‘Making a B-Line for Northumberland’

Mapping Northumberland’s B-Lines

March 2015
Paul Evans, Buglife

Saving the small things that run the planet

Buglife - The Invertebrate Conservation Trust is a registered charity at Bug House,
Ham Lane, Orton Waterville, Peterborough, PE2 5UU
Company no. 4132695, Registered charity no. 1092293, Scottish charity no. SC04004

Report Content

Acknowledgements

We would like to thank Natural England for their support for this mapping project. In addition we would like to thank all the partner organisations who assisted with workshops, advice and information. Finally we would like to acknowledge the following data sources; Natural England, Northumberland National Park Authority, Northumberland Wildlife Trust, Northumberland Biodiversity Partnership, Newcastle City Council, National Trust, Environmental Records Information Centre North East and the Centre for Ecology and Hydrology

1. Introduction:

1.1 Background to B-Lines

In living memory there has been a substantial reduction in the area of wildflower-rich grassland in the UK - over 97% of this valuable habitat has been lost. This has been one of the major contributing factors behind the dramatic declines to our native pollinators - 66% of large moths are in decline, three quarters of butterfly species are in trouble and there have been significant contraction in the ranges of wild bumblebees. Much of our surviving wildflower-rich habitat now exists as just small fragments. As populations of insects are left isolated from each other, separated by intensively managed farmland and by our towns and cities there is a major risk of them dying out. This problem is only likely to increase as species also need to find a way to move around the country as our climate changes.

The B-Lines Initiative aims to start addressing pollinator declines by restoring and creating large areas of wildflower-rich habitat within a prioritised and connected network. This approach will both help conserve and enhance existing insect pollinator populations, while also making it easier for these pollinators and other wildlife to move freely around the UK. The B-Lines will over time develop into a series of linear pathways of species-rich habitat, linking existing core wildlife areas to create a coherent network. They will therefore play a core role both in increasing habitat area, increasing habitat connectivity and improving the permeability of the wider 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.

The aim is to target large-scale creation and restoration of wildflower-rich habitats within the B-Lines and then support this habitat with other habitat features such as species-rich hedgerows, flower-rich field margins and flowering shrubs; benefiting not only bees and other insect pollinators but a whole range of wildlife. The B-Lines Initiative is ambitious – it has calculated that to complete the network we may need 150,000 hectares of restored or newly created habitat.

1.2 The National Pollinator Strategy and B-Lines

The Government's National Pollinator Strategy 2014 sets out a 10 year plan to help pollinating insects survive and thrive across England. It outlines actions to support and protect the many pollinating insects which contribute to our food production and the diversity of our environment. Many of the Strategy's actions are about expanding food, shelter and nest sites across all types of land so that our 1500 pollinator species can survive and thrive. In addition it promotes the need for "more, bigger, better, joined-up, diverse and high-quality flower-rich habitats (including nesting places and shelter) supporting our pollinators across the country".

Buglife's B-Lines Initiative aims to play a major role in the delivery of the National Pollinator Strategy, by developing a wide partnership of organisations, statutory agencies, farmers and landowners, businesses and the general public, who will work together to conserve our native insect pollinators. B-Lines provides a clear framework in which to target conservation effort and to galvanise wider support from other partners. Local authorities, conservation partners, landowners/managers local communities and the general public along the length and breadth of the B-Lines network will be encouraged to join forces to make a real difference.

1.3 B-Lines: Current Status

Buglife –The Invertebrate Conservation Trust, in conjunction with the Co-operative's Plan Bee Campaign, launched the B-Lines Initiative in May 2011, with a pilot project extending across the Yorkshire 'region'. The key aim of this pilot project ('Bee Roads') was to identify and map key B-Line pathways and then develop widespread partner support for a programme of delivery. A report on lessons learnt during the pilot project is available at www.buglife.org.uk. This report also gives provides guidance on delivery and outlines a suite of 'Guiding Principles' (see Annex 1) which are designed to help partnerships and stakeholders implement B-Lines in other areas of the country in a joined up and coherent manner.

From 2012-2014, with support from the Co-operative, Natural England and other partners, the B-Lines Initiative expanded out of Yorkshire into the neighbouring counties of Durham, Cumbria, Lancashire and Greater Manchester. Buglife is also working with a new partnership, including the RSPB, London Wildlife Trust, Bee Collective and Greater London Authority to develop a B-Line across London. Further mapping has been completed, or is in progress in Avon, South Devon, Norfolk, Suffolk, Kent, East Sussex and West Sussex. Buglife is working on the ground in several parts of the country to restore and create wildflower-rich habitats, while other areas of the B-Lines network are being developed by a range of other partners. In addition there is on-going work with Natural England and the Campaign for the Farmed Environment to ensure the B-Lines are delivered in agri-environmental schemes and voluntary measures.

1.4 The Northumberland B-Lines Mapping Project

In partnership with Natural England, Northumberland Wildlife Trust, Northumberland National Park Authority, the University of Liverpool, and the Environmental Records Information Centre - North East, and with support from a number of other partners (see Annex 2), Buglife is now looking to expand the B-Lines network northwards into Northumberland.

This mapping project identifies a network of priority B-Lines; the fessential first step in the development of the B-Lines in Northumberland. To enable a successful partnership to be developed, Buglife worked closely with key stakeholders and partners, looking to utilise and link with existing landscape-scale and green infrastructure initiatives. The mapping base identified key wildflower-rich habitat assets alongside existing landscape-scale and green infrastructure initiatives, and identifies key areas within which to develop networks of wildflower-rich habitat.

The Northumberland B-Line mapping project is based around GIS mapping of key grassland and other wildflower-rich habitats within Northumberland, the City of Newcastle and North Tyneside.

Key objectives of the project were:

- The development of a mapping baseline, identifying and collating appropriate data
- Modelling of potential B-Lines networks across the project area
- Verification of the first phase of the mapping products with key partners and stakeholders to start the identification of priority areas for action and delivery
- Review of current delivery and appropriate mechanisms for delivery across the area
- The development of an initial partnership for the North East with discussions with appropriate partners

2. The B-Lines Mapping Methodology

The Northumberland B-Lines project utilised the standard B-Lines mapping methodology (see Annex 3 for details), involving several key stages of work, notably:

- Collation of key data sets
- Analysis of data and provisional mapping
- Stakeholder input and verification – a mapping workshop
- Revision and prioritisation of mapping

To provide additional evidence to help guide identification of priority B-Lines, the University of Liverpool used the collated data to model key species 'dispersal channels' through the Northumberland area, using their new *Condatis* 'circuit' model of colonisation routes. This modelling was presented at the workshop, and was also developed further to assist in the identification of priority areas for the restoration/creation of wildflower-rich habitat.

2.1 Background to the Mapping

The B-Lines mapping methodology uses a simple approach for identifying priority B-Lines across the UK. The methodology is underpinned by the core aims of B-Lines, notably:

- The need to improve connectivity between areas of priority habitat (in particular wildflower-rich grasslands and other habitats supporting core pollinator populations).
- The desire to include, or abut the largest core areas of appropriate habitat (and their associated habitat networks) and to identify the most realistic options for reducing fragmentation and improving connectivity.

2.2 Northumberland B-Lines Mapping methodology

2.2.1 Overall aim

The aim of the Northumberland mapping was to identify and map B-Lines stretching across Northumberland (roughly east-west and north-south connections). In accordance with the B-Lines 'Guiding Principles', the networks were mapped as 3km wide 'lines', encompassing the best and majority of the areas wildflower-rich habitats (in particular grasslands) and linking these in the most ecologically sensible, yet pragmatic manner. The B-Lines mapping links existing areas of important habitat (e.g. SSSI, Local Wildlife Sites), alongside smaller-scale features. It also aims to complement existing landscape-scale mapping/delivery initiatives such as green infrastructure mapping, biodiversity opportunity mapping and Living Landscapes.

2.2.2 The Northumberland B-Lines Mapping

The B-Lines were mapped using a range of local data sets, supplemented by national datasets where gaps in local data existed. Datasets were collated by the Environmental Records Information Centre – North East (ERIC) in conjunction with wider conservation partners, including the Northumberland National Park Authority and the Northumberland Wildlife Trust. A full list of data sets utilised are provided in Annex 4.

GIS Mapping Method:

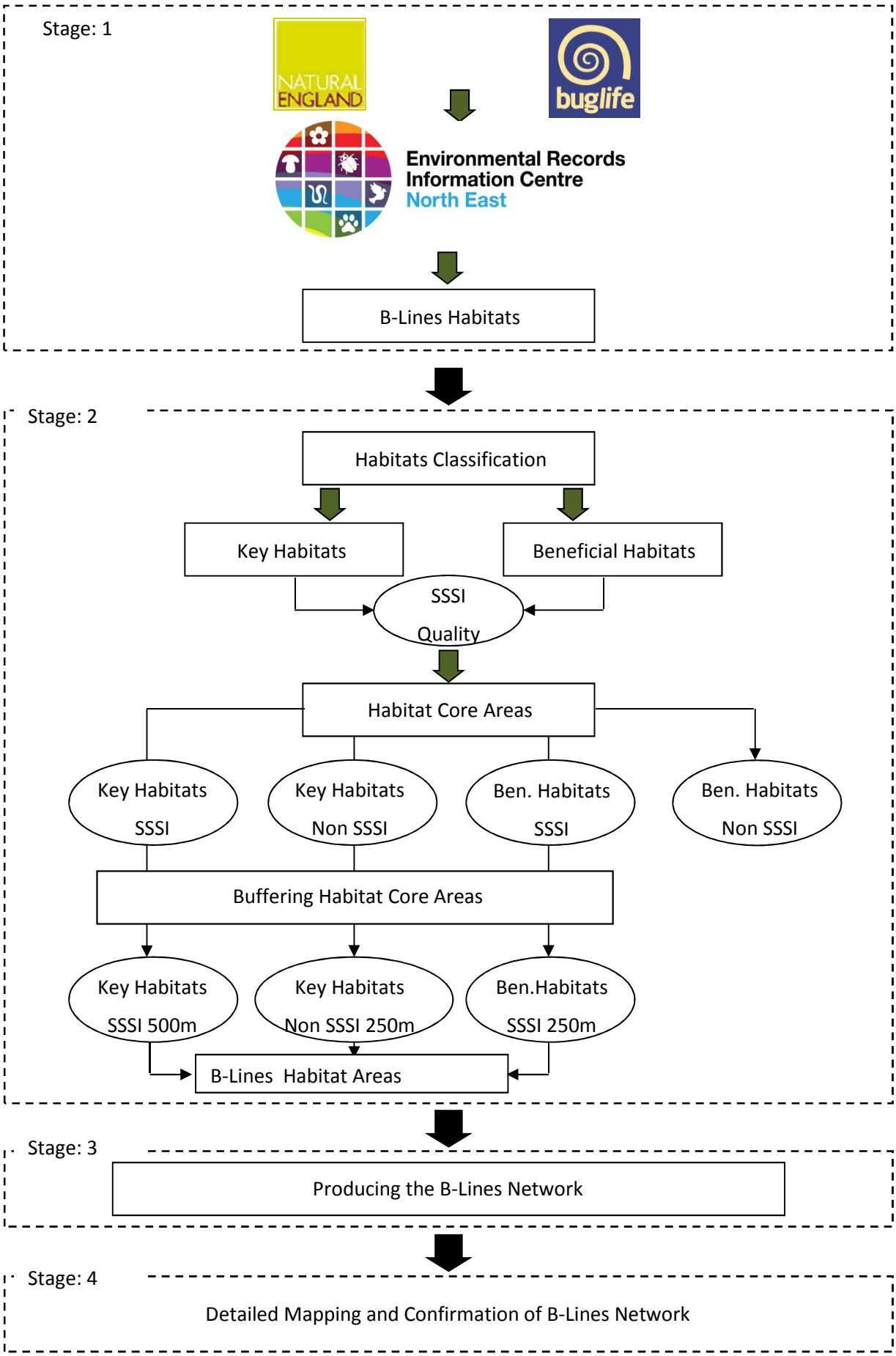
The B-Lines mapping used basic 'connectivity' modelling to identify potential networks of habitats for pollinators and other wildlife. It was designed to be both simple and pragmatic, using habitat data, and used local stakeholder and partnership knowledge to refine and confirm priority networks.

