To achieve connectivity across the network will require all these parties to target and deliver habitat creation in a joined up and integrated manner. Work on the ground, particularly through agri-environment, will need to be done collectively. Farmers will need to be brought together into collective agreements/projects to link their work together and ensure appropriate work is carried out across whole sections of the B-Lines and wider landscapes.

[56] www.buglife.org.uk/conservation/adviceonmanagingbaphabitats

9 Delivering the B-Lines

B-Lines will aim to deliver improved habitat connectivity between our most important habitats and will work both within, and between landscape-scale initiatives being promoted under the Lawton review and the government White Paper. Due to the scale of the proposed work it will need to be delivered through a range of mechanisms, both national (e.g. agri-environment delivery) and more locally-led initiatives. To achieve this it is recognised that B-Lines may link, and where possible integrate with, other landscape-scale initiatives which can help deliver its core aims. In addition there may be a need to incentivise the restoration and creation of wildflower-rich habitats to make this a more viable and attractive option to landowners and farmers. The impacts of tax relief in helping to increase woodland planting in the 1970s (albeit some of this detrimental to the natural environment), demonstrates how incentives can have a major impact on land use. More recently the use of increased rates of agri-environmental subsidies in Switzerland to promote the developments of designed ecological networks[57] has also been trialled as a way of incentivising the development of particular habitat types in specific locations.

9.1The agricultural perspective

Three quarters of the UK land area is in agricultural management and farmers and landowners clearly have a major responsibility for managing the wildlife that this supports. The input of the farming sector to the maintenance and enhancement of wildlife is clearly demonstrated by c. 70% of the countryside being under environmental management agreements and/or other voluntary initiatives including the Campaign for the Farmed Environment. UK agriculture brings over £4.5 billion into the UK economy, while at the same time support to the farming sector under the Common Agricultural Policy (CAP) accounts for c. 40% of the EU budget – a substantial amount of the EU's resources. The farming industry is currently having to address a range of major issues including increasing food supply (as world food supply is predicted to rise by 50% by 2030), dealing with the impacts of climate change (this includes both opportunities as well as detrimental impacts), and protecting the environment and biodiversity. The uncertainties surrounding the current review of CAP are at best unsettling, and some key messages coming out from discussions may already be leading to some farmers reviewing their current involvement in agri-environmental measures.

The work the farming industry carries out to protect and enhance our environment is well documented, particularly that carried out under agri-environmental measures. Also well documented are the losses and declines seen in much of our wildlife as agricultural management has, and continues to intensify. Clearly a lot of very important work is being taken forward by farmers and landowners to protect environment, however the continuing declines we are seeing across much of our wildlife suggests more is required, including more innovative approaches. Current proposals being promoted under the 'Greening Scheme' include increased protection for permanent pastures and a requirement for 7% of land to be maintained as 'ecological focus areas'. These measures would be a key requirement of greening direct payments. A review of 2nd Pillar measures, which includes agri-environment schemes) will also be required post 2013.

Alongside the CAP reforms, the Natural Environment White Paper for England outlines new ideas as to how the countryside will need to be managed into the future. It is clear on the role and importance of the farming/landowning community with regards to "achieving society's ambitions for water, wildlife, healthy soil, food production and the management of landscapes", and outlines several 'new' ways in which additional financial

[57] Haaland, C., et al., 2011. Sown wildflower strips for insect conservation: a review. Insect Conservation and Diversity, 4. 60-80.

resources might be utilised to support environmental management, including payments for ecosystem services and the use of biodiversity offsetting measures. The proposal to bring in additional funding to support environmental friendly land management could be of major significance, in providing new incomes for farmers. As importantly the White Paper highlights the need for a 'landscape-scale' approach to wildlife conservation and the need to develop a more comprehensive and coherent habitat network. This in itself will pose major challenges to both the farming and wildlife conservation sectors.

To achieve a more focussed landscape-scale approach to wildlife management, the wildlife community must continue to improve on the key messages that it is promoting to the farming/landowning community. This will require both greater consistency between wildlife organisations with respect to how they communicate wildlife priorities and identify the most important geographical areas where they wish to see action taken. Agri-environment may also need to be targeted more accurately at areas where we can see the greatest landscape-scale benefits for nature. Although contentious to some, this could require drawing much tighter 'lines on maps' in order to focus attention on key parts of the landscape where benefits to wildlife will be greatest. The B-Lines initiative promotes this way of working and outlines a very simple approach which can be easily understood by individual landowners/managers while also having the potential to achieve multiple benefits. To assist the farming community in delivering in these areas, increased targeted and multi-disciplinary advice will be required. Incentives will also need to be provided to ensure that adjacent farmers work together more collaboratively to ensure increased wildlife benefits through the joining up of actions across the countryside, and also to encourage take up of specific agri-environmental management options.

Currently a large proportion of 'wildlife-friendly' farming, particularly that carried out under Entry Level Stewardship options and/or the Campaign for the Farmed Environment, is small scale field edge options, for example buffer strips and headlands. Other more extensive blocks of land are often managed as grasslands with low (or very low) fertiliser inputs. Many of these options are highly compatible with current farming practices as they are often implemented on areas of lower agricultural productivity/value. The restoration/creation of larger areas of wildflower-rich grasslands as advocated under B-Lines is potentially much more of a challenge; in many areas it may mean diversification of farming practices away from purely arable to a more mixed farming approach. There are clearly greater cost implications to the individual farmer with this partial move away from small temporary features to the creation of larger blocks of high quality grassland habitat, and this would need to be addressed through increased availability of either Higher Level Scheme options or other incentives. One potential benefit of the B-Lines approach is the fact that wildflower-rich grasslands could remain under agricultural management (albeit low intensive management) and would therefore still contribute towards the overall farm income. In what is now a highly specialised agricultural landscape, the challenge will be how to sustain and make the most benefits from grassland habitats in predominantly arable farming areas.

The implementation of the B-Lines Initiative will ultimately depend on the backing of, and interest from individual farmers, and the attractiveness of financial support which can be made available. It is clear from the work of the Yorkshire 'Bee Roads' pilot project, and other landscape-scale initiatives operating across Britain, that an unambiguous vision and objectives are also essential in gaining both interest and support from the farming community. The real challenge might appear to be for wildlife organisations to tighten up their focus on some simple key actions/areas and work with the agricultural sector and Government to ensure that a suite of competitively-based financing mechanisms can be put in place and targeted directly at those best able to deliver them.

9.2 The role of and making use of agri-environment

Agri-environment has and will continue to have a major role to play in the delivery of landscape-scale projects such as the B-Lines Initiative. Taking England as an example, there are c. 43,000 Environmental Stewardship Scheme agreements covering over half of England's land surface (5,721,0000 ha in ELS options and 928,000 ha in HLS options) with a total cost of c.£1.15 billion[58]. Agri-environment in whatever form it takes in the future will need to support both the capital costs of habitat creation as well as ongoing management support costs.

