‘Making a B-Line for Kent and Sussex’

Mapping B-Lines in Kent and Sussex

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Saving the small things that run the planet

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Report Content

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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 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 and Northumberland. 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 Kent and Sussex B-Lines Mapping Project

In partnership with Natural England, Kent Wildlife Trust, Sussex Wildlife Trust, South Downs National Park Authority, the University of Liverpool, Brighton and Lewes Downs Biosphere, Kent and Medway Biodiversity Records Centre and the Sussex Biodiversity Records Centre, and with support from a number of other partners (see Annex 2), Buglife is now looking to expand the B-Lines network into Kent and Sussex.

This mapping project identifies a network of priority B-Lines; the essential first step in the development of the B-Lines in Kent and Sussex. 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.

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
- Brief review of current delivery and appropriate mechanisms for delivery across the area
- The development of an initial B-Lines partnership for Kent and Sussex with discussions with appropriate partners
- To identify potential opportunities to take forward B-Lines within the Nature Improvement Areas and the Biosphere

2. The B-Lines Mapping Methodology

The Kent and Sussex 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 Kent and Sussex area, using their new *Condatis* 'circuit' model of colonisation routes.

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 Kent and Sussex B-Lines Mapping methodology

2.2.1 Overall aim

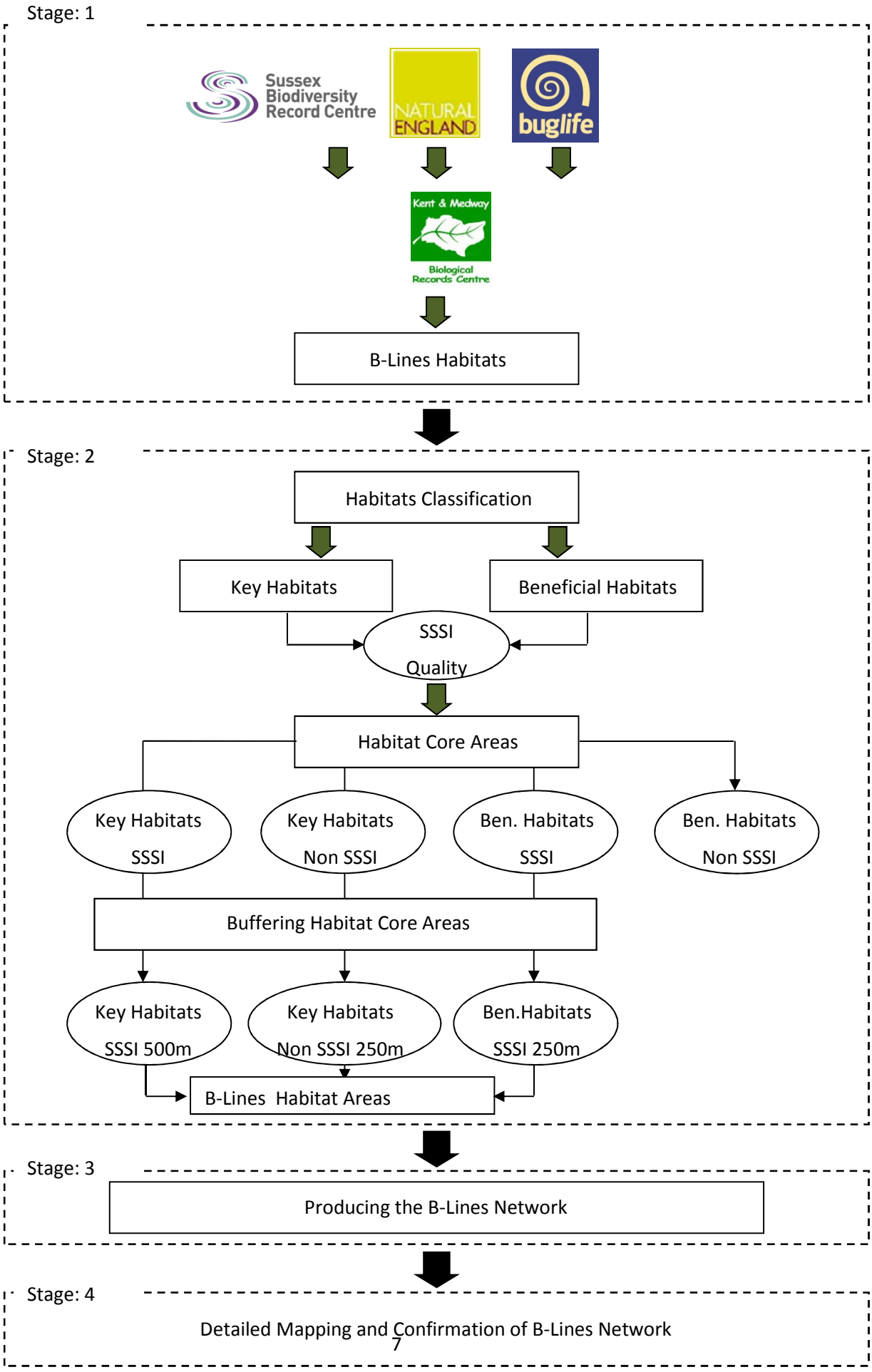
The aim of the Kent and Sussex mapping was to identify and map B-Lines stretching across Kent and Sussex (roughly east-west and north-south connections). In accordance with the B-Lines 'Guiding Principles', the networks were mapped as 3km wide 'lines', encompassing the best and majority of the areas 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 biodiversity opportunity mapping and Living Landscapes.

2.2.2 The Kent and Sussex 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 Kent and Medway Biodiversity Records Centre in conjunction with the Sussex Biodiversity Records Centre and wider conservation partners. 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.
A summary is provided as a flow diagram (see below) and a fuller methodology is provided in Annex 3.


Stage: 1
Sussex Biodiversity Record Centre
NATURAL ENGLAND
buglife
Kent & Medway Biological Records Centre
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 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.

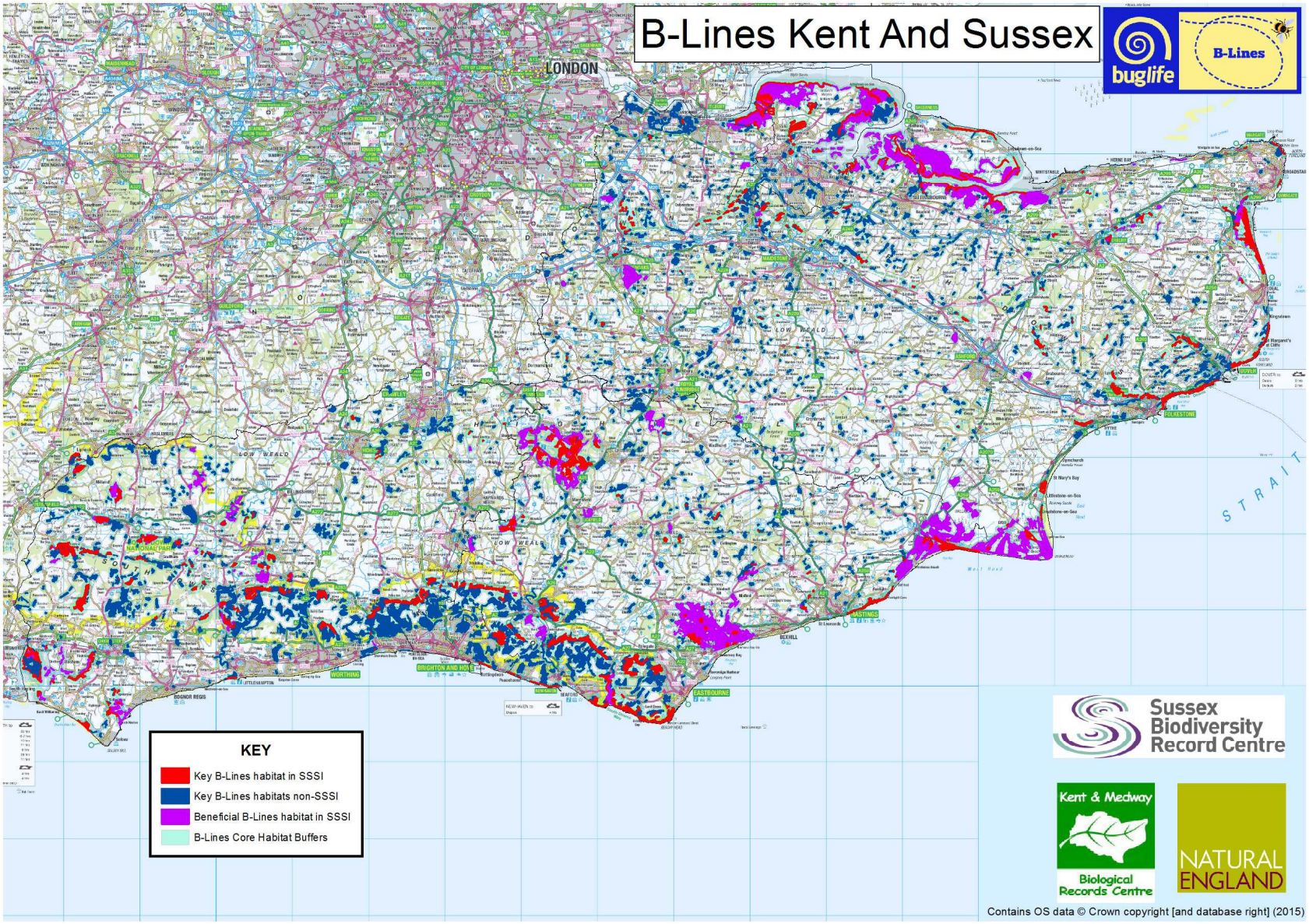
A habitat network was created from the target grassland habitat map, aggregated to 1km squares - each square is defined as a patch (the base habitat accounts for the proportion of habitat in each grid cell). Under the *Condatis* model, a simple, blind colonisation process has been assumed where occupied 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 section 6.1).