The mapping work was supported by a local 'Steering Group', who helped identify key local data, and then ensured that habitat selection and prioritisation took into account local wildlife/ landscape distinctiveness.

The mapping methodology has four main stages:

Stage 1: Data Collation
Stage 2: Identification of the B-Lines core habitat areas
Stage 3: Producing the B-Lines Network
Stage 4: Detailed mapping and confirmation of B-Lines Network

A summary is provided as a flow diagram (see below) and a fuller methodology is provided in Annex 3.


Stage: 1
NATURAL ENGLAND
buglife
Environmental Records Information Centre North East
B-Lines Habitats
Stage: 2
Habitats Classification
Key Habitats
Beneficial Habitats
SSSI Quality
Habitat Core Areas
Key Habitats SSSI
Key Habitats Non SSSI
Ben. Habitats SSSI
Ben. Habitats Non SSSI
Buffering Habitat Core Areas
Key Habitats SSSI 500m
Key Habitats Non SSSI 250m
Ben.Habitats SSSI 250m
B-Lines Habitat Areas
Stage: 3
Producing the B-Lines Network
Stage: 4
Detailed Mapping and Confirmation of B-Lines Network

2.2.3 University of Liverpool *Condatis* Modelling (to help guide B-Lines mapping):

The data collated in Phase 1 of the mapping work was also used by Department of Ecology, Evolution and Behaviour, University of Liverpool to model dispersal routes across the landscape. Modelling a landscape of habitat as if it were an electrical circuit is a potentially powerful tool for identifying routes of lowest resistance for species dispersal (*The Speed of Range Shifts in Fragmented Landscapes, Jenny A. Hodgson et al., 2012. PLOS ONE, Vol. 7, Issue 10. www.plosone.org*).

The key assumption is that the resistance between two patches of habitat is the expected time taken for the species to be able to colonise one patch starting from the other one. Simple source and target locations for the species (which become the ends of the circuit over which we impose a voltage) were identified, being the north-south and east-west extremities of the project area.

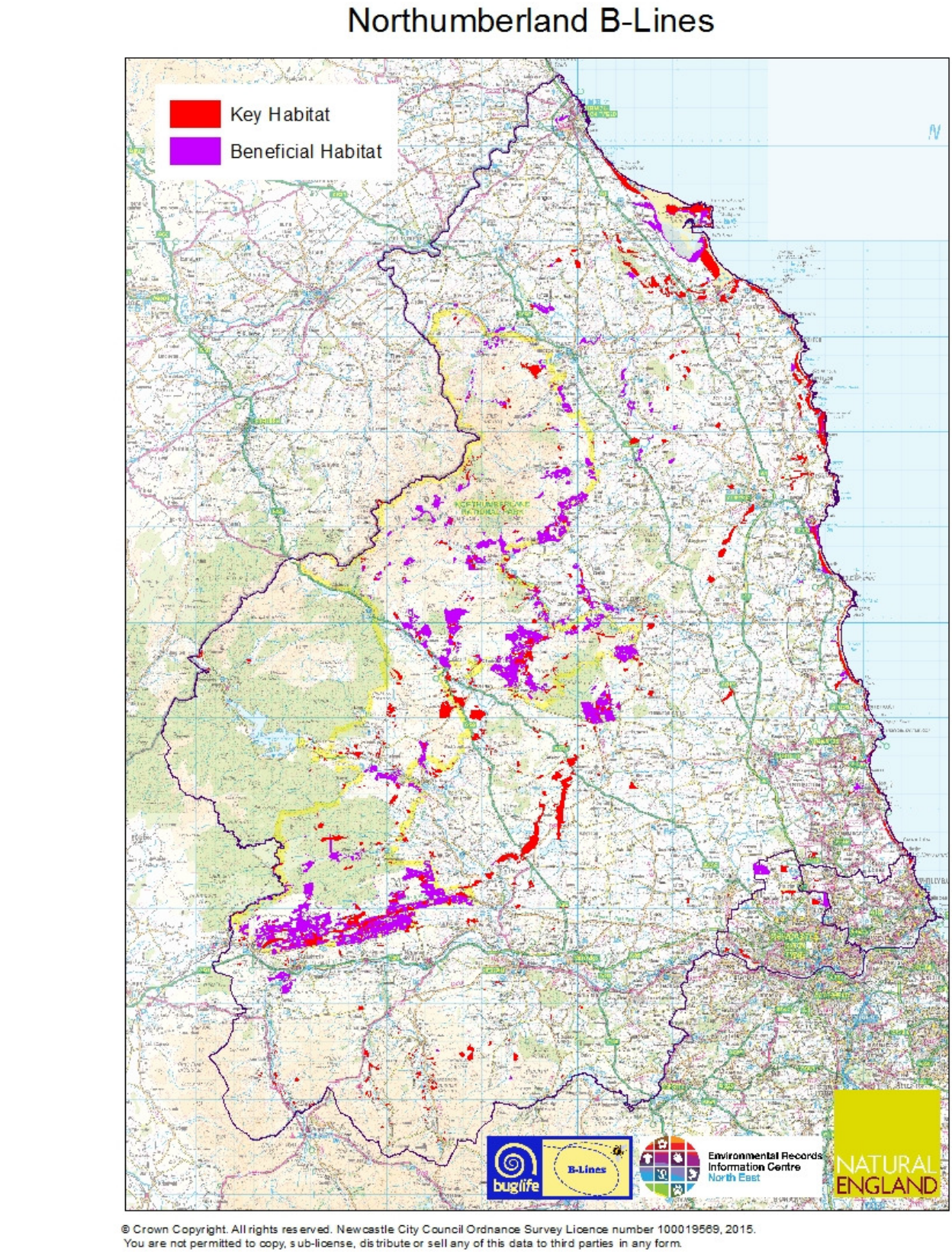
A habitat layer was created from the target grassland habitat map, aggregated to 1km squares - each square is defined as a patch (the base habitat accounts for the proportion of habitat in each grid cell). Under the *Condatis* model, a simple, blind colonisation process has been assumed where occupied habitat is producing disperses at the rate of 100 per hectare of habitat per generation (i.e. quite a numerous species but not unreasonable for an insect), and they rain down on other patches according to a negative exponential dispersal kernel with a mean distance of 1 km. The model considers every possible path between patches by linking each cell that contains habitat to every other cell in the landscape, forming a complete network. The flow maps show the flow through each patch, which is the sum of the flows from each other cell in the network.

By adding extra habitat we can reduce overall resistance and calculate how much faster colonisation might be if extra habitat were added in different candidate locations (see later work).

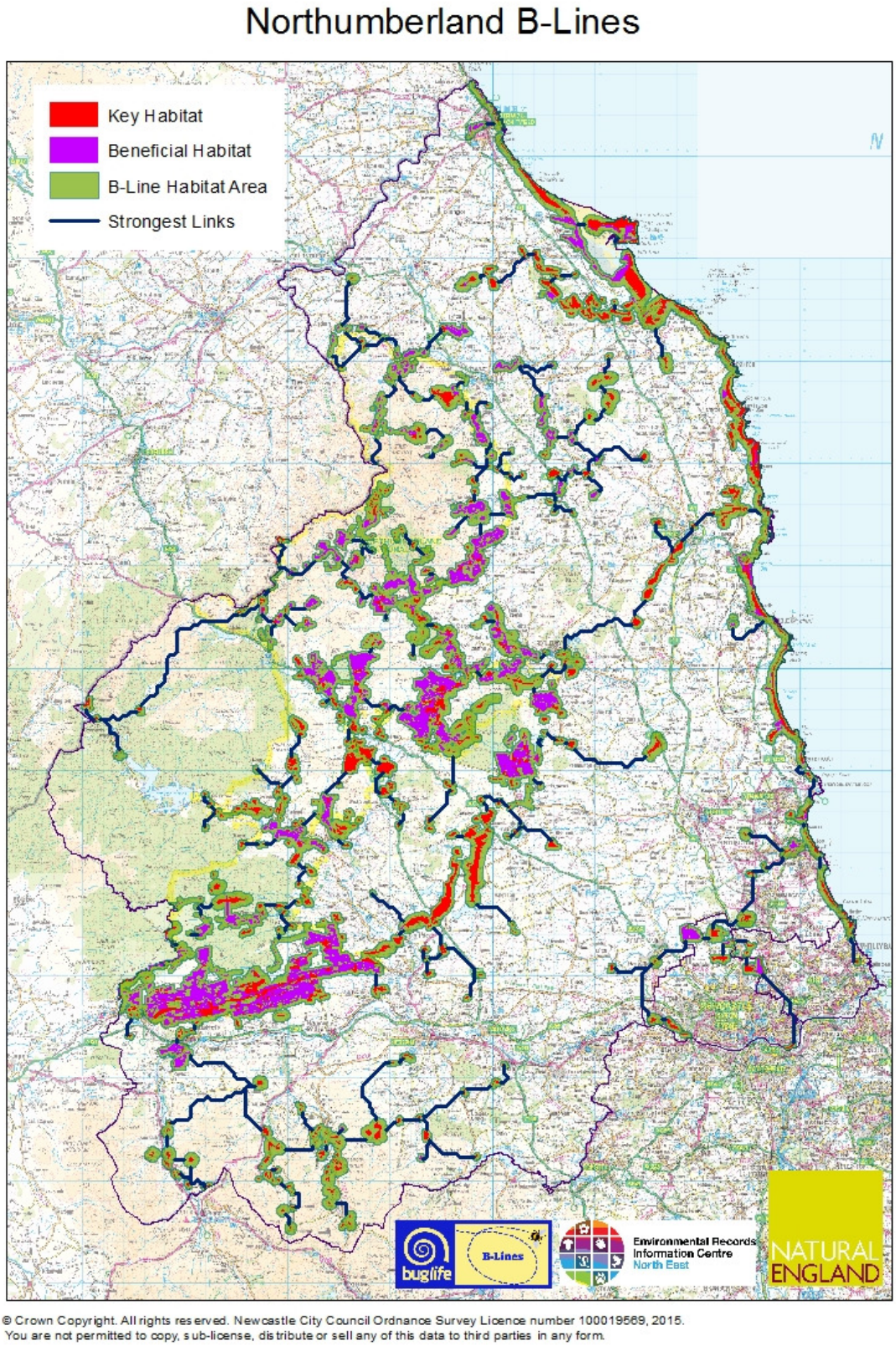
3. Identifying the B-Lines for Northumberland