Both ELS and HLS have key options which can help develop substantial areas of the B-Lines network. Key grassland creation and restoration options under HLS, for example HK6 - HK8, are key to the development and maintenance of the large areas of wildflower-rich grasslands which will provide the core of the B-Lines. Habitat feature option within ELS, including those delivering better hedgerow management (EB1-3), buffer strips (EE1-EE3) and pollen and nectar strips (EF4) all have a role to play in the future development of a wildlife enriched landscape within the 3 km wide B-Line linear zones. A full list of Environmental Stewardship options and how they relate to delivery within the B-Lines linear zones is provided in Annex 4

Currently targeting of HLS takes place in-line with regional targeting maps produced in 2008. These identify very broad-scale landscapes and prioritise key biodiversity interests found within them. More local targeting can take place within the target areas, using Natural England habitat mapping tools and where appropriate officer knowledge. There are very good examples of HLS being used to support and/or deliver landscape-scale work, however it is clear that HLS is not consistently being used to deliver a long-term vision for individual landscapes. Although HLS is being used to support partnership led initiatives/ projects where these occur within target areas or 'priority themes', these individual initiatives have little or no influence on overall HLS delivery/targeting. If Natural England is to make HLS targeting more responsive to local initiatives this does present a challenge in prioritising between the plethora of partners' projects/programmes. The identification and prioritisation of the Nature Improvement Areas perhaps indicates a move in this direction, but this initiative is currently restricted to only twelve areas and even here there is currently no suggestion of increasing the allocation of HLS resources within these areas.

To join Entry Level Stewardship farmers select the land management options which work well for them and this is supported by a Natural England (NE) contracted programme of free farm advice visits. ELS option 'bundles' are now available, targeting specific groups of wildlife interests and these are promoted via broad-brush targeting maps (the most relevant to B-Lines being 'Butterflies, Bees and Vulnerable Grasslands'). However in practice the broad brush nature of the target maps and the terms of the contracts means there is currently very little opportunity for focussed targeting and promoting options beneficial to B-Lines delivery. Advice is provided to farmers who are about to renew their ELS agreements and this is a clear opportunity to promote the B-Lines and try and prioritise key options within them. In addition 'best practice' visits are also made to existing ELS agreement holders in the early years of there agreements and this provides another opportunity to promote pollinator friendly options.

Although the basic tools are in place for agri-environment to assist in the delivery of the B-Lines network, substantive changes in the way it is targeted and delivered may be required. Current targeting of both ELS and HLS is relatively broad-brush, working within

[58] Information provided by Natural England

large, and often NCA-scale target areas. Few opportunities are available for making ELS more effective at supporting the delivery of landscape-scale biodiversity objectives, and take-up of more beneficial options (including 'invertebrate friendly' options) is limited. HLS offers much more scope to deliver strategically planned landscape-scale work, however it is generally limited capacity to be pro-active and visionary in the development of 'new' habitat features, and is rarely in a position to act opportunistically with regards to habitat creation potential. There is clearly a major need to improve both spatial planning and collaborative approaches to agri-environmental delivery if it is to be effective in delivering B-Lines [59].

Recommendation 15: B-Lines needs to work with Natural England to trial a more targeted approach to assist in the delivery of its landscape-scale vision.

Case Study 7:Agri-environment working in the Yorkshire pilot 'Bee Roads' Project

What is agri-environment already doing in Yorkshire?

Agri-environment clearly has a major role to play in the delivery of landscape-scale projects, including the B-Lines Initiative. The coverage of Entry Level Stewardship (ELS) and Higher Level Stewardship (HLS) options in Yorkshire currently extends to 741,061ha and 172,090ha respectively, at annual cost of £38,225,876 in land management payments (£21,204,084 ELS, £17,021,791 HLS). The habitat resource managed and maintained through these schemes is a magnitude greater than any other funding or initiatives that deliver biodiversity outcomes

What needs to happen to ensure agri-environment can support and help achieve the B-Lines vision?

The success of landscape-scale approaches such as B-Lines will ultimately depend on better integration of agri-environment with local wildlife projects, landscape-scale projects and other community-led initiatives. Experience from the Yorkshire pilot project has suggested that this can happen, but will require some changes to current delivery. There is potential to target the provision of ELS advice to promote key management options in particular geographical areas, and this is already partially the case with ELS 'bundles' being targeted at a National Character Area (NCA) basis. However making ELS work more effectively in delivering biodiversity objectives at a landscape-scale will require a more comprehensive mapping exercise utilising not only national species and/or habitat data, but also the visions and objectives of local landscape-scale delivery initiatives. Alongside this more targeted approach, there is also a need to develop a mechanism whereby farmers/landowners are encouraged to select particular options in specific geographical areas. This may include a degree of incentivisation, perhaps by allocating additional ELS points where selected options include key management options beneficial in specific locations?

With regards to HLS, the 'Bee Roads' pilot project has demonstrated that a clear landscape-scale vision can help provide a focus for new or revised delivery. Within the constraints of current HLS 'pipelines', targeting processes and priorities, Natural England have been very helpful and proactive in looking for opportunities

[59] Prager, K. et al., 2012. Encouraging collaboration for the provision of ecosystem services at a landscape-scale – rethinking agri-environment payments. Land Use Policy. 29: 244-249

to restore and create habitat within the B-Lines. Natural England have informally reviewed existing agreements to look for new habitat creation opportunities within these, and have agreed to consider the B-Lines vision during any negotiations relating to new agreements. In addition it has been possible for Natural England to provide some 'low-key' promotion of the B-Lines Initiative allowing Buglife to utilise their own resources to take forward additional work. This flexibility of approach has increased the level of habitat restoration/creation activity within the B-Lines, however it is still far short of having an agri-environmental scheme which can be both responsive to, and have the ability to target within, landscape-scale initiatives.

The B-Lines pilot project is beginning to explore how agri-environment can support and integrate with developing landscape-scale work, however there is a real need to review how future targeting is carried out. In addition it would seem an imperative to make agri-environment processes more responsive to new ideas and initiatives which are brought forward from wider from the wider biodiversity and local communities. If we are ever going to be in a position to develop coherent ecological networks, alongside wildlife-rich areas (e.g. NIAs), agri-environment will need to be more proactive, targeting better prioritised (including habitat creation opportunities alongside habitat maintenance), and delivery will need to be more clearly directed towards the delivery of individual long-term landscape visions.

9.3 Assisting delivery of agri-environment to deliver at a landscape-scale

As the restoration of ecosystems, habitats and ecological networks beyond protected sites and existing biodiversity assets is implemented more widely, there will be an increasing need to both target, and engage more directly with key land owners/managers. In addition there will be an increasing need for a more hands-on and co-ordinated approach, whereby individual (or groups) of farmers will need to be encouraged and supported to create new habitat in specific locations. The complexity of the works involved in large-scale habitat restoration/creation will also require a greater input of specialist help to ensure successful outcomes into the longer-term.

As Natural England resources become more restricted it would seem that there is a greater than ever need for other conservation organisations to assist more fully in advising on, and helping agri-environment deliver at the landscape-scale. The delivery of B-Lines will require a closer working relationship between government agencies responsible for agri-environmental measures and the NGO sector; assistance being provided with both targeting and managing of projects. Partners implementing the individual stretches of the B-Lines will need to be empowered to work with groups of farmers to develop habitat restoration/creation plans, with a degree of certainty that there will be ongoing support through agri-environment agreements. Publically funded programmes will also need to be integrated more fully with those originating from the charitable or business sector and innovative ways of combining resource are likely to be needed to ensure that complex habitat creation programmes are financially viable.

Recommendation 16: B-Lines should agree a more formal pilot area with Natural England to assist in the identification and development of habitat restoration/creation initiatives and also in which to trial a more joined-up approach with the NGO and private sector.