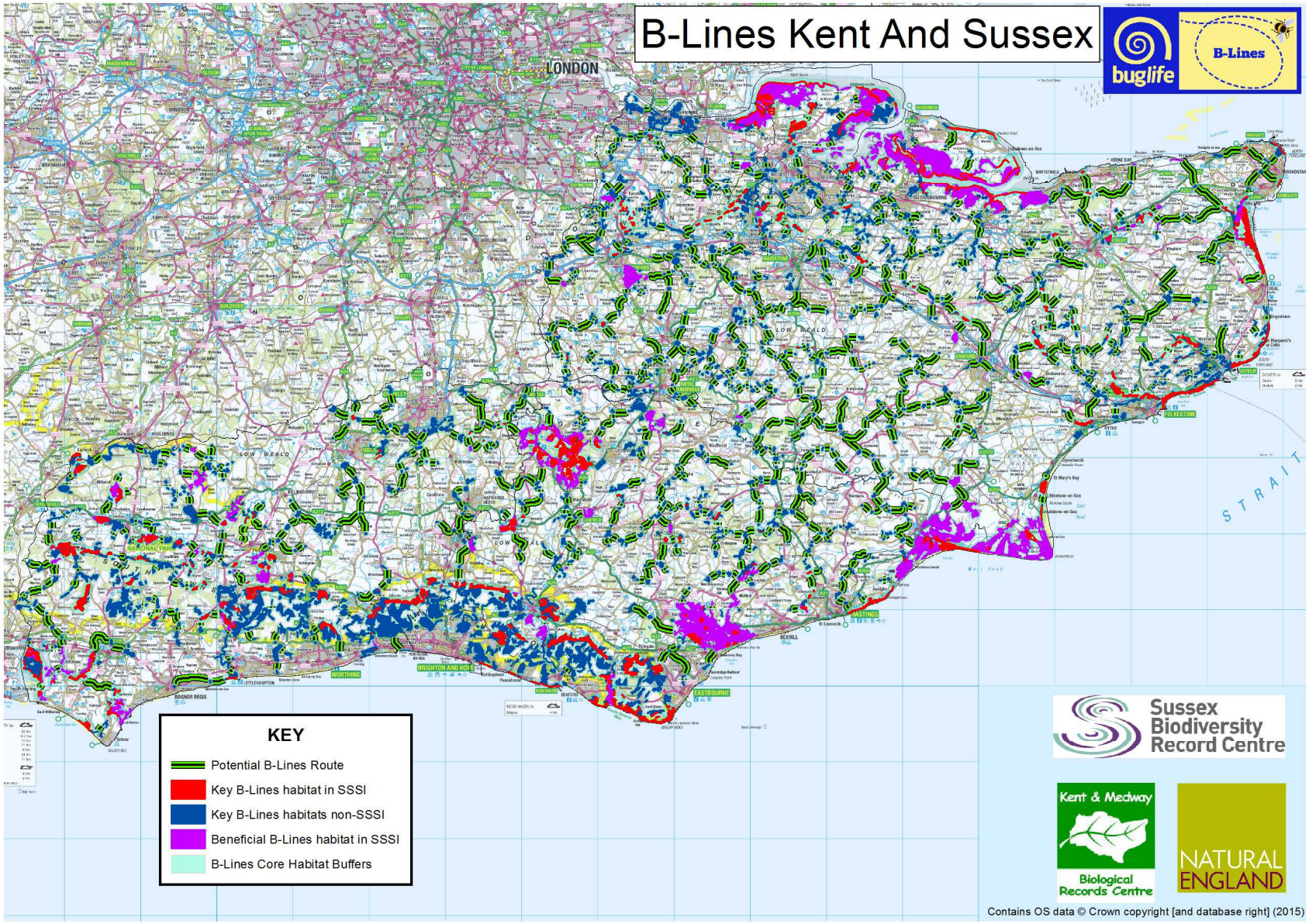
3. Identifying the B-Lines for Kent and Sussex

The mapping outputs of this work include:

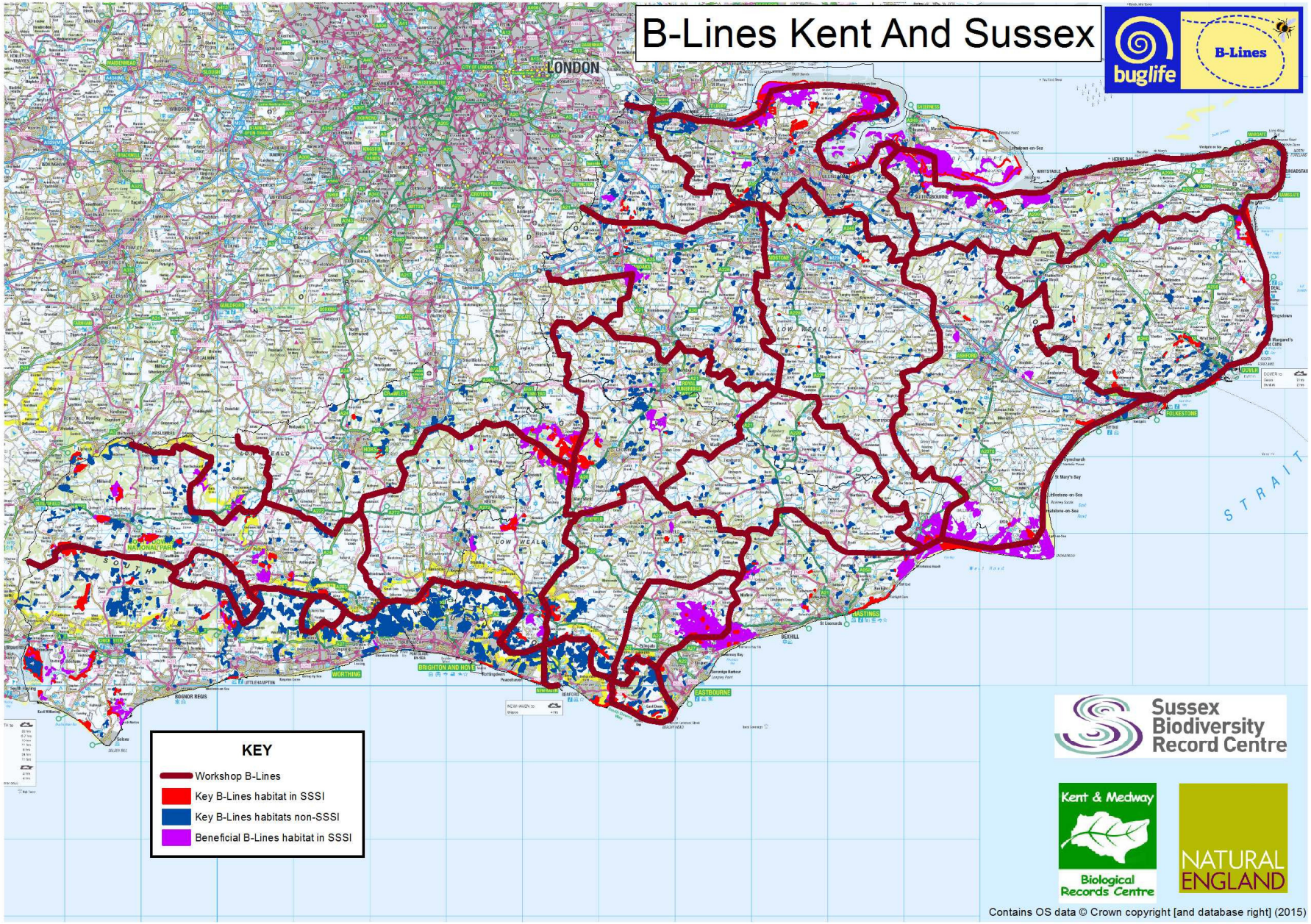
- Spatial identification of key biodiversity assets (collating and combining the most up-to-date habitat survey information)
- Connectivity mapping of wildflower-rich habitat resource
- Identification of priority B-Lines and areas (from above outputs and workshop sessions) which could form a focus for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