The mapping outputs of this work include:

- Spatial identification of key biodiversity assets (collating and combining the most up-to-date habitat survey information)
- Connectivity mapping of wildflower-rich habitat resource
- Identification of priority B-Lines and areas (from above outputs and workshop sessions) which could form the basis of key projects/programmes of habitat restoration/creation
- Maps of current initiatives which could contribute towards the implementation of the B-Lines

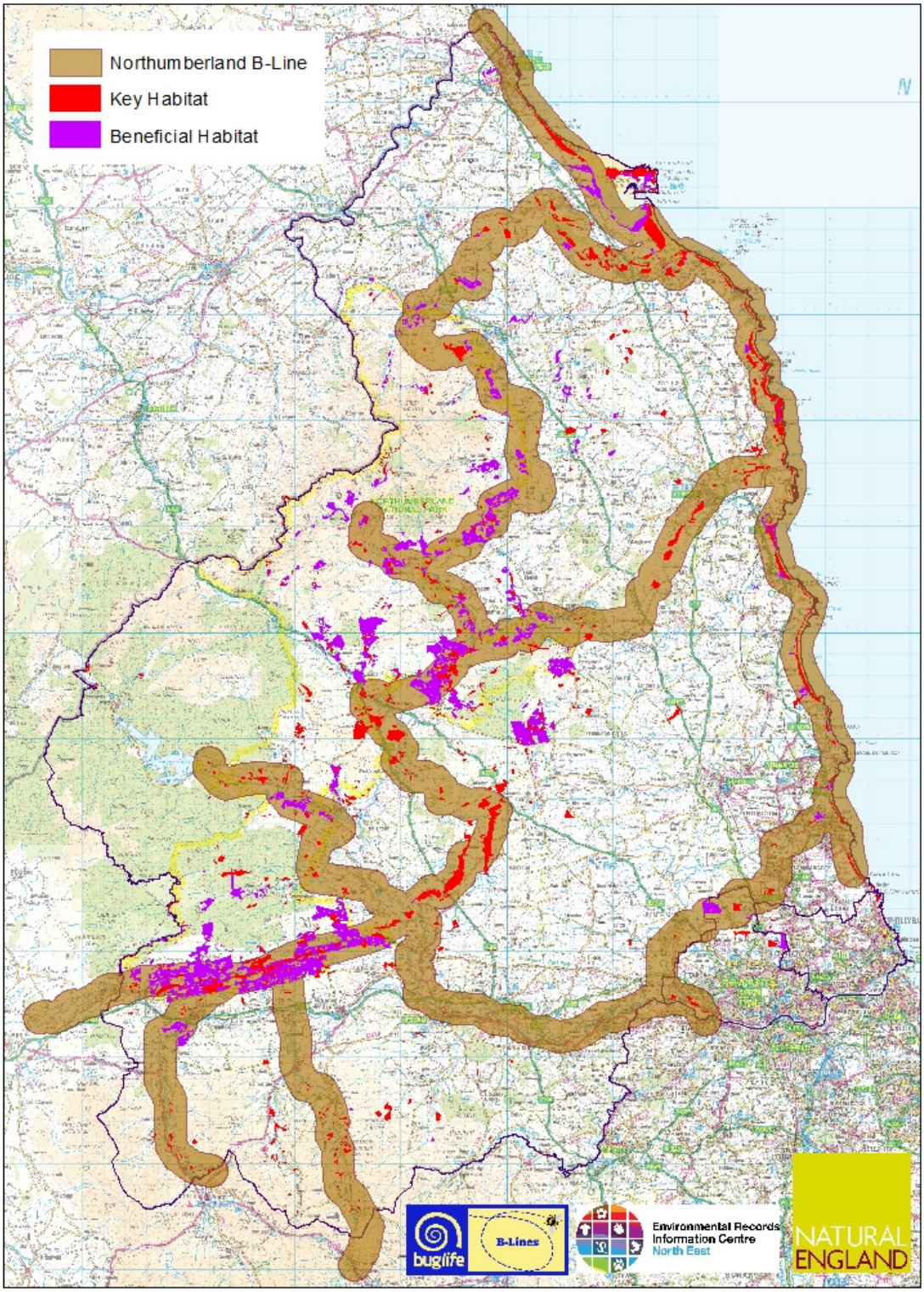


Map 1 – Geographic distribution of wildflower-rich ('lowland') habitats from data sources gathered from national and local conservation partners (see Annex 4)

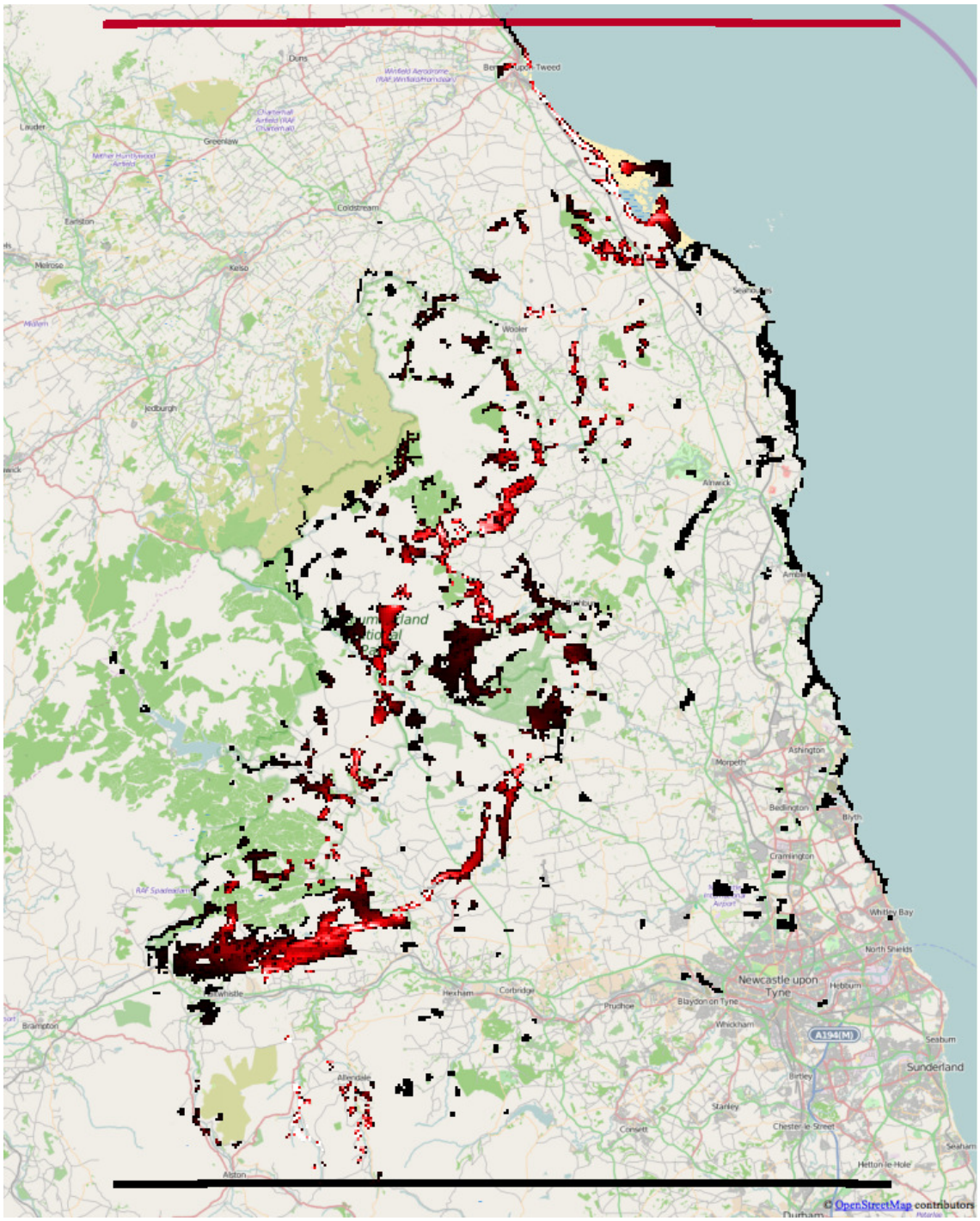


Map 2 - Core wildflower-rich habitats and 'buffers' (see methodology) and the strongest connections arising from the connectivity modelling (This is the mapping utilised in the workshop sessions).

Northumberland B-Lines



Map 3 - B-Lines Habitats and Priority B-Lines agreed at the workshop



Map 4 – ‘Condatis’ model initial output demonstrating key dispersal routes across the Northumberland wildflower-rich habitat areas (source is south of the geographical area, and target the northern extremity). Habitat areas shown in red demonstrate routes of highest ‘flow’ across the landscape.

4. Northumberland's B-Lines

The priority B-Lines network mapped, and then refined through the workshop are presented in Map 5 (below). This map will be subject to further refinement through a phase of consultation with key partners/ stakeholders. In addition we will look to work with partners to develop opportunity mapping within the identified B-Lines, to help with future targeting and promotion of habitat restoration and creation.

Map 5 – The B-Lines map for Northumberland – showing links to B-Lines in Co Durham and Cumbria

5. Current plans and programmes delivering B-Lines in Northumberland

B-Lines is a significant landscape-scale initiative aiming to create a UK-wide network of wildflower-rich habitats. Buglife will use the mapped B-Lines network to act as a focus to prioritise action for native insect pollinators, and to enthuse stakeholders to support the Initiative and help deliver key areas either as part of, or linked to their own biodiversity plans and programmes. B-Lines also hope to enthuse landowners, farmers, local communities, local authorities and other landowners to play a part in creating the B-Lines network.