Case Study 8: The Hay Time Project – helping to deliver landscape-scale meadow restoration through improved co-ordination and targeting of agri-environment

Hay Time - set up in 2006 to co-ordinate hay meadow restoration in the Yorkshire Dales. Managed by the Yorkshire Dales Millennium Trust (YDMT)

The Grassland Resource:

- A large proportion of the UK's species-rich upland hay meadows, including many which are of considered of European Importance. Only 650 ha remain although much larger areas have been degraded by agricultural intensification.

The Issues:

- Agri-environmental schemes had protected the most species-rich hay meadows, but seen little or no recovery of more degraded ones. A combination of a short-lived soil seed bank, and the lack of seed coming in from the surrounding countryside means species were not re-establishing.
- Agri-environment funding for meadow restoration involving seed addition had been available for some years, but little work had actually been carried out.

What was needed?

A co-ordinated effort to restore meadows across the area. Agri-environment funding was available however there was not capacity within Natural England to take a co-ordinated landscape-scale approach. The Hay Time project took up the challenge and set up a process to identify meadows which were suitable for restoration and other species-rich types from which to harvest native locally sourced wildflower seed.

How does Hay Time work?

Annual programmes of meadow restoration are developed, agreed with Natural England and then implemented on the ground. Project staff liaise with partner organisations, land managers and contractors, identify donor and receptor meadows, co-ordinate receptor meadow preparation, seed harvesting and spreading, and help land managers to upgrade or enter agri-environment schemes. Hay Time also owns specialist seed harvesting and spreading machinery operated under contract.

Agri-environment schemes such as Higher Level Stewardship provide grants to farmers wishing to restore their meadows. These grants cover costs of the contractor to operate the seed harvesting and spreading machinery, the preparation of receptor meadows, and for the seed harvested from donor meadows. Farmers also receive an annual payment to manage their restored meadows.

What was achieved?

The project ran from May 2006 to December 2011 helped to implement 69 meadow restoration schemes, resulting in locally-harvested seed being added to 141 fields (279 ha). Overall there were highly significant increases seen in species richness and species in the treated meadows.

Hay Time – a model for delivering grassland restoration & creation at a landscape scale?

Delivering large-scale habitat restoration/creation programmes requires a high degree of co-ordination, alongside the ongoing provision of guidance to land managers. Hay Time has demonstrated an effective model of supporting agri-

environment schemes at a landscape-scale, providing overall co-ordination of delivery and on-the-ground expert advice. This has resulted in increased delivery of grassland restoration across the target area, and improved efficiency of agri-environment delivery and spend.

With the likelihood of further reductions in Natural England's capacity to invest in both targeting and co-ordination of such programmes of work, there is a gap which will need to be filled by other conservation/farming partners. In addition there is a need for agri-environment to be better focussed on priority landscape-scale initiatives, and within these project areas to be better directed to deliver key wildlife objectives.

B-Lines is currently exploring opportunities to work with Hay Time to help deliver the B-Lines vision both with the Dales area and potentially further afield.

9.4 Local ownership and delivery

The successful delivery of the B-Lines vision will rely on the realisation of opportunities identified at a local scale. Experience from successful projects/programmes has often demonstrated that buy-in from local communities and individual landowners is essential in the delivery of landscape-scale initiatives[59]. One of the key strengths of B-Lines is its readily understandable 'product/idea'. Any participating individual/farmer should easily be able to see how their specific input would contribute towards the development of the overall network and how work on one farm relates to other areas. This should help engender more collaborative work between landowners/farmers in any one geographical location and help in the development of a coherent B-Lines network.

It would seem essential that collaborative working, including the identification, agreement and delivery of improved habitat connectivity is developed at a local basis, albeit within the wider B-Lines network (and with direct support from agri-environment and other funding). In the longer term it would be hoped that in addition to landowners/farmers directly engaged in B-Lines, wider communities, including the general public and local businesses would buy into the initiative and helped deliver or fund wildflower-rich habitat. This may be a slow and gradual process, but with time it would be hoped that the benefits to wildlife and society (through, for example the ecosystem services provided) would be more easily recognised and result in increased uptake and support for the initiative.

9.5 Joined up delivery

The B-Lines concept has a distinct and clear vision with regards to restoring and creating large-scale flower-rich grassland 'corridors' across England, and therefore has the potential to integrate with both large landscape-scale initiatives and biodiversity work in the wider farmed landscape. The future viability and success of B-Lines and the proportion of national agri-environment (and other) resources it may be able to secure for future delivery may well increase if, while maintaining its own core identity and vision, B-Lines also looks for opportunities for integration with other initiatives (i.e. it does not see its future purely as a 'stand-alone' landscape-scale project).

B-Lines recognises the benefits of reviewing current delivery initiatives and seeking to identify opportunities for strategic/beneficial join-up and/or integration. This will ensure not only efficiencies of delivery, but also ensure wider partner support for B-Lines. The development of a shared vision with wider partners, alongside multi-stakeholder

engagement and ownership of the work is a core objective of the B-Lines Initiative. This integrated/partnership approach will also aid acceptance of the B-Lines concept within the local development planning arena, which has already adopted a range of mapping work and associated policies.

A suite of 'Guiding Principles' has been developed as part of the Yorkshire 'Bee Roads' pilot project and are presented in Annex 1. These principles have been produced to help partners deliver B-Lines in a reasonably consistent manner and should enable B-Lines to be created by communities, local partnerships, farmers and wildlife organisations. Individuals, partnerships and organisations will be encouraged to sign up to these principles as a way of demonstrating their commitment to assisting in the delivery of B-Lines through both current and new work.

Recommendation 17: B-Lines must be careful to maintain its vision and identity, however it must also look for opportunities to assist with and influence other landscape-scale initiatives where they can help realise the B-Lines aims.

Case Study 9: Leeds City Region – Joining up partnerships, projects and investment to deliver high quality multifunctional green infrastructure.

Leeds City Region Green Infrastructure Strategy – launched in August 2010 to identify existing green infrastructure assets and partnerships, establish future priorities and identify mechanisms for green infrastructure investment.

Leeds City Region – some facts and figures

- Covers 5,000 km^2, over 106,000 businesses and an economy worth £53 billion producing around 5% of the English GVA annually.The City Region is therefore one of the most significant economies in the UK.
- Home to nearly 3 million people, 93% of which both live and work and within the city region area,
- The area covers some of the UKs grandest scenery and associated wildlife resource. These natural assets, the Region's green infrastructure, represent a key economic driver for the city – the high quality environment attracting business and people

The aim of the Strategy - To set out a shared vision for green infrastructure and to determine how future investment for green infrastructure will be secured and where it will be targeted. The production of the Strategy commits the City Region to investing in the development of high quality green infrastructure.

How will it be delivered?

Five Investment Programmes, including:

- Urban Green Adaptation – Promoting investment in 'greening' urban areas to provide cooling, shading and rain water capture.
- Rivers for Life - A co-ordinated approach to river catchment management, restoring function of floodplains and associated biodiversity

Three existing Strategic Projects which have a the potential to significantly increase their impact across a wider range of functions if investment is forthcoming will provide the initial focus for enhancing green infrastructure.

Collaborative working, which is already highly developed in the area through partnerships such as the White Forest Partnership and the Strategic Waterways Group, is promoted as a key factor in the future success of the Green Infrastructure Programme. Many of these partnerships are already being highly successful at attracting investment and delivering integrated action.

Securing Investment for Delivery:

The Leeds City Region is committed to attracting new forms of investment from private and public sector funding. Proposals include the establishment of a Corporate Environmental Responsibility Fund and Habitat banking Funds to hold and distribute finances to priority Green Infrastructure Programmes.