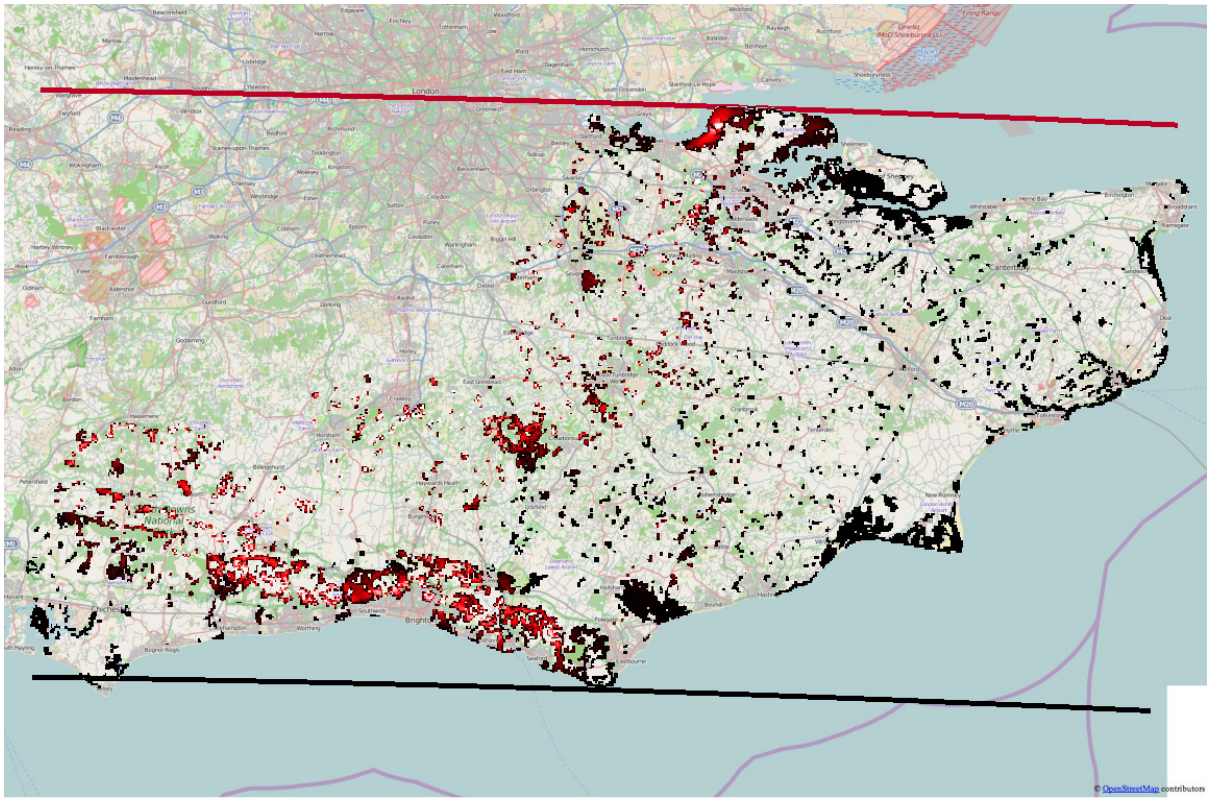
Map 1 – Geographic distribution of wildflower-rich ('lowland') habitats created from data sources gathered from national and local conservation partners (see Annex 4). Note habitat patches of <2ha have been removed from the mapping



Map 2 - Core wildflower-rich habitats and 'buffers' (see methodology) and the strongest connections arising from the connectivity modelling (and as used in the workshop sessions)



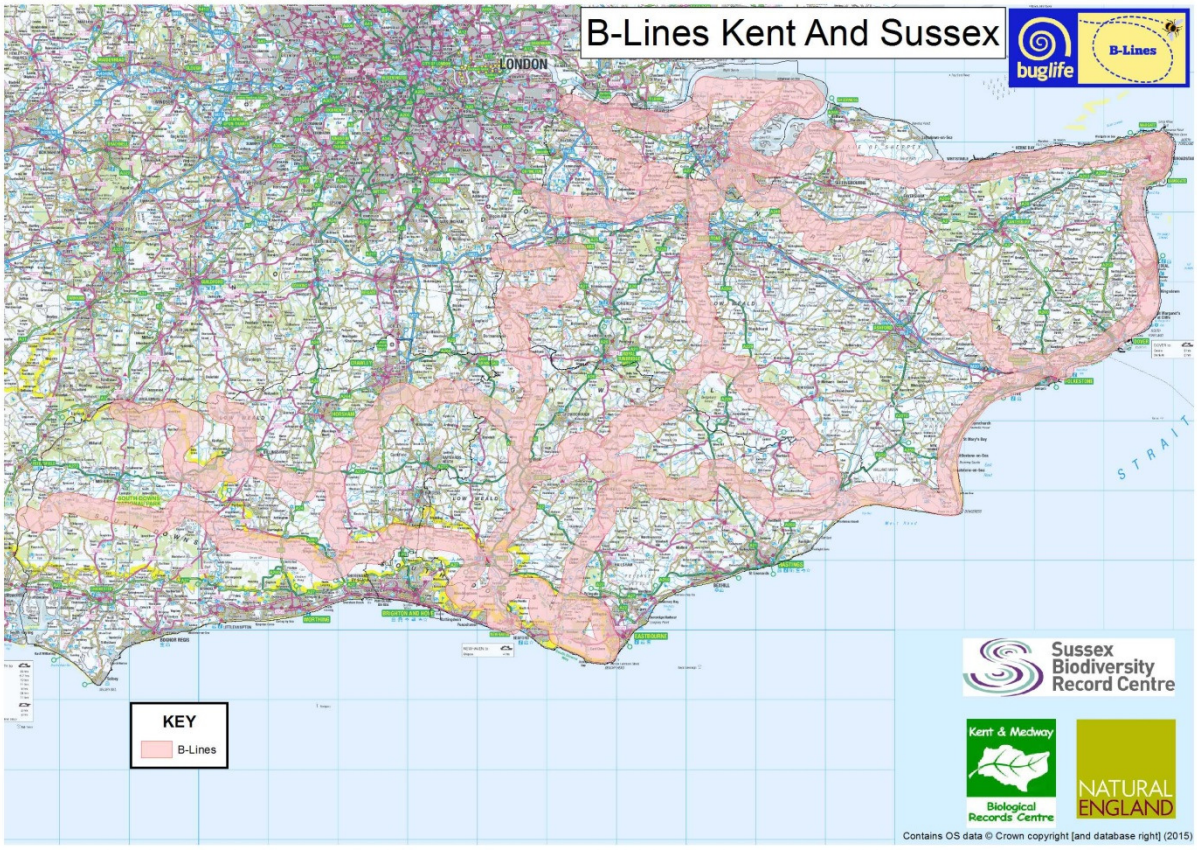
Map 3 - Priority B-Lines as identified in the workshop sessions



Map 4 – ‘Condatis’ model output demonstrating key dispersal routes across the Kent and Sussex wildflower-rich habitat areas (source is south of the geographical area, and target the northern extremity). Red areas show habitat patches through which the greatest ‘flow’ is predicted

4. A B-Lines Network for Kent and Sussex

The priority B-Lines network mapped, and then refined through the workshop is presented in Map 5 (below). This map will be subject to further refinement through a phase of consultation with key partners/ stakeholders before being circulated to a wider audience. 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. Future actions relating to the promotion and use of this map are provided later in this report.



Map 5 – The B-Lines map for Kent and Sussex

5. Current plans and programmes delivering B-Lines in Kent and Sussex

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 help deliver key areas either as part of, or linked to their own biodiversity plans and programmes. B-Lines also aims 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 the South Downs Way Ahead Nature Improvement Area (NIA), the Greater Thames Marshes NIA, the Brighton and Lewes Downs Biosphere and Living Landscapes areas), 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 Kent and Sussex is to identify existing key biodiversity partnerships, programmes and plans, which are, or could in the future 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 Kent and Sussex 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.

5.1 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.

Kent and Sussex has a very diverse landscape, including an extensive coastline, chalk downland to the south and north, large areas of coastal and floodplain marshes, intensively farmed areas, and significant urbanised areas, particularly on the coast. This diversity is reflected by the number of NCAs identified across Kent and Sussex.

A brief review of the NCA profiles highlights some areas with large concentrations of wildflower-rich pollinator habitat, for example on the Downs, the north and eastern coastal strips and Ashdown Forest, while in other parts of Kent and Sussex, wildflower-rich habitats are much more fragmented in nature. The need to improve connectivity of the remaining areas of semi-natural habitat is a common theme within the NCA profiles. The mapped B-Lines network identifies key linkages between many of these important habitat fragments and provides a broad framework in which to focus action to increase landscape-scale connectivity.

In addition several of the NCA profiles, in particular those covering major fruit growing areas of the Low & High Weald and the North Kent Plains, and the intensive arable cropping areas of the Downs, highlight the importance of native insect pollinators to the farming sector and food provision. The overall lack 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 the permeability of the 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 5.