B-Lines will work within existing landscape-scale project areas (for example Nature Improvement Areas and Living Landscapes), but uniquely also aims to create vital links between them, improving dispersal corridors for insect pollinators and other wildlife. This is particularly important if we are to reduce species extinctions where populations cannot move fast enough to find new areas with suitable climate.

A key part of establishing the B-Lines in Northumberland is to identify existing key biodiversity partnerships, programmes and plans which could assist in delivery. It is vital to forge working links with these to integrate aims and objectives and to expand current delivery. As part of the Northumberland work, contact was made with a range of stakeholders, and then through workshop sessions, key activities, partnerships and opportunities were identified. Some of the larger and immediately relevant programmes are detailed below, and additional ones are identified on Map 6.

As identified in the North East Regional Delivery Plan (see section 5.1), there has already been considerable success in achieving many of the 2015 habitat targets which are relevant to B-Lines. However much of the habitat resource is still depleted - as is recognised by the government's ambitious 2020 habitat targets. In addition many habitats are very fragmented and isolated from each other, significantly compromising the status of many species with low dispersal abilities.

5.1 The North East Regional Delivery Plan

The Regional Delivery Plan for the North East of England sets out how the region will achieve its share of the UKBAP 2015 habitat restoration and expansion targets. It sets out proposed delivery mechanisms for achieving the targets, where possible linking them to landscape-scale biodiversity projects. In addition it outlines specific actions and accountabilities for delivery. The Plan outlines targets and delivery for each of the UKBAP habitat types. Excerpts from the Regional Delivery Plan are provided (in the table below), for the key contributing habitats towards development of the B-Line network.

Habitat	Key areas for delivery	Links to landscape-scale projects	Key projects (existing or under development)
Lowland Meadow	Important opportunities likely to exist in SE Northumberland (South East Northumberland Coastal plain NCA and Mid-Northumberland NCA)		The Northumberland Growing Wild Project aims to create and restore publicly owned grasslands in the Morpeth area. Linkages into green infrastructure and brown field/quarrying restoration particularly in North Tyneside

Upland Hay Meadow	The key areas for upland hay meadows in the North East are the North Pennines AONB and the Northumberland National Park.	NNPA and North Pennine AONB focus	This target will be met by ensuring that there is continued support and funding for Hay Time, any successor projects or initiatives arising from the Seeding Change project
Lowland Acidic grasslands (Whin grasslands	The key areas for work are the Whin Sill areas and the coal measures of Tyne & Wear		The restoration target for this habitat will be largely met by supporting the development and implementation of the Northumberland Wildlife Trust's Whin Grassland project
Lowland Heathland	Opportunities in the Mid-Northumberland NCA and Northumberland Sandstone Hills NCA. Targeting appropriate coastal and dune heath for heath expansion on the Northumberland Coast.	Lowland heath expansion potential is linked to the proposed River Till and Cheviot Fringe. There is also potential to expand heath within lower altitude areas of the Border Uplands and Kielder	
Coastal sand dunes	The key areas for delivery are in North Northumberland Coast Coastal Plain NCA, the South East Northumberland Coastal Plain NCA and the coastal strip of the Tyne & Wear Lowlands NCA.	Sand dune restoration work will be linked to the proposed Druridge Bay landscape-scale biodiversity project.	Proposals for dune management contained in the Coast and Coal project on Druridge Bay in Northumberland Proposals by North Tyneside Council for additional 1 ha sand dune restoration and subsequent management at Tynemouth
Maritime cliffs and slopes	The Northumberland Coast (North Northumberland Coastal Plain NCA and South East Northumberland Coastal Plain NCA)	Coastal rollback is linked particularly to the proposed Druridge bay landscape-scale biodiversity project, the proposed Prestwick Carr to St.Mary's Island project. Much of the coastline can deliver this habitat.	North of the Tyne, Potential exists on St Mary's Island, on public land, Golf courses and caravan parks as well as on farmland within the coastal strip.
Lowland Fen	Prestwick Carr (Tyne & Wear Lowlands NCA). Additional opportunities exist in Mid Northumberland NCA and further north within the Cheviot fringe NCA.	Opportunities for fen restoration in proposals within the proposed River Till and Cheviot Fringe landscape-scale biodiversity project, the proposed Prestwick Carr to St. Mary's Island project	

Table 1 - Selected habitats from the North East Delivery Plan

The mapped B-Lines network for Northumberland overlaps a significant proportion of the key landscape-scale project areas identified in the North East Delivery Plan. This would be expected as the B-Lines map a network around, and linking the majority and best of our wildflower-rich habitat areas. B-Lines will work with partners to focus new activity in these key landscape-scale project areas and hope to provide fresh/additional impetus to deliver habitat restoration and creation. The B-Lines mapping, and associated vision will be used to enthuse land owners and managers to look for further opportunities to develop insect pollinator friendly habitats; working towards a more joined-up approach across the network.

5.2 National Character Areas

The National Character Areas (NCA) framework provides a useful decision-making framework for the natural environment. The NCA profiles provide guidance and support for planning of conservation initiatives at a landscape scale, and to encourage broader partnership working.

Northumberland has a very diverse landscape, from the long coastal strip, through intensively farmed areas, post-industrial and urbanised areas to the south-east and the higher, more semi-natural areas of the uplands to the west. This diversity is reflected by the number of NCAs identified across Northumberland, with nine NCA partially or completely within the county.

A brief review of the NCA profiles highlights the fragmented nature of wildflower-rich pollinator habitat across much of the county, and the need to improve connectivity of the remaining areas of semi-natural habitat. The mapped B-Lines network identifies key linkages between many of these important habitat fragments and provide a broad framework in which to focus action to increase landscape-scale connectivity. In addition several of the NCA profiles (including South East Northumberland Coast, North Northumberland Coastal Plain, Cheviot Fringe) highlight the importance of native insect pollinators to the farming sector and food provision. The general paucity of good semi-natural insect pollinator habitat is highlighted as a significant issue affecting pollinators, along with the need to create larger habitat patches by joining up remaining fragments. The B-Lines should be used as a focus to prioritise action to create a more joined-up landscape for pollinators and other wildlife, providing a core area around which other pollinator habitats can be put back improving permeability of the wider farmed landscape.

A summary of some of key information relating to pollination services and development of ecological network, or more pollinator friendly landscapes is provided in Annex 6.

5.3 Key existing partnerships and projects for integrated delivery of B-Lines

A range of on-going and developing partnership projects/initiatives were identified by stakeholders and these are identified in Map 6 In addition a range of opportunities exist relating to housing, or transport infrastructure development, both approved and in the pipeline.

i. Living Landscapes

Living Landscapes is a key Wildlife Trusts initiative for developing sustainable wildlife-rich areas across the UK. It aims to work with people and communities to restore damaged and fragmented blocks of habitat; reconnecting these habitats and linking them to the green space in our cities, towns and villages. The Northumberland Wildlife Trust has identified several Living Landscapes which overlap with the Northumberland B-Lines including

- Hadrian's Wall and Whin Sill Corridor

  To develop the unique grassland and wildflower communities and wildlife, found along Hadrian's Wall and the rock outcrops of the Whin Sill. These rare and unique plant communities only occur on the thin, patchy soils associated with the Whin Sill, on associated scarps, slopes and in quarries. At one time there were also important habitats for the Northern Brown Argus butterfly, which is now extinct in the area.

- Prestwick Carr

  To create a connected, flourishing series of wetlands, grasslands and hedgerow habitats that will act as a natural carbon store, help flood defences and providing a nature park on the northern edge of the city of Newcastle upon Tyne. By returning the whole area to its historic status of marshland allowing plants and animals of these habitats to spread and thrive creating a more 'joined-up' area to be managed with wildlife in mind – developing a more robust wildlife network on the edge of the city.

- Coal and Coast (Drurdige Bay)

  The Druridge Bay coastline, which stretches 7 miles from Amble in the north to Lynemouth Bay in the south, is an area of major wildlife and nature conservation importance. By developing a series of interconnected wildlife-focussed areas in and around Druridge Bay and the surrounding farmed land of south east Northumberland, we will protect and enhance wildlife.

ii. Nature Improvement Areas (NIA)

The Border Uplands Nature Improvement Area aims to conserve and restore river habitat, and adapt to / mitigate for the physical impacts of weather extremes and climate change.

iii. Magnificant Meadows

Save our Magnificent Meadows is the UK's largest partnership project transforming the fortunes of our vanishing wildflower meadows, grasslands and wildlife. In Northumberland, led by the Northumberland Wildlife Trust, the project is focussing on areas of calaminarian grassland along the South Tyne, which are largely threatened by scrub encroachment and the deepening of the (non-contaminated) soil humus layer. In addition the project is focussing on the Whin grasslands along the Great Whin Sill where scrub and rank grass encroachment is squeezing the extent of some of our rarer flowers.