The Benefits of the Strategic Approach

- A simple suite of agreed priority actions
- Development of a core partnership, signed up to integrated delivery
- Clear identified programme of work for investment

Delivering B-Lines within the Green Infrastructure Programme – a win win situation?

A number of the Yorkshire B-Lines pass through the Leeds City Region and large stretches of these are also recognised as priority green infrastructure corridors in the Natural England led Yorkshire and Humber Green Infrastructure mapping initiative. In particular the River Aire and River Calder corridors are seen as a priority for biodiversity enhancements across all these initiatives.

The Green Infrastructure Strategy clearly recognises the input of a range of partners and the value of strong collaborative partnerships, and identifies these as its core delivery arm. A strategic link up between B-Lines and the Leeds City Green Infrastructure Programme would ensure that the B-Lines vision will integrate effectively with other biodiversity and ecosystem services enhancements, as well as other land use priorities in what has the potential to be a crowded and 'competitive' arena. This will allow B-lines to seek synergies with other delivery partners/partnership and to develop joint programmes of delivery.

B-Lines also has several strong and unique selling points which will enrich the Leeds Green Infrastructure Strategy. It is a very attractive concept (rivers of flowers) that can be easily understood and accepted by the general public, businesses and developers, linking people in urban areas more directly with the nature with surrounds their cities and towns. It has the potential to deliver a range of ecosystem services, including pollination, flood alleviation, health and well-being, and public access, and as a national network of habitats will ensure the establishment of key ecological links with surrounding areas. All of these factors have the potential to offer a new take on Green Infrastructure which in turn should assist in attracting further economic investment.

9.6 Costs of delivering the B-Lines

A report produced for Defra[60] in 2010 calculated the annual cost of managing our biodiversity assets over the period 2010-2015 as £837 million per annum. The RSPB[61] estimated that based on current expenditure this left a funding gap of c. £237 million a year. In light of more ambitious habitat creation targets recently announced (for example in the England Biodiversity Strategy), and also the desire to create a national coherent ecological network it would seem likely that the overall costs to achieve government targets/ambitions will have increased markedly since the 2010 Defra figures were calculated. Agri-environment is currently the most significant funding stream available to maintain and enhance biodiversity, but this is clearly not resourced highly enough, its future status is still uncertain during the current CAP discussions and period of financial austerity across Europe, and ultimately it does not provide long-term (in perpetuity) protection for habitats and species. Agri-environment clearly has the potential to deliver extensive areas of B-Lines (albeit further incentives may be required to ensure land owners/managers can become fully engaged in the process), however in light of current shortfalls in funding, and the many competing priorities/initiatives, it would seem obvious that additional/new financial resources are required.

Case Study 10: Costing the Yorkshire B-Lines

The Yorkshire B-Lines as shown in Map 2 (and presented in Case Study 2) comprise a linear network extending to approximately 880km in length. Mapped at a width of 3km, the overall area of the B-Lines network is c. 245,000 - approximately 15% of Yorkshire's land surface. Working on the target for 10% of the B-Line being made up of wildflower-rich habitat, or the development of a continuous 300m wide habitat strip, a habitat resource of c. 25,000 ha is required to fulfil the objectives of the B-Lines Initiative. The current wildflower-rich habitat resource (as identified through the national habitat inventories) falling within the mapped B-Lines is approximately 13,000 ha, along with a further 5,000 ha of 'Coastal and Floodplain Grazing Marsh' and 'Undetermined' grassland, which is likely to be species-poor and at least partially agriculturally improved.

Habitat	Area of habitat within B-Lines (ha)	% of the Yorkshire habitat resource in B-Lines	Area of habitat 'linked' to B-Lines (ha)	% of the Yorkshire resource in, or linked to B-Lines
Lowland Calcareous grass	3200	45	2600	67
Lowland Meadow	1300	60	670	63
Maritime Cliff and slope	970	74	120	84
Upland Calcareous grass	2110	27	3300	70
Upland hay meadow	160	25		25
Coastal and Floodplain Grazing Marsh	3400	57	1100	76
Fens	2600	26	5800	85
Blanket Bog	45000	8	322000	59

Analysis of the habitat make up of the Yorkshire B-Lines (analysed against the national BAP habitat inventories). Note 'linked' habitat is continuous habitat patches found within 250m of the B-Lines boundaries.

[60] Costs of the UK Biodiversity Action Plan, 2010 – GHK Consulting.
[61] Financing nature in an age of austerity – 2010 – RSPB (Economics)

Although the accuracy of the analysis is limited by the quality of some of the habitat inventory datasets, it is clear that the B-Lines effectively subsume high proportions (relative to their actual area) of important wildflower-rich habitats. In addition to the habitat within the B-Lines themselves, the identified B-Line linear zones effectively link with an even greater proportion of the key wildflower-rich habitat resource. The exception to this is the upland hay meadows, which are all very small fragmented sites, scattered between several unconnected valleys/dales.

Without much more detailed analysis of the actual distribution of the individual habitat patches, and also the condition of the habitats themselves, it is not possible to calculate accurately the actual areas of habitat maintenance, restoration and creation required to develop a comprehensive B-Lines network. However a review of the mapped habitat resource would suggest that much of the habitat is concentrated in approximately 40% of the mapped B-Lines network and that over the remainder of the network habitat patches are much more isolated/ fragmented.

Assuming much of the BAP habitat is already being maintained through appropriate management (primarily agri-environment) a reasonable estimate for the area of habitat restoration/creation required is 10-15,000 ha. Based on an average figure of £600/ha for habitat restoration and £1,000 for habitat creation (based loosely on the UKBAP costings – 2006) an estimated cost for restoration/creation of the B-Lines would fall within the range £8-13 million. Based on an average cost of agri-environment HLS options for appropriate management into the longer-term (c. £250/ha), the annual maintenance cost of the newly created/restored habitat would be in the range £2.5-3.75 million (in addition a similar cost for the maintenance of the existing BAP habitat resource).

9.7 Biodiversity Offsetting

Biodiversity Offsets are land-based management activities that deliver positive biodiversity outcomes to compensate for detrimental impacts on biodiversity at other locations. Whereas previously compensation for loss would generally be demanded on-site, with offsetting a system of 'conservation credits' allows the environmental loss to be calculated and compensated for elsewhere. Habitat banking is a mechanism that can be used to support the biodiversity offsetting process with 'credits' covering positive biodiversity delivery can be bought to offset a 'debit' from environmental damage elsewhere[62] . Biodiversity Offset schemes have been used widely in other countries (for example the USA and Australia) and the concept is now being considered elsewhere, including the UK. Last year a Government White Paper announced the trialling of 'biodiversity offsetting' and now there are six county pilots and several local planning authorities testing the idea.

The fiscal and legal assurances behind the system are complex but, in essence, planning authorities condition a permission so that developers have the option to buy conservation credits to discharge their environmental obligations. If they choose to do so – and the system is entirely voluntary - the developers then buy their credits, using a national Registry (see www.mmearth.environmentbank.com) to select which credits they want

[62] The Environment Bank. Habitat Banking FAQs. "www.environmentbank.com"

from which 'receptor' sites, and funding then passes to the owners of the receptor site to pay for the long-term management that will delivery biodiversity uplift. For developers, good offset systems save time and money. They provide a fair, transparent, streamlined and secure process, with greater clarity in the planning system and predictable costs and outcomes that both aid future project planning and discharge their environmental obligations in one go. For Local Planning Authorities, offsetting provides a simpler system than long-term S106 agreements – with a reduced burden on staff time and resources through delegated management of offset compliance and delivery. Most importantly, managing wildlife sites suddenly becomes economically viable because such sites can be used to offer credits – the offsetting mechanism provides the landowner with an economic incentive to enhance or create natural areas. Income is reliant on delivery but, importantly, the land remains within their ownership and the landowner sets the price – he decides what price he will charge for his credits (For more information see - www.environmentbank.com).