5.2 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 Maps 6. In addition a range of opportunities exist relating to housing, or transport infrastructure development, both approved and in the pipeline.

i. Living Landscapes

The Living Landscapes programme 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 Kent and Sussex Wildlife Trusts have identified a suite of Living Landscapes, many of which link with the Kent and Sussex B-Lines. These are too numerous to give details of here, but key flagship Living Landscapes include;

- Historic Dover Downlands Living Landscape - Aiming to restore and recreate a downland mosaic of species-rich chalk grassland and ancient woodland habitats in the heart of the Dover area

- Romney Marshes Living Landscape - This area offers enormous potential for large-scale enhancement, restoration and re-creation of wetland habitats

- Gatwick Greenspace Living Landscape - The theme of work is Gatwick is 'Linking', i.e. linking patches of fragmented habitat and we link people to their natural environment

- West Weald Living Landscape – This landscape (which extends north of Sussex into Surrey) is a diverse area of 240km^2 that contains internationally important ancient woodlands and populations of many rare species. Sussex Wildlife Trust is working with landowners to encourage uptake of agri-environment schemes that go part way to de-fragmenting the landscape

There is a great opportunity for the Wildlife Trusts to work with Buglife to deliver key sections of the B-Lines network, where practical working to integrate B-Lines and Living Landscapes to deliver landscape-scale benefits for insect pollinators and other wildlife.

ii. South Downs Way Ahead Nature Improvement Areas (NIA)

The NIA covers the key chalk sites of the South Downs National Park and extends into the urban area of Brighton and Hove via its Green Network. The South Downs Way, which traverses the entire length of the chalk scarp and links nineteen chalk grassland Sites of Special Scientific Interest (SSSIs) and numerous locally protected sites, provides the spine of the NIA. Key aims of the NIA include the conserving, enhancing and reconnecting a functioning ecological network which encompasses the flora, fauna, soils, geology and hydrology. The NIA has mapped restoration zones and stepping stones of habitat and successfully restored and created over 1,000 ha of chalk grassland and associated habitats. It has also carried out a significant programme of work to connect the Downs with local urban conurbations, with the 'Towns to Downs' programme having created pollinator friendly habitats right into the heart of local urban centres.

The South Downs Way Ahead NIA has been taking forward a B-Line in all but name over the last 3 years, and with a strong partnership and major funding has already made significant steps in creating a functioning B-Line along the South Downs. It is an imperative that the speed of progress in developing the ecological network is maintained and then work is carried out to enable the benefits of this work to spread out into other parts of the South East.

iii. Greater Thames Marshes NIA

The Greater Thames Marshes NIA is focused on delivering more, bigger, better and connected habitats, and has been particularly focussing on two priority habitat types, notably open mosaic habitat on previously developed land and coastal grazing marsh. As one of its key objectives the NIA aims to deliver a truly coherent landscape-scale ecological network benefiting the 'Thames Terrace Invertebrates' expanding the work of Buglife's 'All of a Buzz in the Thames Gateway' and 'Stepping Stones' Projects. The NIA has focussed on creating and maintaining a mosaic of suitable habitats (i.e. flower-rich grassland, scrub, and bare ground) as a key action to conserve this distinctive suite of invertebrates.

The Greater Thames Marshes NIA is working towards the development of a large-scale ecological network which is already having significant benefits for insect pollinators. It is very important that the NIA continues to develop a network along the north Kent Coast as this is a core area for some insect pollinators, while also providing a key section of a wider Kent coastal network.

iv. Brighton and Lewes Downs Biosphere

The Brighton and Lewes Downs Biosphere established in 2014, has three objectives covering 'nature conservation', 'sustainable socio-economic development' and 'knowledge, learning and awareness'. These objectives include actions to manage and restore key habitats, create ecological networks and engage local people more with their local environment.

The Biosphere provides an important mechanism to re-connect urban populations with the rich natural environment on their doorsteps. It is working through the 'South Downs Way Ahead' Nature Improvement Area project and Brighton & Hove Green Network to boost the ecological connectivity by managing greenspace in a new way to bring the countryside into the heart of our towns. This will help increase local people's understanding of their local ecosystem services, including pollination. In addition the

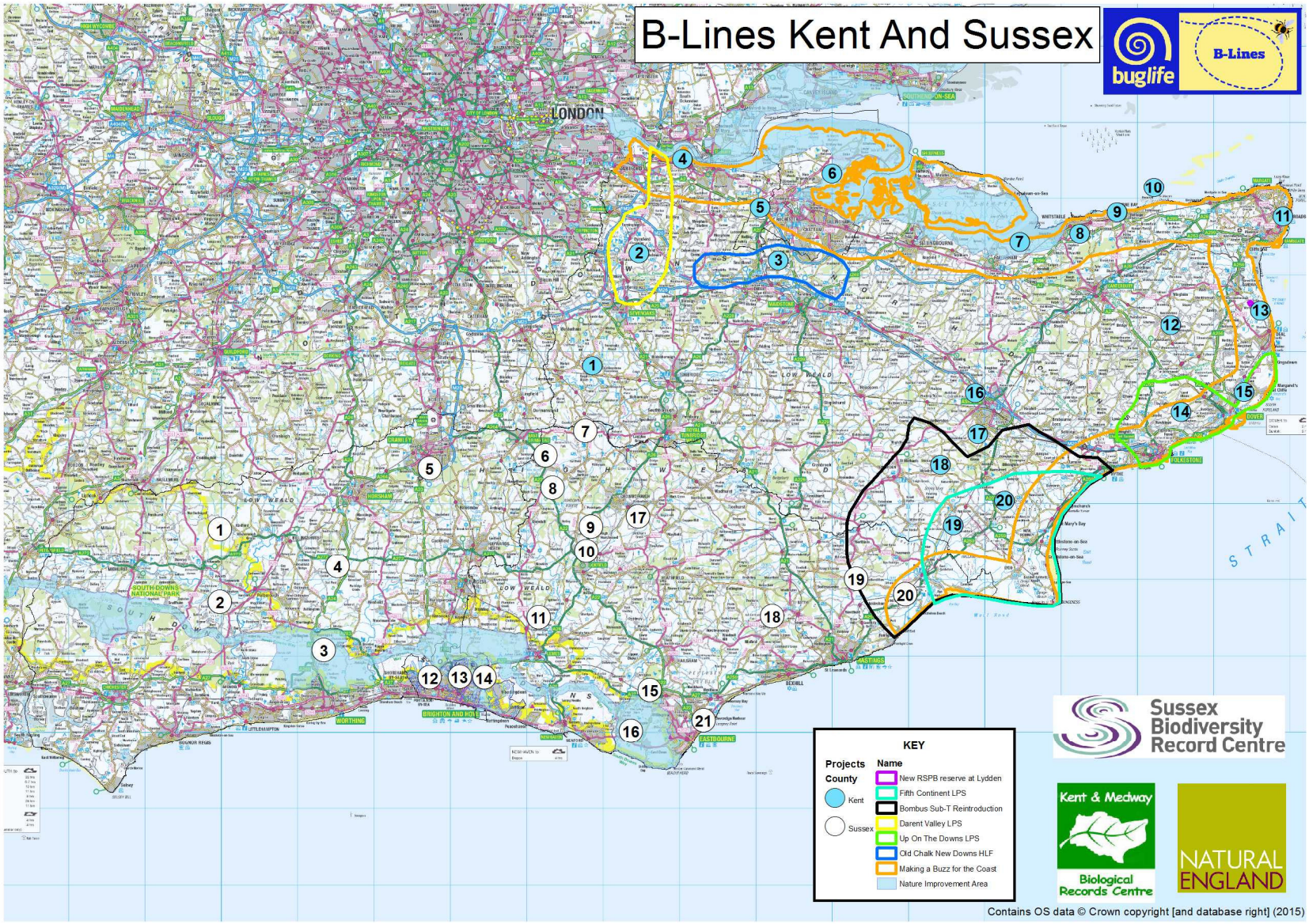
‘Green Network’ seeks to link existing designated wildlife sites and other semi-natural greenspace through a suite of potential core areas, green buffers and connection zones.

The current work being undertaken by the Biosphere project, engaging local communities in wildflower grassland and insect pollinator conservation is key to the success of B-Lines. Finding new funding for programmes to carry on with this public engagement and to extend to other urban conurbations abutting the B-Lines is essential to maintain interest and support for this work.

v. High Weald AONB Partnership Grassland project

This Pilot Project is the High Weald AONB Partnership’s attempt to address this lack of adequate grassland survey data, enabling work to conserve important grasslands to become more effective. The project includes a strong landscape connectivity as it is aiming to identify smaller fragments of valuable grassland habitat, which can act as vital links between known high value grassland areas.

Other on-going project and programmes, alongside other potential opportunities for delivering Kent and Sussex’s B-Lines are shown in Map 6.