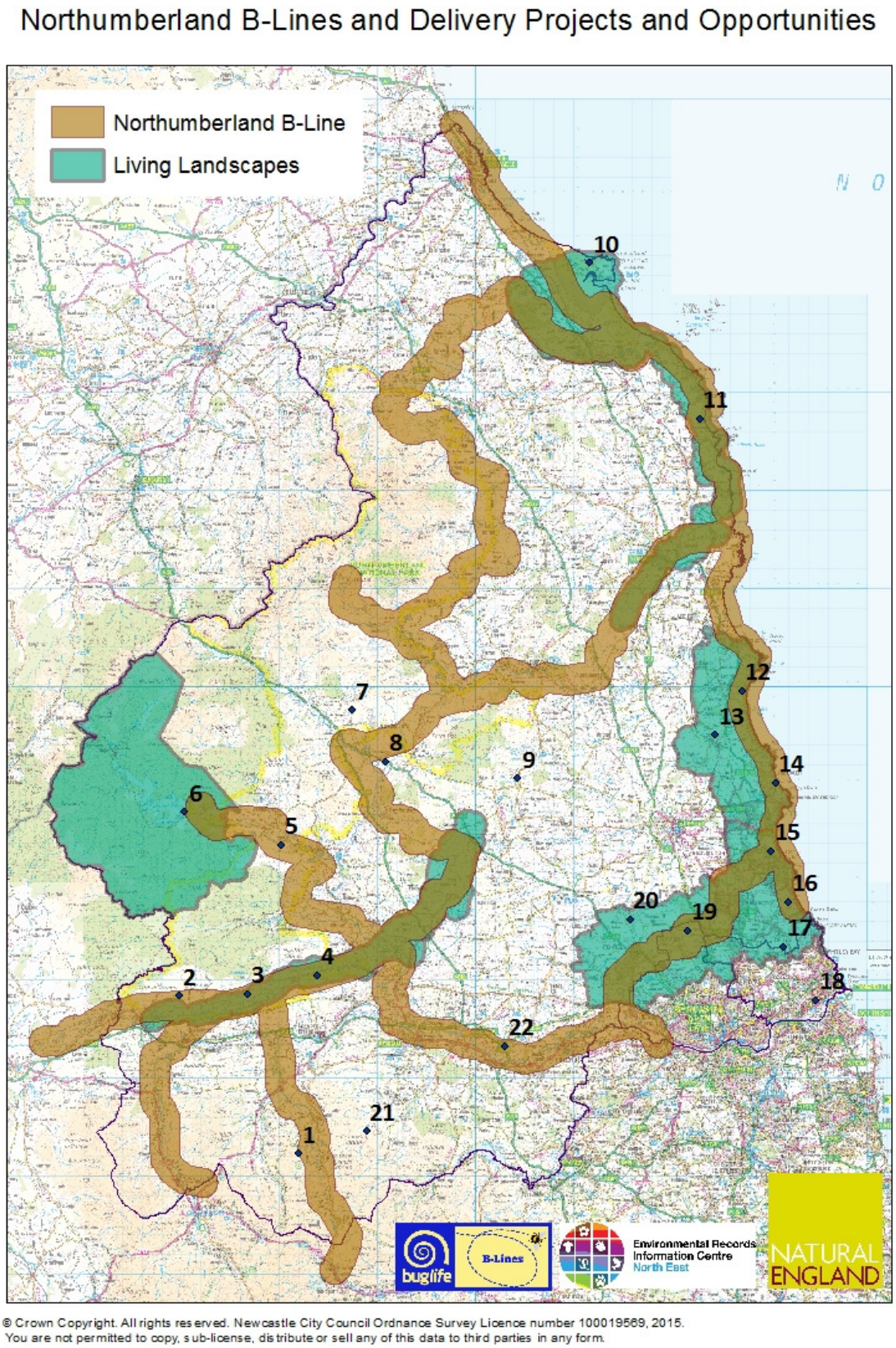
iv. Nectarworks

Led by the North Pennines ANOB this project aims to restore and strengthen the network of flower-rich nectar-sources across the AONB through targeted management and expansion of the best examples of rare flower-rich grassland. It takes a landscape-scale view and will map the current extent of the nectar-source network, with a view to using this to establish coherent corridors. Nectarworks is focussing on both farmed hay meadows and local community and schools activities, to strengthen the overall nectar-source network.

v. Northumberland National Park Kielder verge survey

A project is on the road to success in helping pollinators like butterflies and bees to thrive. A survey has being carried out of 19 miles of roadside verges around Kielder Water in Northumberland, which total more than 100 acres. The line of the road verges acts as a continuous link along which pollinators and other wildlife can move.

Other on-going project and programmes, alongside other potential opportunities for delivering Northumberland's B-Lines are shown on Map 6.



Northumberland B-Lines and Delivery Projects and Opportunities

Map 6 – Current projects, programmes and potential wider opportunities to develop the B-Lines as identified in the mapping workshop .

Map number	Project or Opportunity
1	Allen Valley Landscape Partnership scheme & Nectarworks (North Pennines AONB)
2	Whin Grassland Project
3	Sill Green Roof
4	NNPA Bog improvements
5	Northumberland National Park Authority hay meadow work (NNPA)
6	Border uplands partnership (Kielder verges) – (NNPA)
7	Hay Meadow Improvement in NNPA
8	Redesdale HLF Landscape partnership bid (whole catchment) (NE) (D)
9	National Trust Wallington (working with Butterfly Conservation)
10	Perigrini
11	Northumberland Coast AONB Volunteering Project
12	Dynamic Druridge HLF project– NWT
13	Blyth port expansions – habitat mitigation (O)
14	Lynemouth Power Station – grassland creation on ash landscapes
15	Potential in open coast restoration (O)
16	National Trust – Delaval Hall, Cragside & Coast (O)
17	Biodiversity Offsetting (Cramlington area) (NWT) (O) & Network mapping south east Northumberland (NCC)
18	Greening the Grey - NWT (D)
19	NWT Living Landscapes 'Carr to Coast' (NWT)
20	Water framework Directive Blyth/Lyne (O)
21	Save our magnificent meadows Project (NWT)
22	Tyne Valley habitat fragments, Local Wildlife Sites, hedges etc (O)

Key for Map 6 - All current projects, except (D) – in development, and (O) –opportunities

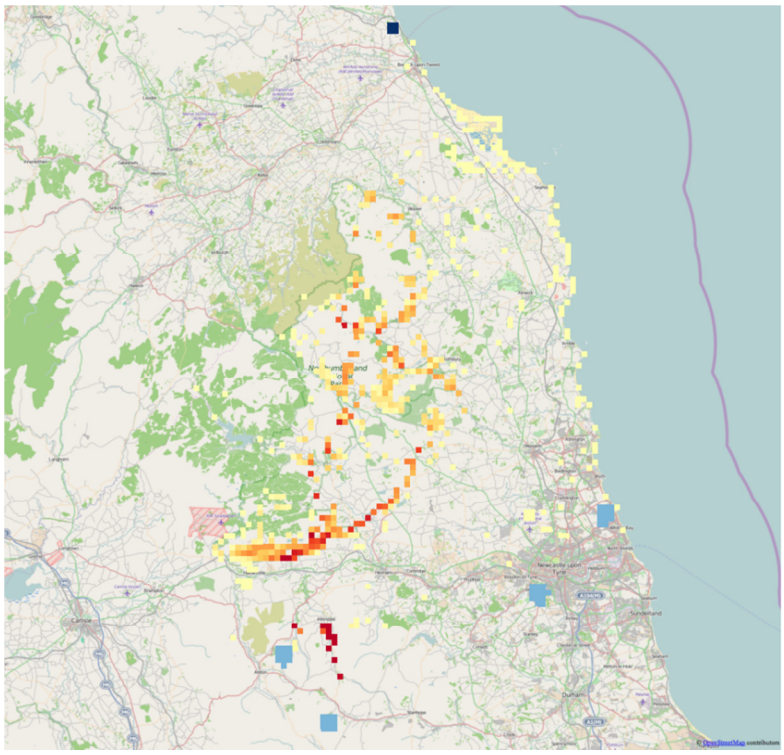
6. Future Development of the B-Lines

The mapping of B-Lines for Northumberland is an essential step in developing the B-Lines Initiative across the area. The maps provide a framework within which to promote increased, strategically located wildflower-rich habitat restoration/creation alongside other targeted pollinator habitat measures. The mapped B-Lines network also provides a framework for prioritising the development of new, or extension of existing projects and delivery programmes. The identification of the B-Lines paves the way for further promotion of the initiative and for integrating delivery activities with other partners. It also provides increased emphasis on particular parts of the landscape, now recognised as part of the developing UK-wide B-Lines network.

The Priority B-Lines identified in Map 5 are proposed as the B-Lines network for Northumberland and support for this will be sought from key partnerships and organisations. In particular we will seek to get B-Lines recognised by both of Northumberland's Local Nature Partnerships and by Northumberland County Council, Newcastle City Council and North Tyneside Council. In addition the B-Lines mapping will be made widely available to Natural England and other land management advisors, to ensure targeting of appropriate options within the B-Line network.

6.1 Identifying priorities for action and gaps in current delivery

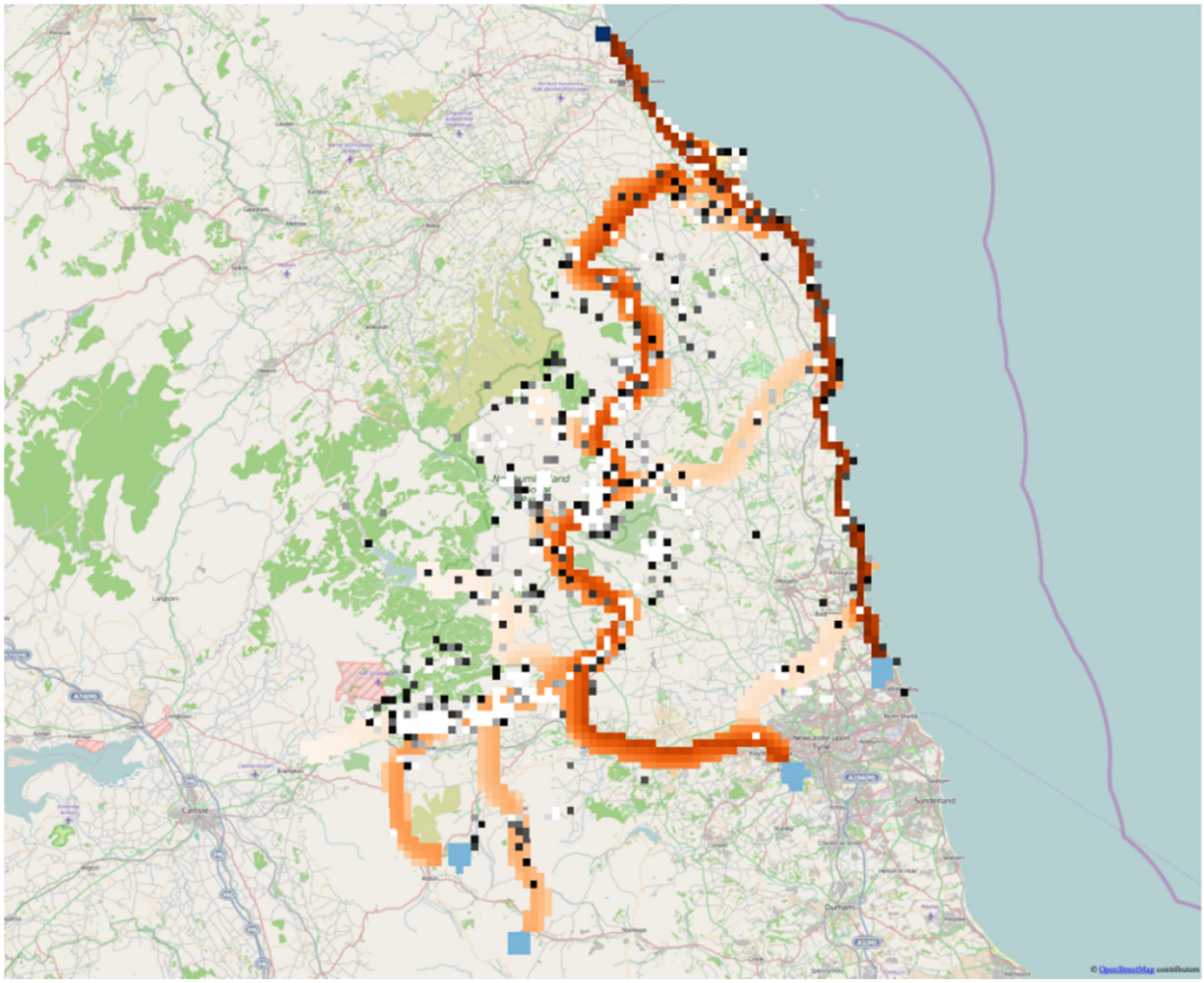
In addition to mapping flow of species across a landscape (see 2.2.3), the *Condatis* model allows us to predict where adding extra habitat to the landscape is likely to increase 'colonisation' from a source to target location.