Biodiversity Offsetting is seen by some as a considerable untapped financial resource which could help fill some of the current funding shortfall for our biodiversity work. There have been varying calculations as to the potential size of the biodiversity offsets market in the UK and estimates vary from £53 million a year to £289 million per year[61]. This could fund between 4,000 – 9,000 ha of habitat creation each year[63] an ensure long term management for a 200 year timeframe.

Biodiversity Offsetting has been identified as one potential mechanism to fund the B-Lines network. From discussions held during with local authorities and also the Environment Bank, it would seem that B-Lines would clearly meet criteria for being accepted as a 'receptor' initiative for offsetting funding. Restoration and creation of wildflower-rich habitats are clearly delivering biodiversity gain and qualify as creating 'conservation credit' which could be sold. In addition it is a truly landscape-scale habitat creation-led programme, which can be easily identified with by both developers and the general public. It would represent a potentially very high profile, national initiative which would be viewed as helping to secure the future of significant parts of our biodiversity resource and as such should be an attractive proposition in which developers and local authorities can engage.

With regards to the practicalities of utilising offsetting to deliver B-Lines, clearly there is a need to secure agreements with a large number of individual landowners. However as has been shown with agri-environmental measures, which are also voluntary, if payment levels fully reflect the costs involved and the loss of current income, large numbers of land owner/managers will engage in the process. For biodiversity offsetting to work at this scale, any benefits to landowners/managers must exceed those currently on offer (although the long-term nature of biodiversity offsetting works may provide a level of financial security which will encourage take-up from some farming sectors). Securing the benefits of habitat creation under biodiversity offsetting schemes does require a guarantee of long-term management of created habitats, and it is often suggested that land will need to be purchased by NGOs or mitigation banks, however B-Lines considers that much of the grassland it wishes to be created could remain under agricultural use and still produce an agricultural product. This will need further consideration (potentially through the Defra pilot projects) as mechanisms such as long-term covenants with a registered organisation may be required.

With regards to timescales for delivering B-Lines through these measures, it is widely recognised that unless biodiversity offsetting and associated markets are made

[63] HM Government 2011. Options stage impact assessment; Offsetting the impact of development on biodiversity

compulsory, and therefore developers are fully aware that there is the requirement to, and a mechanism by which they will need to compensate for detrimental activities, it is unlikely to occur at the scale required. This is likely to require changes to primary legislation so is unlikely to take place until the results of the six pilot projects are full considered. However independent habitat banking schemes are already becoming established in the UK and B-Lines has initiated discussions and is currently seeking to identify appropriate 'receptor sites'.

Recommendation 18: B-Lines should engage fully in one of the Defra biodiversity offsetting pilot projects and explore options for working with private landowners and farmers at a landscape-scale

9.8 Marketing/branding

With the current shortfall in spend on biodiversity delivery, and in anticipation of a step-change in the pace of delivery to meet the duel challenges of the England 2020 habitat creation targets and those posed by the Lawton review, it will be essential that other sectors of society increase the level of resources they provide. There are many ways that businesses can contribute towards the conservation of the UK's wildlife, one of the key ways being the use of wildlife branding or labelling. The use of eco-labels provides a tried and tested tool for bringing new funding in to support sympathetic wildlife/agricultural management, whilst also raising awareness of key environmental initiatives/issues with the general public. High profile branding initiatives which provide a direct financial return to producers for creating more wildlife habitat on their farms, include the well established 'Conservation Grade' label. Initially working in conjunction with Jordan's Cereals, Conservation Grade now works with eight separate licensees and has voluntary agreements with farms across the country. Utilising a simple set of management prescriptions and with clear requirements around proportions of farm area to come under conservation management (10%), this is an easily understandable initiative, which is relatively easy both to administer and to monitor compliance. In addition its management prescriptions are directly compatible with agri-environmental requirements, making it easy for farmers to manage in line with their ELS or HLS obligations.

In addition to the bigger national eco-branding labels, there are also a number of smaller locally based initiatives which sell products which are either produced on biodiverse habitats or contribute towards wider habitat management, for example salt marsh lamb, and Herdwick mutton. Many of these initiatives are directly linked to the management of particular areas of habitat, rather than wider wildlife management across whole farmholdings.

There is evidence that consumers prefer products that are certified by NGOs [64], rather than government imposed standards, and voluntary branding initiatives such as Conservation Grade must clearly benefit from this public response. B-Lines would appear to offer an attractive, readily understandable concept which could be easily sold to the general public who would be able to recognise and see the benefits to their local environment. To take this step, B-Lines will need to further refine its management guidelines, and define minimum standards for producers to meet in order to gain any B-Lines accreditation. For example the standards could include a prescribed proportion of newly created or restored land within a B-Line (e.g. a minimum 2 ha block of wildflower-rich habitat, or 10% of land), the creation of a continuous strip of habitat, or a combination of permanent wildflower-rich grassland alongside other pollinator friendly margins, field corners etc? Alternatively B-Lines could consider supporting a branded product produced

[64] PricewaterhouseCoopers (PWC), 2008. Sustainability: are consumers buying it?

directly from the core wildflower-rich grasslands, i.e. animals grazed on the pastures/meadows for specific periods of time prior to slaughter. This could work through both a national approach linked to a major retailer, or as a series of more local 'farm gate' type approaches. Such an approach could use both the environmental benefits of the scheme, and the health and taste benefits of eating meat produced from biodiverse pastures[65] as key selling points.

In the short-term it may be beneficial to work alongside Conservation Grade, encouraging farmers to sign up to their standards, and insisting that their 'other habitat' was permanent wildflower-rich grassland, while at the same time jointly developing a set of standards applicable to the B-Lines 'guiding principles'.

Recommendation 19: B-Lines needs to refine it standards and guidelines to enable it to carry out a feasibility study into the potential for either developing local or national branding and/or linking with existing initiatives.

9.9 Conservation sponsorship

The business sector currently plays a significant role in the delivery of wildlife conservation in the UK, and clearly The Co-operative Group has supported the development of the B-Lines Initiative through the 'Bee Roads' pilot project (under the Plan Bee Campaign www.co-operative.coop/Plan-Bee). Businesses support and/or engage with wildlife organisations and projects for a number of reasons, including to help negate their own operational impacts on biodiversity as part of Corporate Social Responsibility work, to improve the public's perception of their work and for genuinely philanthropic reasons. Where a business is keen to increase public awareness of its support for, and investment in wildlife conservation in the UK, B-Lines would appear to offer an unrivalled opportunity for publicity and promotion. The simplicity of the B-Lines vision and approach, the wildflower-habitat links it hopes to create into the centre of major cities and across all counties, all offer a great story to 'sell' to customers and the wider general public. The B-Lines concept would also offer a range of opportunities to businesses and individuals to provide financial support. This could entail both general support for the overall initiative and potentially directly support to pay for the creation of identified stretches of the national B-Lines network. It would not seem unrealistic to see businesses effectively paying for the creation of specific stretches of B-Lines which will help to benefit both wildlife and local communities.