Map 6 – Projects, partnerships and opportunities as identified at Kent and Sussex workshops

Kent projects and programmes	
1. River Eden Meadows Restoration (KWT)	11. Thanet GI and Gardening project (KWT)
2. Darent Valley HLF (Kent Downs AONB)	12. East Kent Turtle Dove project
3. Old Chalk New Downs (Kent County Council)	13. New RSPB reserve
4. NIA legacy opportunities	14. Up on the Downs
5. Ranscombe Reserve (Plantlife)	15. Dover District Council Planning Permissions with habitat creation
6. Medway Green Infrastructure and gardening (KWT)	16. Ashford Meadows
7. Buzz for the Coast (Bumblebee Conservation Trust)	17. Concentration of meadow creation/restoration
8. Buzz for the Coast (Bumblebee Conservation Trust)	18. Sissinghurst (National Trust)
9. Crossrail Ltd (Intereg) for Kent Coast	19. Short-haired bumblebee reintroduction
10. East Kent Mapping bumblebee project (KMBDC)	20. Fifth Continent (KWT)

Sussex projects and programmes	
1. West Weald Landscape Partnership (SWT)	12.Brighton and Lewes Downs Biosphere - Intereg partnership on green/blue infrastructure
2. Arun and Rother Connections	13. Green network for City Plan
3. South Downs Way Ahead NIA	14. Brighton and Lewes Downs Biosphere - Town to Downs
4. Knepp Castle Estate	15. Green Infrastructure opportunity mapping
5. Gatwick Greenspaces Initiative (SWT)	16. Cuckmere Estuary
6. Fieldscapes Project (High Weald)	17.High Weald AONB Grazing Feasibility Project
7. East Sussex Wildlife Verges (East Sussex County Council)	18. Pevensey Levels catchment partnership
8. National Grid undergrounding	19. Bexhill to Hastings Link Road
9. High Weald Meadows survey	20.Bede Valley Landowner grant project (High Weald AONB)
10. Sussex Flow Initiative (SWT_	21. Rye Harbour Nature Reserve (SWT)
11. Adur & Ouse Catchment Partnership	

Significant projects, partnerships and opportunities as identified in the workshops (see map 6)

6. Future Development of the B-Lines

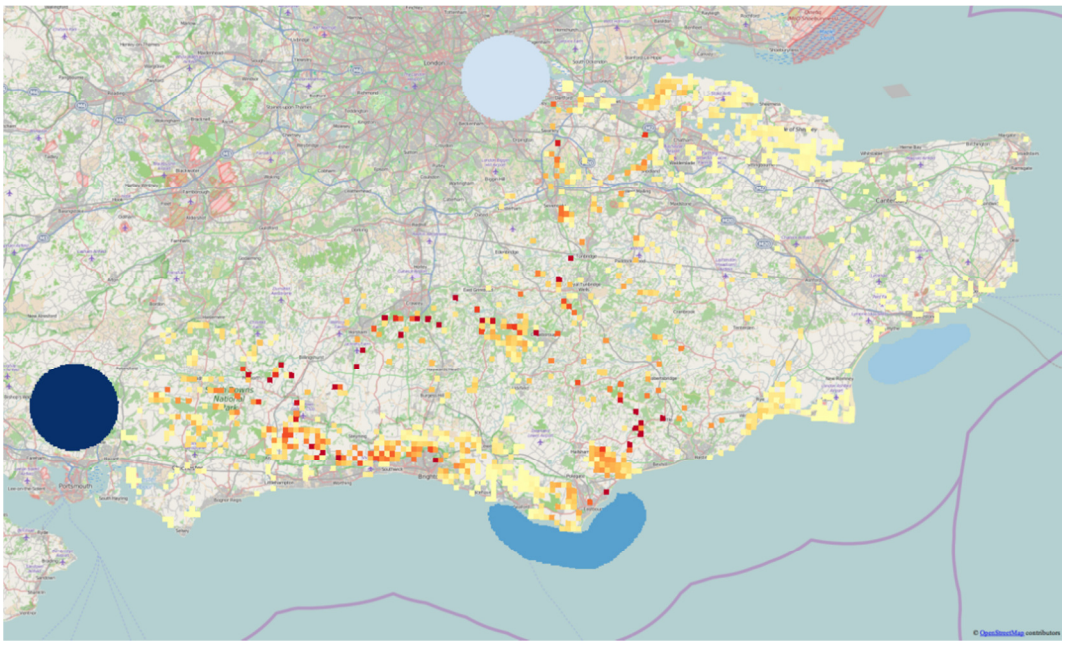
The mapping of B-Lines for Kent and Sussex is an essential step in developing the B-Lines Initiative across the area. The maps provide a framework within which to promote increased, strategically located wildflower-rich habitat restoration/creation alongside other targeted pollinator habitat measures. 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 Kent and Sussex 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 Kent and Sussex's Local Nature Partnerships and by Kent and Sussex County Councils, and other local authorities. In addition we will ensure the B-Lines mapping is 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

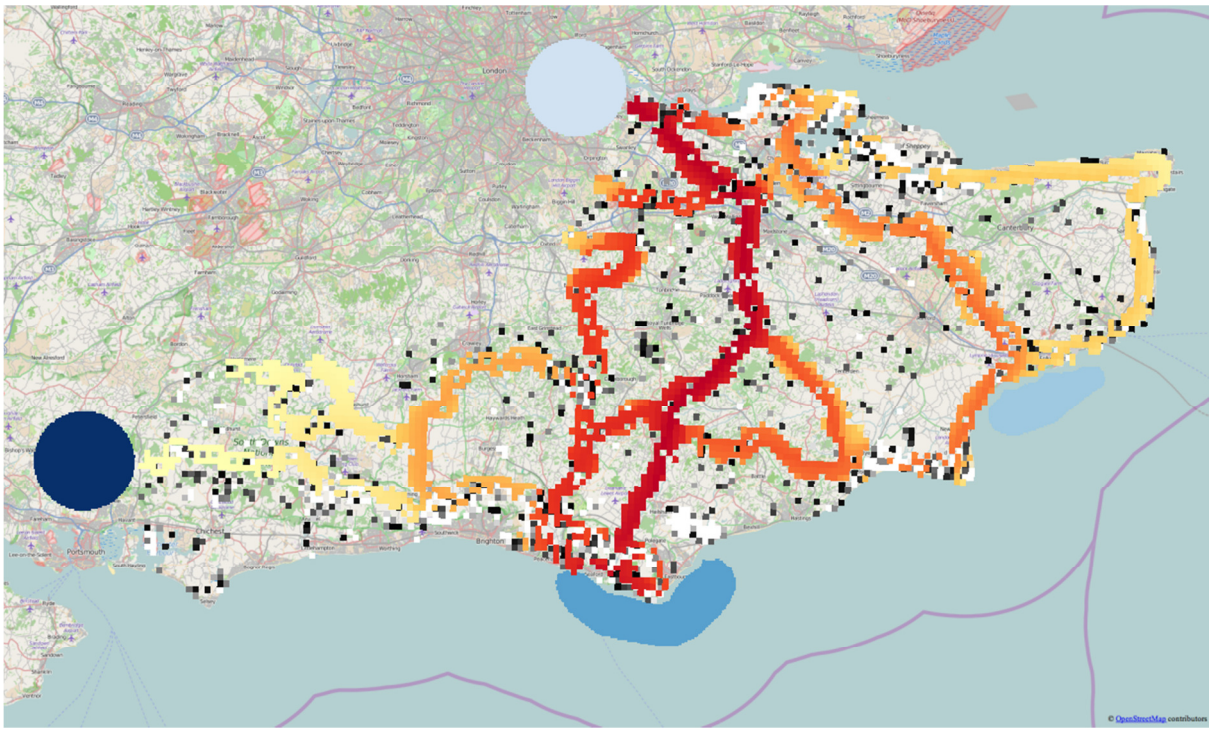
i. Using the '*Condatis*' model to guide priorities for habitat creation

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. We modelled this for several scenarios within the B-Lines network and one example of this is provided in Map 7. Here the source is Beachy Head and the target location is where the B-Lines enter London. The modelling demonstrates that two key routes are currently likely to be contributing most to any flow of species from the mapped 'source' locations to the northerly 'target'.