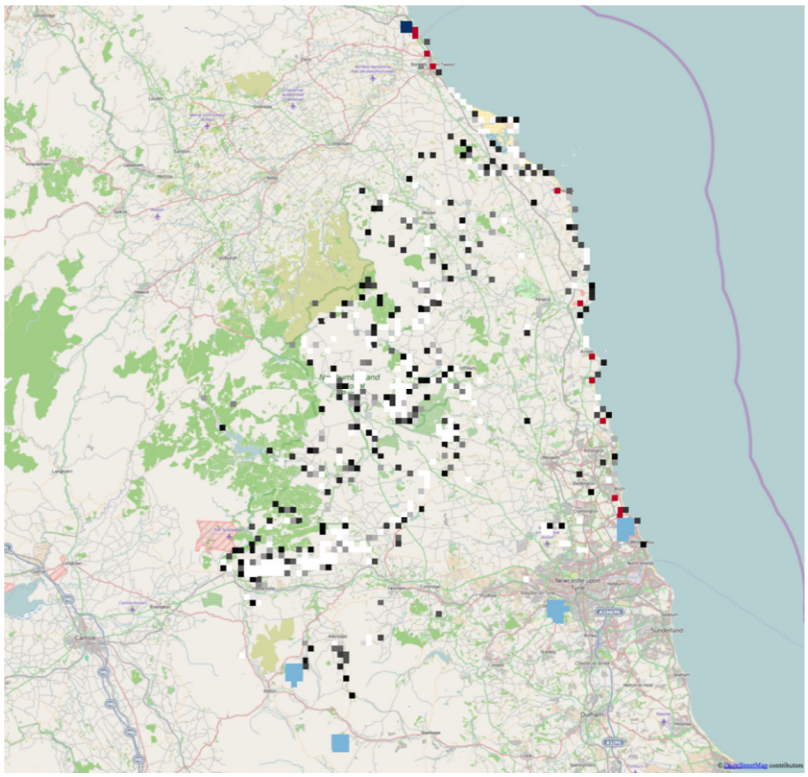
Focussing just within the B-Lines and the existing habitats they contain, the *Condatis* model was used to demonstrate which parts of the network were contributing most to the 'flow' of species from the Durham/Cumbrian B-Lines (the sources) to the most northerly extremity on the North East Coast (the target location) (see map 7). The modelling demonstrates that the B-Lines mapped to the west are currently likely to be contributing most to any flow of species from the mapped 'source' locations to the northerly 'target'.

Map 7 – Current flow through habitat within the B-Lines (darker reds show more significant flow)

Within the B-Lines *Condatis* was then used to calculate the contribution that each additional 1km square of new habitat could add to the overall connectivity of the network habitat (using the 'source' and 'target' locations listed above). By adding a 'new habitat' layer (i.e. a layer which fills in all of the gaps in the current B-Lines) the model calculates the relative importance of each area of new habitat to increasing flow along the B-Lines. Effectively this prioritises the individual 1km squares, and highlights those which would provide the largest increase in 'connectivity' of the B-Lines should key wildflower-rich habitats be created in them. Map 8 shows existing habitats in grayscale (white being 1km with highest proportion of habitat coverage and black with lowest proportion) and ranks the remaining 1km cells (in colour) according to how important new habitat would be towards increasing overall flow. The mapping outputs from this scenario suggest that that adding additional habitat to the Coastal strip is likely to have the greatest impact on flow through the B-Lines network.



Map 8 – Prioritisation of potential habitat creation within individual 1km squares of the mapped B-Lines network (Grayscale shows existing mapped habitat, and colour scale shows a 'new' habitat layer. Dark orange colours on the map highlight areas where adding new habitat would have the greatest impact on flow through the B-Lines network.



Map 9 – Existing mapped habitat areas in grayscale and the highest ranked 1km squares or habitat creation shown in red (see main text)

By removing ('dropping) the lowest ranked 1km squares, *Condatis* can identify the most useful locations for habitat creation (i.e. the 1km squares were habitat creation will improve overall flow through the network from source to target locations). Map 9 shows existing habitat areas in grayscale and identifies (in red) the twelve most important 1km squares where habitat creation could be targeted. *Condatis* allows you to add habitat one area at a time, so does allow for a complete priorisation across the network.

The 'dropping' part of the *Condatis* model works on a 'sliding scale' to prioritise individual habitat areas, so is therefore not easy to represent in a report. We have therefore provided the one scenario for the Northumberland B-Lines (see above), but several other scenarios have also been produced. Partners can access the model (funded by NERC) at http://www.condatis.org.uk/ and is available for all to use.

In parallel with any prioritisation work, such as that demonstrated above, it is also important to review current agri-environment uptake in the B-Lines network This will help identify much more accurately the scale of delivery on the ground needed, as well as helping to identify opportunities to seek upgrades to existing agreements, and to help focus other key Stewardship options. We would encourage Natural England to carry out this analysis within the B-Lines network, with the outputs then being used alongside outputs from the *Condatis* modelling to help prioritise future action.

6.2 Delivery through existing initiatives, projects and programmes

A wide range of wildlife delivery is currently underway in Northumberland. The B-Lines Initiative will aim to support project development in these existing delivery programmes to increase the restoration and creation of wildflower-rich habitat types. Of particular importance is the identification of habitat gaps in the recently mapped B-Lines and the creation of stepping stones, and we will look to further refine the modelling work carried out by the University of Liverpool *Condatis* model to guide this work. This work will be made available to conservation partners to help guide geographical priorities to improve overall connectivity across the B-Lines network.

6.3 Projects in development

A series of existing and developing projects/programmes have been identified through the Northumberland mapping project (see section 5), with many of these having potential to deliver key parts of the B-Lines network. We will aim to work with these to identify priority areas, and to provide support for project development and/or funding bids.

6.4 Potential new projects or areas for further exploration

- **Northumberland Coast** – The Northumberland Coast provides a substantial stretch /extent of semi-natural habitat, albeit in many areas a thin strip hugging the coast and bordered inland by arable farming. There has been, and continues to be significant habitat restoration and creation work within this coastal strip, however there is considerably more that is needed to create a more ecologically robust coastal network. A 'Coastal B-Line' project may provide a focus to filling in some of the gaps from previous/existing projects, at the same time as working with farmers in the wider B-Line to add pollinator friendly features on more intensively managed farmland.

- **Whin Grasslands** – The best of these grassland areas have been targeted through Whin Grassland Projects and the Northumberland Wildlife Trust led 'Magnificent Meadows Project'. There are however larger expanses of Whin Grassland where restoration may be feasible and which could be targeted as part of B-Lines delivery.

- **Tyne Valley** – although not picked up from the mapped habitat data there are a significant number of wildflower-rich habitat areas along the Tyne corridor, including many Local Wildlife Sites. There is potential to use these areas to promote a 'Tyne B-Line' working with local communities to identify further areas and potential areas for enhancement.

- **South East Northumberland** – The Northumberland Wildlife Trust and others are taking forward a range of work in this area, including working on Local Wildlife Sites, ex-industrial sites, quarries and mines. The B-Lines in this area would seem most appropriate for the development of a more community-focussed pollinator project, linking work on urban greenspace, schools etc. with habitat management on Local Wildlife and other important wildlife sites.
  Building B-Lines into developing plans for ecological networks in Local Development Planning, and using this to encourage new developments to help create the B-Lines in South East Northumberland would appear to be a priority in this area. This work should be aligned to a programme of raising awareness about the value of 'Open Habitat Mosaics' (brownfield sites) for insect pollinators and other wildlife, and as a core part of the B-Lines.

- **Northumberland National Park** – Important work is taking place in the National Park as part of both the Kielder Verges Project and hay meadow restoration projects. This valuable work has helped identify key wildflower-rich habitat resources and carry out a range of habitat restoration works. There is clear potential to work with the Border Uplands partnership to extend this work further to help fill in gaps on the B-Lines network.

- **Allen Valleys** – The mapping has identified significant wildflower-rich habitat resources in these areas, which also provide vital links in the B-Lines network southwards into Weardale. B-Lines should work with the Allen Valleys Landscape

Partnership Scheme to ensure key funding is attracted for habitat works in these valuable linkages.

- **General** – As part of a programme of public awareness, to build up a picture of habitats and species within the B-Lines, and also to help identify new opportunities for habitat restoration and creation, there is potential for a community/public focussed project 'Walking the B-Lines' to carry out simple surveys and other activities.

6.5 Influencing targeting and take-up of agri-environment

Countryside Stewardship has a major role to play in the delivery of landscape-scale projects such as the B-Lines; with both Higher Tier and Middle Tier offering key options which can help develop substantial lengths of the B-Lines network. Key grassland creation and restoration options under Higher Tier, for example GS6,GS7, GS8 and GS14 are key to the maintenance, restoration and creation of the large areas of wildflower-rich grasslands which will provide the core of the B-Lines. Habitat feature options available within both Middle and Higher Tier, including those delivering better hedgerow management (BE3), wildflower-rich margins and plots (AB8), buffer strips (SW1-SW4) and pollen and nectar strips (AB1) all have a role to play in the future development of a wildlife enriched landscape within the 3 km wide B-Lines. The new Wild Pollinators and Farm Wildlife Package has the potential to play a key role in helping to make the B-Lines network more able to support a range of insect pollinators.

Effective delivery of B-Lines will require more joined up planning and delivery, so that management on adjacent landholdings/farms will complement each other more effectively and will assist in the development of the overall habitat network. Essentially this means that individual farms should not be considered in isolation, but their potential contribution to B-Lines should be related to what is happening on adjacent/nearby habitats and landholdings. This requires a holistic approach to delivery on the ground, alongside more proactive targeting of the Higher Tier; identifying and taking forward wider habitat creation opportunities. Opportunities to use 'Facilitation Funds' should be highlighted, to help ensure increased co-operation between adjacent farm holdings.

Where planned carefully, the Higher and Middle Tier options can work effectively together to deliver more for key species. When working on Higher Tier agreements, complementary Middle Tier options can contribute towards the delivery of B-Lines and provide key buffers and linkages/narrow corridors between core areas of semi-natural habitat.