Recommendation 20: B-Lines should continue to explore opportunities with businesses to secure future additional funding for the B-Lines work

9.10 Working with the minerals industry

The potential contribution that restoration of minerals sites can make towards biodiversity programmes and targets has been long recognised, and the minerals industry has worked with wildlife partners to take forward many high quality habitat creation schemes. The minerals industry is already making significant contributions to wildlife, however the scale of opportunity presented by the minerals sector as highlighted through the work of the 'Nature After Minerals Project' (NAM)[66] is vast, extending to over 55,000 hectares of land suitable for the creation of one or more of the 17 Priority Biodiversity Action Plan

[65] Defra Project LS3523: Research Project Final Report – Healthiness and quality of beef produced from traditional and modern breeds reared on species-rich, unimproved grasslands

[66] www.afterminerals.com

(BAP) Habitats. Of this NAM calculated that over 25,000 ha of wildflower-rich BAP habitats could be created on mineral sites within 1 km of existing habitat. A more recent study in Yorkshire[67], which was commissioned on behalf of the Yorkshire and Humber Biodiversity Forum, identified the potential for over 600 ha of wildflower-rich BAP habitat to be created across the region, through future minerals allocations, much of this along the Magnesian Limestone ridge to the east of the Pennines and along the River Ure/Swale corridors.

The NAM report[68] highlights the fact that nature conservation is 'almost always' considered during the identification of 'end-use' for minerals sites, however enough of this 'consideration' is not being translated into large-scale high quality habitat creation. Much of this appears to be related to the perceived (and possibly in some cases real) lack of financial returns from a nature conservation end-use. The need for a much stronger steer from regional and local planning policies to promote large-scale habitat creation, particularly as part of wider landscape-scale biodiversity delivery projects/programmes is also recognised as an issue and is being tackled through NAM and the Yorkshire-based project. Identifying key minerals sites as being part of the solution to the development of landscape-scale programmes such as B-Lines, and developing/using minerals policies to promote more targeted/ appropriate habitat creation would seem to be key to unlocking the potential of these sites. In conjunction with better advice and support, and the targeting of agri-environmental and other funds to ensure long-term management, there are major opportunities for significant areas of B-Lines to be created from minerals allocations located with the identified B-Lines networks.

9.11 Other options for funding B-Lines

There a many other potential options to bring in additional money for the delivery of B-Lines, but one which might seem highly relevant is the idea of a pesticide tax, as part of a 'polluter pays' principle. Pesticides clearly continue to have a significant impact on many insect and other invertebrate species and therefore a tax on their usage could be used directly to help mitigate for their detrimental effects. A very full consideration of this aspect of potential funding for wildlife activities (and the associated encouragement of more sustainable agricultural activities) is provided in the RSPB report 'Financing nature in an age of austerity [61] and will not be discussed further here. However B-Lines would seem to represent a highly relevant project to mitigate for ongoing pesticide damage and its delivery could be greatly increased if any associated income deriving from such a pesticide tax could be used either directly for habitat restoration/creation work or to support a wider B-Lines branding programme.

[67] The development of draft biodiversity targets arising from Mineral Extraction in the Yorkshire and Humber Regions, Golders Associates, 2009
[68] Davies, A.M., 2006. Nature After Minerals: how mineral site restoration can benefit people and wildlife. RSPB publication

10 Monitoring success

Monitoring of specific biodiversity attributes is required to help determine changes in B-Lines over time. There would seem to be a need to monitor both at an individual 'site' level (i.e. short-medium term responses to habitat creation/restoration) and at a landscape-scale (i.e. change within B-Lines compared to the wider countryside).

At a field/farm scale B-Lines monitoring must try to address:

- Success of grassland creation/restoration i.e. progress towards development of target grassland community (establishment of key species)
- Impact of grassland creation/restoration works on key (pollinator) species

And at a landscape-scale:

- Increase in overall target habitat area
- Changes in key pollinator species abundance and diversity (attributable to B-Lines work)
- Responses of rare species
- Improvements in connectivity of habitats and permeability of the landscape

At this stage in the development of the B-Lines Initiative, it is impractical and unrealistic to propose and plan for a national monitoring programme. Resources for biodiversity monitoring are likely to remain very restricted into the foreseeable future, so wherever possible the aim should be to link in with existing monitoring mechanisms/programmes and utilise volunteer or farmer time. B-Lines should aim to work with monitoring programmes such as Bee Walks (Bumblebee Conservation Trust) and the UK Butterfly Monitoring Scheme, data collation initiatives such as the LEAF Greenbox and the developing 'Pollinator Monitoring Network' (BWARS/BRC). This would allow B-Lines to utilise existing data collection while over time helping to increase data input into these national initiatives. It is also more likely to result in a more sustainable monitoring effort/programme. With regards to any longer-term landscape-scale monitoring of B-Lines, this will need to be considered alongside, or as part of a more integrated national approach (or could be trialled as part of a University research project).

As outlined above any monitoring programme for B-Lines would need to work on several levels, notably individual site-based work and landscape-scale. At the same time B-Lines monitoring should be seen as an opportunity to increase farmer/land owner/general public engagement and participation. It is therefore suggested that a hierarchy of monitoring activity is developed:

1. Landscape-scale: This must be designed to allow for analysis of change in B-Lines compared to wider landscapes (e.g. occupancy of 1km squares). It could also be used to calculate changes in habitat connectivity for certain species. As with the currently developing BWARS/BRC monitoring programme it would sense for this to be aligned to existing landscape-wide recording such as the BSBI work.

2. Monitoring at site-level: Repeatable walks/transects for farmers/naturalists (possibly two levels of species ID). Ideally using sampling methods developed by national recording and monitoring societies. This will allow for monitoring of change on individual sites, e.g. those subject to habitat creation/restoration, while also potentially being able to contribute data to a national monitoring scheme.

3. Farmer engagement: Simple species distribution recording (i.e. species recording + grid references). Propose working with LEAF Greenbox to develop invertebrate information and ensure that the species distribution data etc is made widely available.

10.1 Farm-based monitoring

Any monitoring programme/methodology needs to be based on clear objectives. The detailed objectives for individual B-Lines habitat creation/restoration project areas could vary from site to site and habitat to habitat, as they will relate to key plant and invertebrate species associated with individual habitat types. However generic objectives can be set:

- An increase in frequency/abundance of indicator plant species (agreed list for each habitat/site) from ……. to …… over a ten year period.
- An increase in abundance of indicator invertebrate species (against baseline) from ……. to ……. over a ten year period.

Monitoring should aim to demonstrate change over time within the B-Lines habitat restoration/creation project areas and not be designed to make comparison with other areas in the wider landscape, i.e. looking for changes within the habitat creation/restoration areas. The monitoring methodology should be based on 'indicators' as it is considered impractical to monitor full species diversity.

In terms of monitoring changes to the plant community, it is suggested that key 'constant' or 'common' species of the particular habitat type (from the National Vegetation Classification) and those of major importance as food sources for pollinators are used as indicators. In addition locally significant species can also be chosen. Where possible indicator species should relate to those used to assess the condition of plant communities within wider 'Common Standards'[69] and agri-environment monitoring protocols (this will encourage and help allow for sharing of monitoring data).