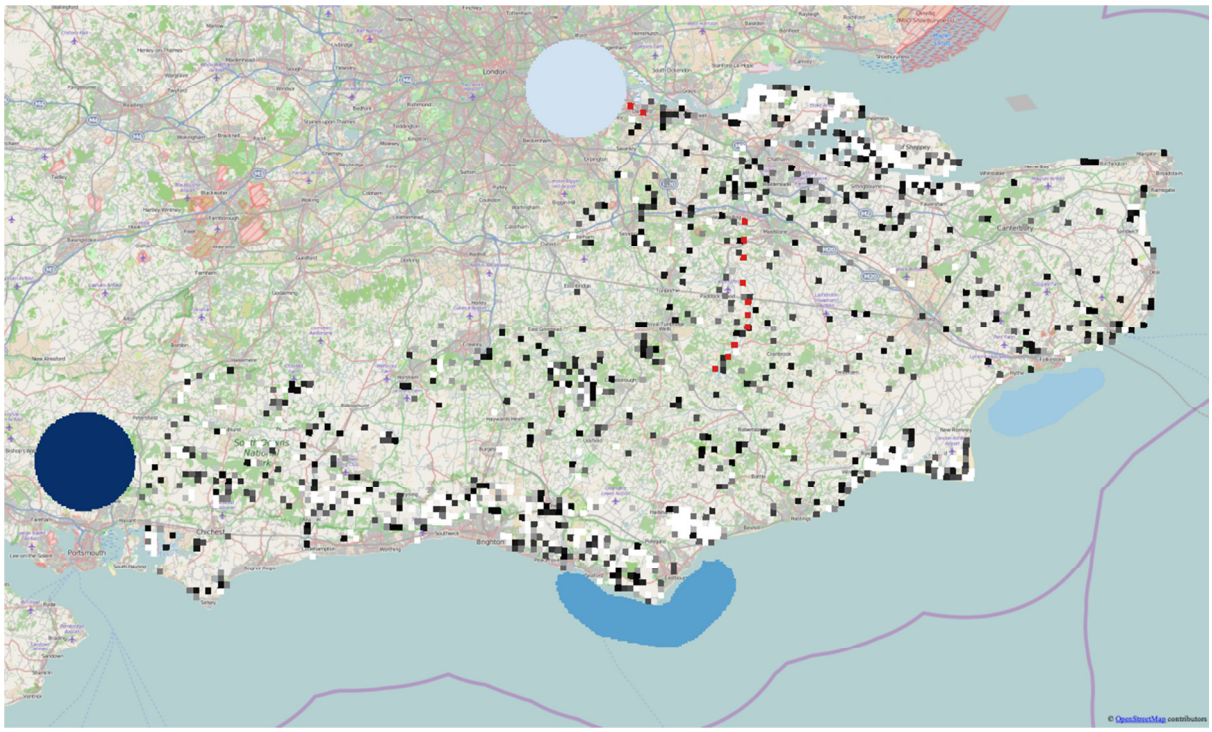
Map 7 – Current flow through existing habitat from source to target locations (darker reds show more significant flow)

Working just 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.

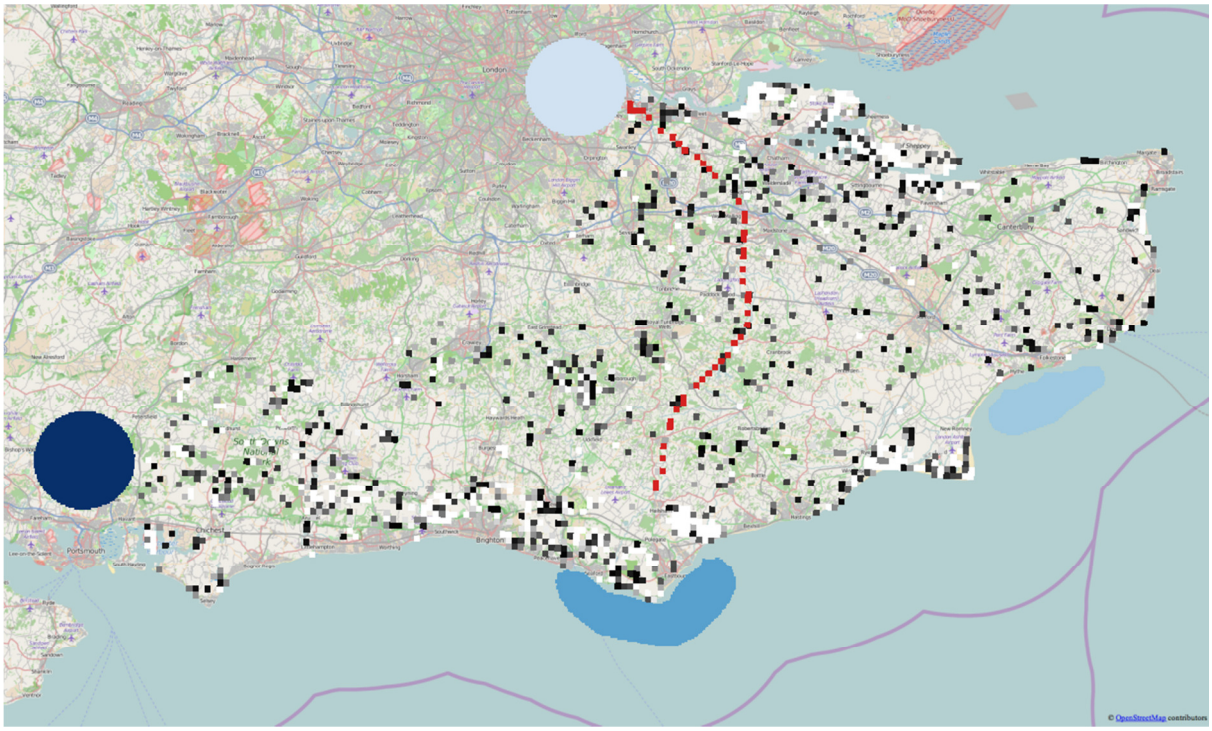


Map 8 – Prioritisation of potential habitat creation within individual 1km squares of the mapped B-Lines network (Grayscale shows existing mapped habitat, and colour scale shows a 'new' habitat layer (see text). Dark red colours on the map highlight areas where adding new habitat would have the greatest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

By removing ('dropping) the lowest ranked 1km squares, *Condatis* was then used to within identify the most useful locations for habitat creation within the B-Lines (i.e. the 1km squares were habitat creation will improve overall flow through the network from source to target locations). Maps 9 & 10 shows existing habitat areas in grayscale and identifies the 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 prioritisation across the network.



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



Map 10– Existing mapped habitat areas in grayscale and the forty highest ranked 1km squares or habitat creation shown in red (see main text). For sources and sinks see main text.

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 are encouraged to use it to focus in more closely on detail.

ii. Review of agri-environment agreement option take up

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* model work to help prioritise future action.

6.2 Delivery through existing initiatives, projects and programmes

A wide range of wildlife delivery is currently underway in Kent and Sussex. 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 (see 6.1), and we will look to further refine the modelling work carried out by the University of Liverpool 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 Kent and Sussex mapping project (see section 5), many of which have 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.

- Making a Buzz for the Coast (Bumblebee Conservation and partners) –

  'Making a Buzz for the Coast' looks to safeguard rare bee populations by creating and restoring habitat in existing population centres and linking isolated populations through the creation of flower-rich 'stepping stones' and habitat corridors along the coast. Its aims in include protecting Kent's wild pollinator populations, with particular focus on bumblebees and solitary bees, to boost pollination services and conserve biodiversity, and safeguarding and strengthening rare bumblebee populations, linking isolated populations'

- Interreg bid (Biosphere)

  A joint bid including areas of Norfolk, Devon and Normandy. Elements of the work will focus on ecosystem services including Green and Blue Infrastructure, with potential to continue and expand previous work on 'Towns to Downs' and other ecological network development.

- Fifth Continent Landscape Partnership Scheme

  The Romney Marsh 'Fifth Continent' project (led By Kent Wildlife Trust) aims to facilitate the restoration and enhancement of the Marsh's built, natural and cultural heritage. Biodiversity work will concentrate on the development and management of 'Blue Lanes of Romney' and 'Green Lanes for Bumblebees', helping to develop a more connected network of habitat, and a more permeable overall landscape for wildlife.

6.4 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.

6.5 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'.

6.6 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 Kent and Sussex. 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 during the workshop, particularly relating to development on the North Kent Coast. The Greater Thames Marshes NIA and Kent County Council are clearly aware of the risks and opportunities afforded by these.

6.7 Potential new landscape-scale projects

As outlined earlier in this report there are a significant number of projects in development across Kent and Sussex with the capacity to integrate with and/or deliver key sections of the B-Lines network, and the priority should be to ensure these individual projects make as significant a contribution as possible. Local knowledge is clearly key to the development of new projects, and in the timescales of the B-Lines mapping project there has not been time to consider these in depth. However some suggestions are put forward for further consideration, particularly in relation to work within the two NIA and Biosphere.