6.6 Campaign for the Farmed Environment

The Campaign for the Environment (CFE) supports the farming community in delivering wildlife and wider environmental benefits out-with the funded agri-environmental schemes/options. CFE achievements include significant areas of land being managed sympathetically for the wildlife and/or the environment as part of voluntary measures.
CFE actively promotes key environmental objectives, and has increased its work on insect pollinators in line with recommendations made in the National Pollinator Strategy. CFE has a significant role to play in the development of the B-Lines network, by actively targeting training and other demonstration events within the B-Lines, and by continuing to promote key land management options within the B-Lines network.

As in other parts of the country B-Lines will aim to work with CFE to provide guidance and other information to circulate around its 'client base'.

6.7 Delivery linked to wider Land Use and Plans

i. The new coastal access path being taken forward by Natural England (the England Coast Path) may provide opportunities to promote the mapped coastal B-Line in Northumberland. In addition the development of the new coastal path, and the communications work around this with farmers and landowners, may provide opportunities to carry out habitat restoration, habitat creation through arable reversion or the creation of a wide range of other habitat features.

ii. A wide range of potential opportunities to create habitat within the B-Lines both through mitigation, compensation or wider planning gain linked to development has been highlighted, particularly relating to development around Newcastle and South East Northumberland. In addition large-scale work has been undertaken or is planned related to the restoration of quarries, mines or other post-industrial sites, significant proportions of which could make a contribution to increasing good quality permanent habitat features within the B-Lines.

7 Next steps

7.1 Refinement of the B-Lines mapping

The B-Lines are mapped is at a scale which ensures that individual farmers/landowners are not identified directly at this stage in the process (i.e. prior to further consultation with the land managing community) and allows a range of 'on the ground' options to be assessed. The next phase of work with partners is to interrogate the data in more detail, allowing key habitat restoration/creation sites to be identified (and delivery projects to be developed). This will increase local and shared ownership of the B-Lines approach, and will also allow opportunities and smaller-scale features to be identified. Some of this work is already underway through partnership projects, such as Kielder Verge Project and Nectarworks. B-Lines will aim to assist with these on-going programmes to ensure efficiency of effort and integration of mapped outputs. It will also look to carry out similar exercises in the B-Lines outwith these project areas.

7.2 Promotion of the B-Lines and developing support

A stakeholder engagement programme will be carried out across Northumberland. The current B-Lines mapping work will be been promoted through the Northumberland Lowlands and Coast Local Nature Partnership (LNP), and the Northern Upland Chain LNP. B-Lines will continue to work through these LNPs to promote the B-Lines mapping and develop delivery programmes within the priority networks. A stakeholder contact list will be developed and used to promote the B-Lines work more widely. In particular we will promote the B-Lines network to landowners, farmers and Natural England advisors, to encourage take up of key options within the B-Lines network. In addition we will promote the B-Lines network to local authorities, identifying these as core networks for both protection and biodiversity enhancements. An email out of the maps and identified B-Lines will be carried out in spring 2015, to ensure the results of this mapping project are disseminated appropriately.

7.3 Securing support for the B-Lines

The effectiveness of B-Lines is dependent on maintaining the integrity of its vision across a large geographic area and many individual delivery partnerships. The B-Lines Guiding Principles (see Annex 1) have therefore been produced to help partners deliver B-Lines in a reasonably consistent manner. Used in conjunction with other guidance/information provided at www.buglife.org.uk they are designed to help the B-Lines concept and vision to be delivered by communities, local partnerships, farmers and wildlife organisations. It is hoped using these principles will ensure the creation of a comprehensive and coherent B-Lines network, while allowing full expression of distinctiveness, landscape character and approach.

As one of the key next steps we will be asking key stakeholders and partners to more formally support the development of the B-Lines, using the Guiding Principles to apply the B-Lines vision in their on-going work and/or project areas. In time a more user-friendly version of these will be developed to enable others to sign-up to the B-Lines programme, including local communities, schools, businesses and individuals.

7.4 Maintaining the B-Lines Partnership

The B-Line mapping project was very well supported by conservation partners across Northumberland, both through provision of data and other information, attendance at the workshop and wider input. There was general enthusiasm for the B-Lines concept and the plan to expand this into the North East of England, and also commitment to looking for opportunities for both promotion and delivery of the network. We will endeavour to develop a more formal B-Lines partnership for Northumberland in order to ensure the outputs of this mapping project are utilised to the full and that we start to work towards developing this part of the B-Lines network.

7.5 Monitoring development of the B-Lines

A web-based mapping facility is available - see B-Lines map - which will be used as a tool for tracking delivery across the B-Lines network. We will promote this to a range of users, including individual landowners, local communities and wildlife organisations, and encourage these to identify where habitats have been restored or created within the B-Lines network. Organisations and individuals will be encourages to use the map to identify where habitats have been restored or created within the B-Lines network. Summaries of data inputted onto this website will be made available to wider partnerships.

7.6 Embedding B-Lines mapping and principles into wider projects and business planning.

We will continue to raise awareness of the B-Line, and provide advice and guidance to partners as to how B-Lines can be embedded into existing and planned and landscape-scale work. We will also encourage partners to ensure B-Lines Guiding Principles are integrated with, and run through all aspects of work.

7.7 Key Actions for B-Lines

To maintain the momentum of the B-Lines, and establish the programme in Northumberland, we will take forward, and/or seek resources to take forward the following actions.

Activity	Timescale	Action	Partners
Refine Mapping	April – June 2015	Further consultation on maps. Local refinement	Workshop attendees and wider local authority staff
Stakeholder engagement and support	April – Sept 2015	Promotion of maps and key messages.	LNPs, wider conservation partners, farming and landowning community, Northumberland National Park Authority (NNPA), North Pennines AONB, Northumberland Coast AONB
B-Lines launch	July 2015?	Consider a launch of the Northumberland B-Lines in conjunction with the LNP and other partners	LNP, other conservation partners, local authorities
Working with partnership/projects	On-going	Liaison and engagement with existing project or developing project leads.	LNPs, project partnerships, NWT, NNPA, AONBs
Sign up to B-Lines	April – Sept 2015	Formal approaches to partners. Wider promotion across the area	LNPs, local authorities, NNPA, AONBs, biodiversity partners
Recognition of B-Lines in core documents and plans	On-going	Influencing and inputting into key plans/programmes	LNPs, Local Authorities, NNPA, AONBs
Increase Delivery	On-going	Ideas development. Project development for key locations. Work with wider partnerships	LNPs, Living Landscapes, local authorities, National Trust, NNPA, NWT, AONBs etc.
Influence agri-environment targeting and delivery	On-going	Working with and providing support, guidance to NE Wider promotion of B-Lines across the area	Natural England, Farm advisors, National Park and AONB advisors

8 Recommendations for partners

The successful delivery of B-Lines is dependent on a wide range of partners working in partnership with the mapped B-Lines network. This may not involve new work, as much can be achieved through existing projects and other work; and the mapped B-Lines do overlap and help define connections between many existing partnership programmes. However to ensure we develop the B-Lines effectively there is a need for conservation and wider partners to buy-in to the B-Lines Vision and look to see how they can integrate this into their work areas.

Recommendation	Who
To recognise the B-Lines network in key plans and policies	Local Nature Partnerships Northumberland National Park Authority (NPA), Northumberland County Council, Newcastle City Council, North Tyneside Council, North Pennines AONB, Northumberland Coast AONB
To 'Sign up' to the B-Lines approach and Vision	All Conservation Partners
To assist with monitoring of progress with B-Lines creation through use of the online mapping facility	All Conservation Partners
To use the B-Lines network to help local delivery and targeting/prioritisation of Countryside Stewardship options	Natural England, Campaign for the Farmed Environment, Northumberland NPA, North Pennines AONB, Northumberland Coast AONB
To review agri-environment uptake and options within the B-Lines, helping to identify gaps in delivery	Natural England, Northumberland NPA, AONBs
To actively engage with the farming and landowning communities within the B-Lines, promoting the value of pollinator services, and identifying opportunities for habitat restoration and creation through agri-environment	Natural England, CFE, NPA, AONBs.
To review management of existing land holdings within the B-Lines and identify/take forward key habitat restoration and creation programmes	Local authorities, land owning organisations
To promote B-Lines, and key messages around pollinators to the farming and other communities	All Conservation Partners
To engage wider communities, business and the general public in pollinator conservation	All Conservation Partners
To integrate the B-Lines work, and key messages within organisational work plans	All Conservation Partners
To work with Buglife to develop and/or integrate delivery programmes within the B-Lines	All Conservation Partners

Annex 1:

B-Lines Mapping – underlying 'Guiding Principles'

The effectiveness of B-Lines is 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.

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.*

Annex 2: Stakeholder Consultees

Natural England
Environment Agency
Northumberland Wildlife Trust
Northumberland National Park Authority
Forestry Commission
North Pennines AONB
National Trust
Groundwork
Northumberland County Council
Northumberland Coast AONB
Northumbrian Water
Newcastle City Council
Northumbrian Rivers Trust
Natural History Society of Northumbria
Northern Upland Chain Local Nature Partnership
Northumberland Lowlands and Coast Local Nature Partnership
Environmental Records Information Centre (North East)

Annex 3:

Northumberland B-Lines: Mapping methodology

Stage 1: Data Collation

Stage 1 involved the collation of habitats data from a wide range of sources (see Annex 4 for examples). The collated data was designed to fulfil the B-Lines criteria by including:

- Wildflower-rich grassland habitats
- Other wildflower-rich habitat types which reflected local landscape character and wildlife interests (e.g. lowland heathland/grassland mosaics, lowland fen, raised bog, wood pasture and parkland).

Non-statutory designated areas such as County Wildlife Sites and Roadside Verges were also included where these supported relevant habitats.

Stage 2: Identification of Potential B-Lines Core Habitat Areas

The aim of this phase of work identified and mapped the B-Lines core habitat areas which provided the working foundations for the B-Lines Network. The ArcGIS building model technique 'Model Builder' was used in analysing, editing and mapping the collated habitat data. **A detailed step by step methodology for using this ArcGIS model is available.** The developed model is a vector data model[1] based on the following B-Lines Guiding Principles:

- *Classifying habitats into key and beneficial habitats*
  The collated habitat data sets are classified into 'key' and 'beneficial' habitats (the classification developed by the mapping Steering Group). Key habitats included those likely to be the most wildflower-rich, and therefore those which should be a priority to include in the B-Lines. A suite of other habitats were defined as beneficial, i.e. habitats which would help support and provide the framework of the network.

- *Producing the B-Lines core habitat areas*
  The designation of Sites of Special Scientific Interest (SSSIs), i.e. the country's very best wildlife areas, was used as a proxy for habitat quality. The intersected areas of the SSSIs and the B-Lines Habitat GIS layers were used to map the core areas for the B-Lines (i.e. recognised as the highest priority to include in the network).