It may also be important to show effects of B-line on pollinators at farm level, by comparison between restored/created habitat and other flower-rich habitats on the farm, e.g. nectar & pollen mix agri-environment elements, hedgerows, beetle banks. If monitored from establishment (= baseline), this would enable monitoring of trends on B-line transect compared to no upwards or downwards trend elsewhere (unless B-lines habitat was acting as source of pollinators).

10.2 Landscape-scale monitoring

Monitoring of Landscape-scale projects/initiatives is a difficult and complex subject and one which wildlife organisations will be aiming to develop protocols for through the new Nature Improvement Areas programme. With regards to the monitoring of the effect of B-Lines implementation at a landscape-scale, it is suggested that this should be designed to allow for analysis of change to both habitats, species and overall ecological connectivity.

As the implementation of B-Lines will require an increase in high quality habitat, both through habitat restoration and creation, ideally any monitoring strategy would in addition to gathering data on habitat extent (including gains and losses) and condition, also gather data on the suitability of new habitat to support individual species. The monitoring of

[69] http://jncc.defra.gov.uk/page-2217

habitat might seem at first the simplest part of a 'landscape-scale monitoring programme, however the lack of a good up-to-date habitat dataset, and also the lack of a consistent/repeatable survey protocols provides a challenge to establishing a baseline.

With regards to monitoring species at a landscape-scale, monitoring methodologies and structured surveys such as those used by Butterfly Conservation, BTO and BSBI are all designed to monitor species at a UK-level. It would seem sensible to use these existing surveys to form the basis for monitoring/sampling within B-Lines. These existing monitoring schemes have been tested and improved over many years and have data stretching back for many decades.

Monitoring changes in ecological connectivity is possible but would require a good baseline habitat database (see above), which could be accurately repeated (possibly via remote sensing) on a regular basis. If a reliable and consistent habitat database where available it would be possible using existing methods to analyse the ecological connectivity for a number of key insect pollinator and other species.

Further work needs to be done to design a suitable landscape-scale monitoring programme for B-Lines and this must be developed in conjunction with wider initiatives and monitoring programmes to reduce duplication of effort and ensure effective use of existing and new data-sets. It is suggested that initially it would be sensible to link to UK-wide monitoring programmes (BSBI, Butterfly Conservation, BTO etc), and to develop/expand the 1km square sampling approaches they use to ensure more comprehensive coverage of the B-Lines areas. Further consideration and work is required to develop this idea, but this is out with the scope of this report.

Recommendation 21: A realistic and deliverable monitoring programme must be set in place to ensure the impacts of establishing the B-Lines can be clearly demonstrated into the long-term

11 Annexes

Annex 1:

Delivering B-Lines; our guiding principles

Delivering a landscape-scale biodiversity initiative nationwide will clearly be a major challenge! The effectiveness of B-Lines at this scale will be dependent on maintaining the integrity of its vision across a large geographic area and many individual delivery partnerships. The following simple guiding principles have therefore been produced to help partners deliver B-Lines in a reasonably consistent manner. Used in conjunction with the guidance/information provided in the B-Lines report they should enable the B-Lines concept and vision to be delivered by communities, local partnerships, farmers and wildlife organisations. Staying true to these principles will ensure the creation of a comprehensive and coherent B-Lines network, while allowing full expression of distinctiveness, character and approach.

Guiding Principles

1) *B-Lines should be identified as 3 km wide linear zones within which the aim should be to deliver a continuous wide (averaging 300m wide- but with thinner and thicker stretches) strip of permanent wildflower-rich habitats, encompassing, expanding and linking together existing wildlife areas.*

2) *Where a continuous strip of habitat is not practical/achievable, the core benefits of B-Lines can be delivered through the maintenance, restoration and creation of large blocks of permanent wildflower-rich habitat (min 2 ha sized blocks) extending to a minimum of 10% of the identified zone (i.e. 300 ha of new/restored habitat per 10km length of the network). The aim of these 'stepping stones' should be to ensure that the distance between individual habitat blocks is no greater than 0.5km.*

3) *B-Lines should be mapped in such a manner as to link together existing important wildflower-rich areas (SSSI, Local Wildlife Sites, nature reserves, BAP habitats) – these areas will provide the foundations of the new B-Lines network.*

4) *B-Lines should ideally be mapped at a 'regional' or county level; each county having at least two, one running approximately north-south and one east-west. County/region-wide mapping would be best refined at a more local level, using local data/knowledge (for example, through Local Biodiversity/Nature Partnerships, Green Infrastructure Partnerships, local communities etc). To ensure a coherent network is developed key connecting nodes must be agreed between adjacent/neighbouring administrative areas.*

5) *Within B-Lines the primary aim should be to maintain, restore and create high quality semi-natural habitat types that fulfil the requirements of pollinators and other invertebrates. Wildflower-rich grasslands of a type typical of the locality should comprise the core of this new habitat, however other habitat types which reflect local landscape character and wildlife interests could also be included (for example lowland heathland/grassland mosaics, lowland fen, wood pasture and parkland).*

6) *Opportunities for wider wildlife enhancements should also be taken within the B-Line zones to help improve the overall environmental quality of the landscape, for example targeting of other agri-environment options, including hedgerow management, floristically enhanced margins, and pollen and nectar mixes*

7) *Priority should be given to the enhancement of the quality of existing sites and restoration of degraded sites through changes/improvements to management. The formation of the B-Lines will, however, require significant areas of wildflower-rich grassland creation and in these circumstances B-Lines will be sensitive to the conservation of our native flora, and use exclusively seed from native plant species, wherever possible sourcing this from local grassland habitats.*

8) *At a landscape-scale, B-Lines will look to achieve a diversity of habitat structure and function aimed at supporting the needs of invertebrates and other wildlife. A range of management regimes will therefore be required/promoted designed to create a diverse natural environment and associated wildlife interests. Development of management plans for individual stretches of the B-Lines should be guided by species and habitat in adjacent areas and surrounding habitats.*

9) *Villages/communities within or adjacent to the B-Lines should be encouraged to participate in the initiative through appropriate garden planting, management of community areas, churchyards, roadside verges etc.*

10) *In more urbanised areas, unitary authorities, local communities and developers will be encouraged to deliver B-Lines through green infrastructure initiatives, enhancing existing community green space and council-owned land, and looking for new opportunities such as living roof initiatives. To ensure the ecological connectivity of the overall network is maintained, it may also be appropriate in some location to identify a 3km wide B-Line around the urban conurbation.*

11) *Delivery of B-Lines will necessitate a wide range of farmers, landowners, wildlife organisations, government agencies, business and local authorities delivering parts of the network in a co-ordinated fashion. To achieve connectivity across the network will require all these parties to target and deliver habitat creation in a joined up and integrated manner.*

12) *To enable the success of the B-Lines to be assessed, monitoring must be put in place to help determine changes over time both at a field and landscape-scale.*

Recommendation 22 – B-Lines should aim to gather a consensus around, and support for these guiding principles which can then be used and promoted by a variety of organisations and individuals around the UK.

Annex 2:
Report Recommendations

A series of recommendations are made throughout this report and these are presented below.

1: B-Lines should take learn from experience gained through past delivery of agri-environment and invest in long-term solutions for recovery of pollinator populations – looking for ecologically viable solutions through the maintenance, restoration and creation of permanent habitat features which are integrated more fully with smaller-scale habitat features.

2: B-Lines should aim to increase the area of permanent wildflower-rich habitats to complement and help increase the benefits of more commonly used temporary habitat creation activities.