i. South Downs Way Ahead NIA

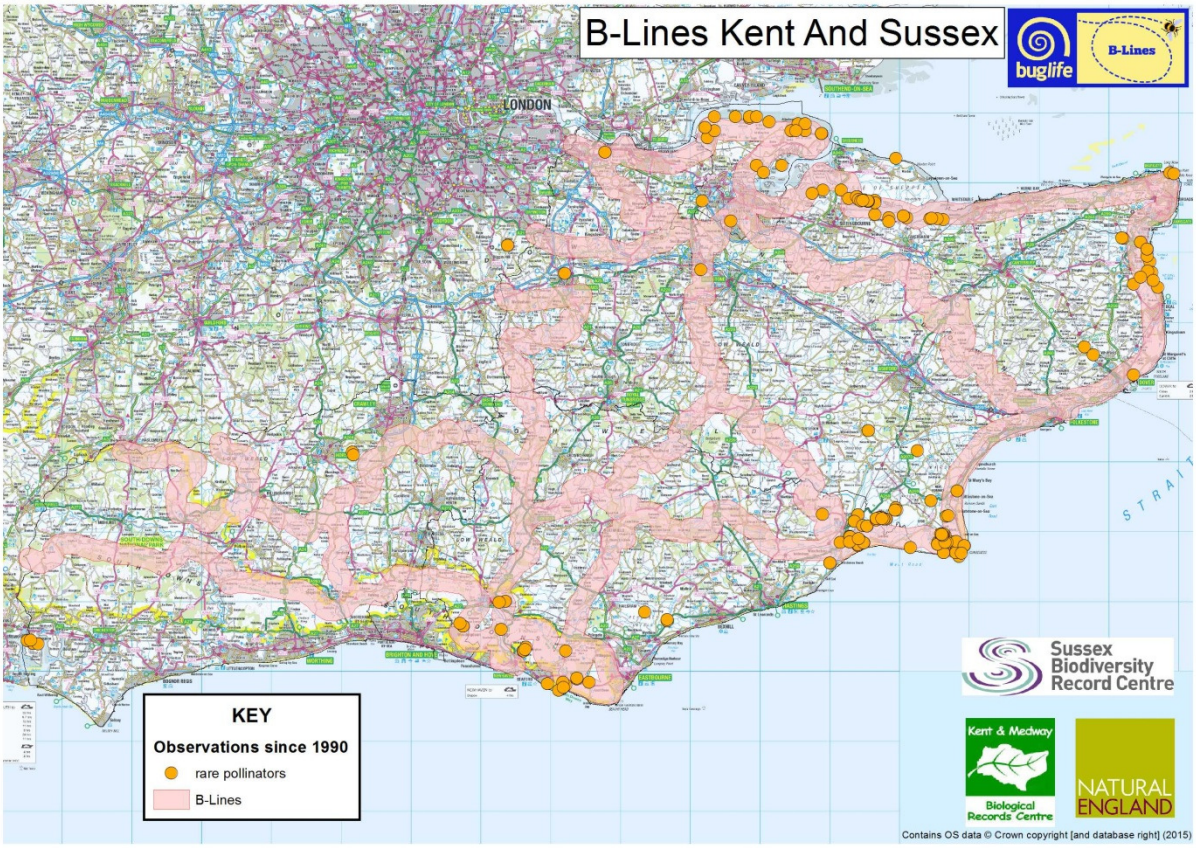
The South Downs Way Ahead NIA has taken forward considerable habitat restoration and creation works over the past few years and has made significant progress in developing a wildflower-rich habitat network across the length of the National Park. Building on this success and utilising the range of skills developed should be one of the priorities for B-Lines in Kent and Sussex, and then the wider B-Lines network. Some suggestions for project development include:

- There is potential for a more explicit focus on insect pollinators, rather than simply on the habitats which support them. This would build on the profile and impetus provided by the recently launched National Pollinator Strategy and the B-Lines themselves, and demonstrate the contribution of the NIA to this work. The priority should remain the restoration and sustainable management of the key habitat resource, but should have increased emphasis on filling in more habitat 'gaps' and/or creating linear linkages within the B-Lines network.

- A key part of the B-Lines approach is to ensure that the B-Lines have the capacity to provide key parts of insect pollinator lifecycle needs. We would recommend a project focussing more on a landscape-scale habitat mosaic approach, demonstrating how B-Lines could be developed to increase populations of insect pollinators, and then using this work to promote/demonstrate the benefits of pollinator (ecosystem) services to the farming community.

- The high profile of the National Park, along with the large urban populations on its doorstep would seem to lend itself to further projects focussing on engaging the public (both local communities and visitors to the National Park) with the issues facing, and the requirements and benefits of insect pollinators. Bringing this together with the linear nature of both the B-Lines and the NIA seems to offer potential to develop a 'Walking the B-Lines' type approach engaging people, communities and schools in searching out new pollinator friendly areas (or opportunities), and simple monitoring of pollinators (Citizen science type work). This could also link well to a revised or extended 'Towns to Down' programme – developing the work further within the Biosphere and looking at engaging with other communities.

- B-Lines is primarily designed to work for more widespread insect pollinators, however the network will include significant areas of habitat supporting rarer species (for example see Map 11). An analysis of species distributions within the B-Lines may identify individual clusters of species, or supporting habitats which could form the basis of a project, both improving habitats and making key linkages between them. This could be done in partnership with other areas of the B-Lines network, starting to link more distant populations together.



Map 11 – Distribution of two rare insect pollinators (*Andrena hattorfiana* and *Bombus muscorum)*

- Opportunities for using Countryside Stewardship Facilitation Funding should be considered as a very useful tool for bringing together groups of farmers to deliver increased connectivity and improved habitat mosaics within some sections of the B-Lines.

ii. Greater Thames Marshes NIA

The Greater Thames Marshes NIA is already progressing significant work towards developing a large-scale ecological network which is already having significant benefits for insect pollinators.

- The 'Making a Buzz for the Coast' project (in development) clearly provides the best, and most immediate opportunity to take forward the work of the NIA with regards to insect pollinators. It also has the capacity to promote and deliver a key stretch of the mapped B-Lines within the NIA and as importantly linking with other areas of the

Kent Coast. Once funding has been secured for this programme it would be sensible to review its proposed delivery and see if complementary programmes can help fill significant habitat gaps on the B-Lines, and or help focus effort on other insect pollinator species.

- As recommended under i) above, there would also seem to be significant potential for a community engagement relating to the B-Lines, connecting people as well as pollinators along the B-Lines.

iii. Wider B-Lines Network

- The high profile of the National Pollinator Strategy and B-Lines, along with public and funding bodies support should be capitalised. Developing the B-Lines (alongside wider insect pollinator conservation work) may help refresh and add value to existing conservation priority areas.

- The B-Lines approach lends itself to community engagement projects at a range of scales, whether small rural communities or the larger urban conurbations which the B-Lines often link. Developing small community programmes to help local communities gain interest and 'ownership' of their local stretches of B-Lines and then help in delivering them would be a very valuable approach to getting B-Lines established in Kent and Sussex.

- There seems to be a useful opportunity to increase conservation in some of the more 'neglected' areas of the three counties by looking at developing some of the newly mapped B-Lines connections between the higher priority landscape-scale project areas, for example 'Downs to Downs' or 'Across the Weald'.

- Similarly there is potential for new B-Lines projects/programmes looking at creating linkages, or stepping stones between key biodiversity hotspots or local communities.

- In light of the significant arable and fruit growing sectors within Kent and Sussex it would be useful to promote the B-Lines to key producers along the network and seek support from them for helping to increase the level of natural pollinator services available to them.

- As advocated in the National Pollinator Strategy there is a need for everyone to play their part in improving our environment for insect pollinators. Local authorities and businesses with large landholding, or land management responsibilities should be made aware of the B-Lines and their potential role in helping to create key stepping stones of wildflower-rich habitats by making changes to management of amenity areas and other greenspaces.

7 Next steps for B-Lines in Kent and Sussex

7.1 Refinement of the B-Lines mapping

The B-Lines are mapped 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 in the South Downs Way Ahead NIA, Sussex Wildlife Trust Habitat Potential and also Ecosystem Services work, Kent Biodiversity Opportunity Mapping and work within Dover District Council. B-Lines will aim to assist with these on-going programmes to ensure efficiency of effort and integration of mapped outputs. Subject to resources 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 Kent and Sussex. The current B-Lines mapping work will be promoted through the Kent Nature Partnership (LNP) and the Sussex Local Nature Partnership, and 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, along with some simple guidance and supporting documentation will be carried out in spring 2015.

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 Kent and Sussex, both through provision of data and other information, attendance at the workshop and wider input. There was widespread enthusiasm for the B-Lines concept and the plan to expand this into the South 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 Kent and Sussex 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. The Kent and Sussex B-Lines will be added to this map, and we will then promote this to a range of users, including individual

landowners, local communities and wildlife organisations. 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 Kent and Sussex 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 conservation partners and local authority staff
Stakeholder engagement and support	April – Sept 2015	Promotion of maps and key messages.	Sussex and Kent LNPs, local authorities, conservation partners, farming and landowning community
B-Lines launch	July 2015?	Consider a launch of the Kent and Sussex B-Lines in conjunction with the LNP and other partners	Sussex and Kent LNP, local authorities, other conservation partners
Working with partnership/projects	On-going	Liaison and engagement with existing project or developing project leads.	Sussex and Kent LNPs, project partnerships. Farming and landowning communities
Sign up to B-Lines	April – Sept 2015	Formal approaches to partners. Wider promotion across the area	Sussex and Kent LNPs, local authorities, South Downs National Park Authority, AONB, conservation partners
Recognition of B-Lines in core documents and plans	On-going	Influencing and inputting into key plans/programmes	LNPs, local authorities, South Downs National Park Authority, AONB, Natural England
Increase Delivery	On-going	Ideas development. Project development for key locations. Work with wider partnerships	LNPs, Natural England, Living Landscape, local authorities, National Trust, South Downs National Park Authority, Wildlife Trusts, 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, South Downs National Park Authority and AONB advisors. Farming and landowning communities