- *Buffering the core habitat areas*

  The B-Lines Core Areas were 'buffered' to reflect the quality of the wildflower-rich areas, and their importance within any network (including their potential level of influence and current potential dispersal of species):

  - Key habitats of SSSI quality were buffered by 500m.
  - Key habitats of non SSSI quality were buffered by 250m.
  - Beneficial habitats of SSSI quality were buffered by 250m.
  - Beneficial habitats of non SSSI quality were not buffered.

  All the created buffers were merged together to create one map of the B-Lines Core Habitat Areas.

Stage3: Producing the B-Lines Network

In line with the B-Lines Guiding Principles, the B-Lines were mapped so as to link together existing important wildflower-rich areas. As an aid to build up the B-Lines network 'Linkage Mapper' was used to help identify wildlife habitat connectivity. It is an open source tool consists of several Python scripts, packaged as an ArcGIS toolbox and developed for the Washington Wildlife Habitat Connectivity Working Group's (WHCWG). **Further details on how to utilise 'Linkage Mapper' in the B-Lines work is available.**

The Linkage Mapper required a 'resistance surface map' to be created for the project area. Key data sources for producing the resistance map include the Land Cover Map 2007 and the B-Lines Beneficial Habitats (that are not buffered). These were then used to provide the cost-weighted criteria for producing the resistance raster map. A high score indicates high resistance (i.e. areas where it will be more difficult both for insect pollinators to disperse and were pollinator-friendly habitats could be provided). The given scores were agreed by the mapping Steering Group.

The Linkage Mapper used the GIS maps of the B-Lines Core Habitat Areas and the resistance surface raster to allocate the least-cost linear pathways between the B-Lines Core Habitat Areas. All the potential routes were then buffered with 3km wide pathways and a set of maps produced highlighting potential B-Lines across the project areas.

Annex 4:
Northumberland B-Lines: Key data sets

Habitat Data Set	Source
Berwick Moor & Beanley Moor NVC Priority Habitats	Natural England
Blyth and Lyne Rivers Phase 1 Surveys	Northumberland Wildlife Trust
Brenkley Meadows NVC Habitats	Natural England
Heather Survey 2009	Northumberland National Park
Natural England Fen Survey NVC - Cheviot Fringe	Natural England
Natural England Fen Survey NVC - Roman Wall Mires	Natural England
North East & Yorks Sites Grassland shapefile	National Trust
North East & Yorks Sites Woodland shapefile	National Trust
North East Sites Phase 1 habitat maps	National Trust
Northumberland BAP Habitats	Northumberland BAP Coordinator
Phase 1 - university grounds	Newcastle University
Phase 1 Survey 2009	Northumberland National Park
Priority Habitats Inventory North East	Natural England
Open Habitat Mosaics (OHM) Habitat Inventory	Natural England
Tree Cover Mapping Project	Northumberland National Park Authority

Tynedale Roadside Verges 1996	Northumberland County Council
Local Sites Phase 1 habitat data	Northumberland Wildlife Trust
Cambois Phase 1	Northumberland Wildlife Trust
Newcastle LWS	Newcastle City Council
North Tyneside LWS	Northumberland Wildlife Trust
Northumberland LWS	Northumberland Wildlife Trust
SSSI	Natural England
Treecover Project	Kielder Roadside Verge Survey 2014
Nectarworks	North Pennines AONB
Kielder Roadside Verge Survey 2014	Kielder Roadside Verge Survey 2014
Druridge Bay Phase 1 2011	Northumberland Wildlife Trust
NBAP Calaminarian Grassland	Northumberland Biodiversity Partnership
NBAP Whin Grassland	Northumberland Biodiversity Partnership
NBAP Maritime Cliff & Slope	Northumberland Biodiversity Partnership
NBAP Sand Dunes	Northumberland Biodiversity Partnership
NBAP Saltmarsh	Northumberland Biodiversity Partnership
NBAP Blanket Bog	Northumberland Biodiversity Partnership
Otterburn Phase 1	Northumberland National Park Authority
Waxcap sites	Northumberland National Park Authority
Hay Meadows	Northumberland National Park Authority
Hay meadows stepping stones	Northumberland National Park Authority
Woodland BEETLE analysis	Northumberland National Park Authority
Kielderhead habitats	Northumberland National Park Authority

Annex 5

Northumberland B-Lines: Habitat Classification

Key Habitats	Beneficial
Upland Hay Meadows	Lowland Dry Acid Grassland
Lowland Meadows	
Upland Calcareous Grassland	Coastal & Floodplain Grazing Marsh
Lowland Calcareous Grassland	Lowland Raised Bog
Maritime Cliff & Slope	Traditional Orchards
Sand Dune	Saltmarsh
Lowland Heathland	Wood pasture
Lowland Fens	
Purple moorgrass and rush pastures	
OHM	
Whin grasslands	

Annex 6

Selected information from Northumberland's NCA relating to pollinator services/status and wider objectives for creating ecological networks

Statement of Environmental Opportunity	State of assets contributing towards pollination service	Analysis/Issues	Opportunities relating to B-Lines
Mid Northumberland (12) **SEO 1:** Work at river catchment scale to protect and enhance the farmed landscape, restoring semi-natural habitats into effective ecological networks…… increasing resilience of native flora and fauna to environmental change.	**Food provision**: Mid Northumberland supports a mixed farming system, predominantly of livestock and cereal production, alongside cash roots and stock feed, making an important contribution to the rural economy. The intensively farmed agricultural landscape of this NCA has relatively little high quality habitat to support pollinating insects and other invertebrates.	There is an opportunity to increase food security by increasing the areas and connectivity of suitable habitat for pollinators, including hedgerows. . The habitat corridor along the A1 and verges alongside minor roads could be managed to increase berry, seed and nectar provision and structural diversity for birds and insects.	Seek opportunities within the agricultural landscape, particularly in proximity to oilseed rape, to promote nectar-rich margins and species rich semi-natural habitats, within a coherent network. Manage and restore the network of hedgerows throughout the NCA. Seek opportunities to create linear areas of habitat for birds and invertebrates……
North Northumberland Coastal Plain (01) **SEO 3:** Conserve and enhance semi-natural inland habitats such as Whin grassland, native woodland and wetlands, improving their connectivity and resilience to climate change….	**Food provision**: The high-quality soils, maritime climate and gentle slopes make this area important for food production; much of the area is used for cereal and oilseed rape production with some grazing of beef cattle and sheep. Pollination by insects is critical to yields of certain crops such as oilseeds (7 per cent of land cover in this NCA) as well as many wild plant species and domestically grown fruit. Within this NCA the main habitats for pollinating insects are the small areas of seminatural grasslands and heath along the coastal fringe and on Whin Sill outcrops, but this resource is fragmented and dispersed.	Ensuring the presence of nectar and pollen sources throughout the flying season and the habitat structure required for all stages of their life cycles at a landscape scale, should help to increase pollinators which will benefit crops such as oilseed rape and field beans. Improving the permeability of the landscape by increasing the prevalence and connectivity of suitable habitat and nectar sources, particularly within the arable farmland, and creating links with areas of more extensive semi-natural habitat in adjacent NCAs such as the Northumberland Sandstone Hills, will improve provision of this service.	Encourage the restoration and creation of nectar-rich habitats such as herb-rich grasslands and heathlands. . Seek opportunities to provide a network of nectar-rich habitats in the farmed landscape, with particular emphasis on arable areas, through pollen and nectar mix areas, flower-rich margins and road verges
Cheviot Fringe (03) **SEO 1:** Manage the agricultural landscape to secure viable and sustainable farming, ……and enhancing biodiversity through improved connectivity of semi-natural habitats, creating ecological networks that are resilient to environmental change	Pollination: The existing network of hedgerows, arable margins and semi-natural habitats benefits pollinators which are important for high crop yields of certain crops such as oilseed rape. Improving the extent and quality of these networks will improve the provision of this service. This NCA has relatively little high quality habitat to support pollinating insects; grasslands, arable margins, hedgerows, tree-lined watercourses and areas of flood	The presence of pollinators plays an important role in producing high crop yields; in this NCA this is particularly the case for crops such as oilseed rape. Increasing the area and quality habitat to ensure the presence of nectar and pollen producing flowers in season, including (for bumble bees) perennial species, suitable nesting habitat (for wild bees). Adequate connectivity of habitats within the landscape will	Seek opportunities within the agricultural landscape, through agri-environment schemes and other initiatives, to promote uncultivated and nectar-rich margins, conservation headlands and species rich grasslands. Seek opportunities to enhance the network of semi-natural habitats and the network of hedgerows and margins throughout the

	plain grazing marsh provide a fragmented network of nectar sources and habitats for pollinating insects through the agricultural landscape.	increase food security and contribute to climate adaptation in both food production and biodiversity.	agricultural landscape so they provide habitat for predator species within close proximity to main food production areas.
South East Northumberland Coastal Plain (13) **SEO 1**: Ensure that mining and development sites are managed and restored so as to minimise pollution and disturbance while contributing to flood alleviation, ecological networks, sense of place and recreational opportunities, particularly alongside Druridge Bay and in growth areas around Ashington, Ellington, Blyth and Cramlington. **SEO 3**: Improve the connectivity and resilience of semi-natural inland Habitats……	**Food provision:** This is a mixed farming landscape with arable farming, livestock fattening and dairying. Cereals and oilseed rape are grown within the NCA …. The NCA has low coverage of crops needing insect pollination (1,650 ha of oilseeds). However many wild plants rely on insect pollination, as do many domestically grown fruit and vegetable plants. The small patches of lowland heathland, flower-rich grassland and wetlands provide important nectar sources for pollinating insects, but these are highly fragmented and widely dispersed.	Habitat for pollinators could be improved in this area through more sensitive management of hedges and provision of nectar-rich habitats in intensive arable areas (such as pollen and nectar mix areas and flower-rich grassland through agri-environment schemes). Urban areas within the NCA could also be managed for the benefit of pollinators, by using nectar-rich plant varieties in municipal planting schemes, encouraging home-owners to grow nectar rich plants and encouraging use of nectar-rich plants in planting schemes and green roofs within new developments	Protect and restore hedgerows and encourage less frequent cutting to allow greater flowering. Encourage creation of nectar-rich habitats on farms, particularly in intensive arable areas. Encourage use of nectar-rich plant varieties in municipal planting schemes, private gardens and new development.

Buglife - The Invertebrate Conservation Trust is a company limited by guarantee. Registered in England at Bug House, Ham Lane, Orton Waterville, Peterborough, PE2 5UU. Company no. 4132695, Registered charity no. 1092293, Scottish charity no. SC040004.
www.buglife.org.uk Follow us: @buzz_dont_tweet