3: B-Lines should promote a more strategic landscape-scale approach to pollinator conservation, planning for and delivering new permanent wildflower-rich habitats to improve habitat connectivity. This work should be integrated with and delivered alongside better targeted and more effectively managed wildflower strips/margins and other important habitat features.

4: Development of a continuum of habitat should be a long-term aim, but habitat-enriched linear zones will provide major improvements in species dispersal, so long as the size of gaps is kept to a minimum (this is of particular relevance to more specialised species).

5: The core focus of the B-Lines should be high quality semi-natural wildflower-rich plant communities which will benefit both insect pollinators and other wildlife. Quality of habitat is key; this needs to be of high enough ecological value to allow the species it supports to survive and develop new populations.

6: Further engagement is required with key researchers and initiatives to develop evidence-based guidelines concerning the proportions and spatial arrangements of the individual habitat components of the B-Lines.

7: There is a need to work with existing urban pollinator/meadow initiatives to develop 'flagship' urban projects and to further refine evidence and related guidelines with relation to B-Lines delivery in urban environments.

8: The B-Lines Initiative should work with, and through partners, wherever possible developing existing mapping approaches to minimise further duplication of effort and ensure increased join up of mapped priorities.

9: The development of the B-Lines network should take place within a national framework, but refined and agreed using local data and stakeholder engagement.

10: Although B-Lines sees itself as a broad-brush approach to insect pollinator conservation, as it aims to link together priority areas of wildflower-rich habitat in enriched linear zones, there will be significant opportunities to contribute towards the conservation of rare species. Key opportunities should be identified along the proposed B-Lines, and measures taken to ensure the needs/requirements of rare species are accounted for in both the location and 'design' of individual B-Lines stretches.

11: B-Lines should establish itself as a simple yet potentially very effective model to help deliver the core recommendations of the Lawton review as they relate to habitat protection and connectivity.

12: B-Lines should aim to work with local authorities to ensure that existing maps and associated policies recognise the B-Lines networks, however where it is not possible to influence existing maps, core areas of overlaps should be identified.

13: B-Lines should promote the need for restoration of large areas of habitat and ensure that any habitat creation meets the highest standards.

14: B-Lines must relate management of individual parcels of land/habitat to that in the surrounding landscape. It should aim to achieve a diverse and complementary range of habitat type and conditions across the proposed linear zones and into the wider countryside.

15: B-Lines needs to work with Natural England to trial a more targeted approach to assist in the delivery of its landscape-scale vision.

16: B-Lines should agree a more formal pilot area with Natural England to assist in the identification and development of habitat restoration/creation initiatives and also in which to trial a more joined-up approach with the NGO and private sector.

17: B-Lines must be careful to maintain its vision and identity, however it must also look for opportunities to assist with and influence other landscape-scale initiatives where they can help realise the B-Lines aims.

18: B-Lines should engage fully in one of the Defra biodiversity offsetting pilot projects and explore options for working with private landowners and farmers at a landscape-scale.

19: B-Lines needs to refine it standards and guidelines to enable it to carry out a feasibility study into the potential for either developing local or national branding and/or linking with existing initiatives.

20: B-Lines should continue to explore opportunities with businesses to secure future additional funding for the B-Lines work.

21: A realistic and deliverable monitoring programme must be established to ensure that impacts of establishing the B-Lines can be clearly demonstrated into the long-term.

22: B-Lines should aim to gather a consensus around, and support for these guiding principles which can then be used and promoted by a variety of organisations and individuals around the UK.

Annex 3:

Yorkshire pilot 'Bee Roads' project – Project Implementation Group

Buglife
The Co-operative Group
Farming and Wildlife Advisory Group (FWAG)
National Farmers Union (NFU)
Natural England
North Yorkshire County Council
The University of York (advisory capacity)
West Yorkshire Biodiversity Group
Yorkshire Wildlife Trust

Annex 4:

B-Lines: Consultees and advisers

National Farmers Union (NFU)
National Farmers Union (Scotland)
Country Landowners and Business Association (CLA)
Farming and Wildlife Advisory Group
Campaign for the Farmed Environment (CFE)
Conservation Grade
LEAF
Game and Wildlife Conservation Trust
Sustain
Soil Association
University of York
Stockholm Institute
University of Leeds
University of Reading
University of Cambridge
Newcastle University
Centre for Ecology and hydrology (CEH)
British Ecological Society
Scottish Agricultural College (SAC)
Natural England
Countryside Council for Wales
Scottish Natural Heritage
DEFRA
SEPA
The Grasslands Trust
Plantlife
Bumblebee Conservation
Butterfly Conservation
RSPB
The Wildlife Trusts
Landlife
Rivers of Flowers
Flora Locale
Environmental Law Foundation
ALGE
Association of National Parks
Town and Country Planning Association
Royal Town Planning Institute
LBAP Officers Network
The Environment Bank
The Ramblers Association
British Mountaineering Council
Central Association of Beekeepers
British Beekeepers Association
Floodplain Meadows Partnership
Friends of the Earth
Ministry of Defence (MOD)
Co-operative Farms
The Co-operative Group
National Trust
Sir John Lawton
Sarah Raven
Haytime Project
Carstairs Trust
Yorkshire Dales Millennium Trust
Food and Environment Research Agency
Stockbridge Technology Centre
South Yorkshire Biodiversity Group
West Yorkshire Biodiversity Group
Yorkshire Dales National Park Authority
North York Moors National Park Authority
North Yorkshire Biodiversity Group
East Riding of Yorkshire Council
Yorkshire Wildlife Trust
Yorkshire Naturalists Union

Annex 5:

Environmental Stewardship – some key options

Environmental Stewardship options which could play a key role in the delivery of B-Lines (note other options may also provide benefits) include:

Higher Level Stewardship Options

Key habitat restoration and creation options:

These options should form the core habitat area of the B-Lines as they manage, restore and create semi-natural grasslands rich in wildflowers.

HK6 – Maintenance of semi-natural grassland

HK7 – Restoration of semi-natural grassland

HK8 – Creation of semi-natural grassland

(note similar options for management of lowland heathland, lowland fen, parklands and orchards can also offer suitable management in appropriate locations)

Wider habitat management options:

HB12 - Maintenance of hedgerows of very high environmental value

HC15/12/17 – Maintenance/restoration/creation of successional areas of scrub

HK15/16/17 – Maintenance/restoration/creation of semi-improved grassland for target species

Temporary habitat measures:

HE11 - Enhanced buffer strips on intensive grassland

HE10 - Floristically enhanced grass margins

Of potentially less importance than the wildflower-rich options above (although clearly having a role as cover for invertebrates and other wildlife) are:

HF16 - Cultivated fallow plots or margins for arable flora as enhanced set-aside

HF19 - Unharvested, fertiliser-free conservation headlands

Entry Level Options:

Preferred options:

EF4/ OF4 - Pollen and nectar flower mixtures

EK3/ **OK3** - Permanent grassland with very low input (can be valuable if species- rich, but should look to restore through HLS)

EB1-2/ **OB1-2**: Hedgerow management

EB3/ **OB3 -** Enhanced hedgerow management

EC4/**OC4** – Management of woodland edges

Other useful options:

EE1-EE6/ **O1-O6**: 2,4 and 6m buffer strips on cultivated land

(of greater value if seeded with wildflower seed)

EF1/ **OF1**: Field corner management

EF7/ **OF7**: Beetle banks

EF10/ **OF10**: Unharvested cereal headlands

EF11/**OEF11**: Uncropped, cultivated margins on arable land