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. Much can be achieved through existing projects and other work, as the mapped B-Lines do overlap and help define connections between many existing partnership programmes, however much more habitat restoration and creation will be needed. In addition 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	Kent and Sussex Local Nature Partnerships South Downs National Park Authority (NPA),Kent, West Sussex and East Sussex County Councils, Other local authorities, AONB, Kent Downs AONB, High Weald AONB, Natural England
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 review agri-environment uptake and options within the B-Lines, helping to identify gaps in delivery	Natural England, South Downs Way Ahead NIA/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 use the B-Lines network to help local delivery and targeting/prioritisation of Countryside Stewardship options	Natural England, Campaign for the Farmed Environment (CFE), South Downs Way Ahead NIA, North Pennines AONB, Kent Downs AONB, High Weald AONB
To promote B-Lines, and key messages around pollinators to the farming community	All Conservation Partners
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, South Downs NPA, AONBs.
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 existing and new delivery programmes/projects 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	Kent High Weald Partnership
Environment Agency	Kent Downs AONB
Sussex Wildlife Trust	Kent and Medway Biodiversity Records Centre
Kent Wildlife Trust	Medway Valley Countryside Partnership
Bumblebee Conservation	Sussex Biodiversity Records Centre
Short-haired Bumblebee Project	Butterfly Conservation
RSPB	Hastings Borough Council
The South Downs Way Ahead NIA	Dover District Council
Greater Kent Marshes NIA	High Weald AONB
South Downs National Park Authority	Adur & Worthing Councils
Brighton Biosphere Reserve	East Sussex County Council
Plantlife	West Sussex County Council
Forestry Commission	Kent County Council
National Trust	

Annex 3:

Kent and Sussex 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:
Kent and Sussex B-Lines: Key data sets

Key Habitats	Source Sussex	Comment	Source Kent	Comment
Lowland Meadows	NE PHI Data		Kent Habitat Survey 2012	
Lowland Calcareous Grassland	Sussex BRC Data		Kent Habitat Survey 2012	
Maritime Cliff & Slope	EA Data		Kent Habitat Survey 2012	
Sand Dune	EA Data		Kent Habitat Survey 2012	
Scrub	Some data in EA data set		Kent Habitat Survey 2012	
Lowland Heathland	Sussex BRC Data		Kent Habitat Survey 2012	
Traditional orchards	NE PHI Data		Kent Habitat Survey 2012	
Sea Wall Grasslands	EA Data		Kent Habitat Survey 2012	
Brownfield Grasslands	EA Data	None	Kent Habitat Survey 2012	
Open Mosaic	NE data		NE data	
Marginal and Swamp	EA Data		Kent Habitat	

Vegetation			Survey 2012	
Beneficial	**Source Sussex**	**Comment**	**Source Kent**	**Comment**
Lowland Dry Acid Grassland	Sussex BRC Data		Kent Habitat Survey 2012	
Lowland Fens	Sussex BRC Data		Kent Habitat Survey 2012	
Coastal & Floodplain Grazing Marsh	EA Data	complex of habitats stripped of less useful habitat types	Kent Habitat Survey 2012	complex of habitats stripped of less useful habitat types
Lowland Raised Bog	NE PHI Data	No records	Kent Habitat Survey 2012	No records
Saltmarsh	EA Data		Kent Habitat Survey 2012	
Wood pasture	NE Data		NE Data	
Coastal Vegetated shingle	EA Data		Kent Habitat Survey 2012	
Maritime Grasslands	EA Data	None	Kent Habitat Survey 2012	

Annex 5

Selected information from Kent and Sussex'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
North Downs (119) SEO 3: Manage and enhance the productive mixed farming landscape of the North Downs and the mosaic of semi-natural habitats including the internationally important chalk grassland.	**Food provision:** The NCA is a significant producer of beef, lamb, wheat and oilseed and also retains over 1,000 ha under fruit; the majority of orchard crops are now grown from dwarf varieties rather than traditional standard trees. Existing habitats provide important sources of nectar for pollinating insects within this otherwise intensively farmed landscape	The mixed farming landscape of arable, livestock and horticulture means that pollinating services are important in maintaining future food production and the viability of crops While stewardship schemes have focussed on creating pollinator habitat, these can be fragmented and may not have the connectivity or provide the mosaic of habitats in close proximity to function effectively as pollinator habitat. A landscape-scale approach creating the right pollinator habitat in the right places is needed.	Restoring and strengthening the mosaic of connecting landscape and habitat features including the patchwork of smaller downland banks, hedgerows, unimproved hay meadows, pockets of heath and acid grassland, flower-rich roadside verges and uncultivated field corners, field margins and woodlands Increase pollinator habitat through expansion and linking of semi-natural habitats, seeking to increase the diversity of habitats in close proximity to food crops, in particular looking to create and link calcareous and neutral grasslands, chalk heath, flowering hedgerows and buffer strips Identify opportunities for working across the sectors and with local communities to increase awareness and appreciation of pollinator habitats
South Downs (125) SEO 1: Plan for an expansion of species-rich chalk grassland and other semi-natural habitats, and manage and enhance other existing chalk habitats for wildlife connectivity,	**Food provision**: The area is a major producer of cereals (including wheat and barley) grown on the dip slope, as well as meat (notably, South Downs lamb from the eastern downs) and dairy produce (from the valleys).	A variety of habitats support plants which provide a sound base for pollination Networks of pollinator habitat limit the ability of pollinators to supply this service. Increases in habitat for	Bring areas of semi-natural grassland into suitable grazing management. Explore opportunities for restoration and expansion of chalk grassland on the chalk ridge and of wetland habitats within the valleys.

reinforcement of the distinctive landscape character, and improvement to water resource management.	Oilseed rape is also a significant crop. Existing heathland, meadows and grasslands provide limited nectar sources for pollinating insects Nectar sources will be provided by the gardens of Brighton, and the larger towns such as Worthing, Seaford and Lewes.	pollinators, such as the creation of areas of semi-natural habitat, hedgerow improvement and the creation of field margins will help. These will create important corridors and habitat mosaics for pollinator species, increasing populations of pollinators which will in turn support production of a wider variety of crops.	Work with farmers to increase the floristic content of, and value to invertebrates of the extensive lengths of grass verge along farm tracks and outside the managed field areas.
High Weald (122) SEO 1: Maintain and enhance the existing woodland and pasture components of the landscape, including the historic field pattern bounded by shaws, hedgerows and farm woods, to improve ecological function at a landscape scale for the benefit of biodiversity, soils and water, sense of place and climate regulation…	**Food provision:** This NCA produces some cereals, vegetables, soft fruit, lamb, game and some beef for local consumption. Numbers of livestock continue to decline. With over 3,000 ha of heathland and almost 1,000 ha of grassland, the NCA provides an important source of nectar for pollinating insects.	Further loss of heathlands and lowland meadows will impact on food supplies for pollinating insects.	Increase the areas of semi-natural habitats, with emphasis on extending and connecting heathland an lowland meadows. Work across sectors to create multifunctional greenspaces Increase the area, range and connectivity of habitat mosaics, making connections between existing sites attractive to pollinators
Low Weald (121) SEO 4: Maintain the sustainable but productive pastoral landscape of the Low Weald, while expanding and connecting semi-natural habitats to benefit biodiversity, regulating soil and water quality by promoting good agricultural practice, and maintaining the extent and quality of unimproved permanent grassland and meadows. Restore degraded neutral grasslands to buffer sites and encourage pollinators and predators for pest regulation	**Food provision:** Livestock were traditionally reared on the pasture and continue to be a major land use. Arable and horticultural farming remain important, particularly in the east. Fruit growing is important, particularly in the east of the NCA, and relies heavily on the supply of pollinators. Connectivity of habitats, particularly networks of woodlands, shaws and hedgerows, contribute towards the movement of pollinators	In the productive eastern area, orchards and soft fruit pollinators are critical for the future of insect dependent crops and increases in this service may be required to provide greater options for future cropping. Fragmentation of the landscape could lead to isolation of habitats	There are opportunities to enhance networks and connectivity of suitable habitats in the agricultural landscape – creating a network of habitats and providing foraging, nesting and breeding sites for pollinators. Encourage nectar rich plantings in gardens and public places.

North Kent Plain (113) SEO 1: Maintain the historic character and long tradition of a farmed landscape, creating habitats to establish more resilient and coherent ecological networks within the farmed and peri-urban areas, benefitting biodiversity and geodiversity, and helping to regulate water and soil quality. Protect traditional practices including the longstanding associations of the fruit belt, maintaining a strong sense of place and reinforcing Kent's reputation as the Garden of England.	**Food provision**: The area features a productive agricultural landscape with highly fertile, deep, rich loams, which are easily worked. There is a large proportion of Grade 1 agricultural land, which produces significant amounts of arable crops (mainly cereals, as well as oilseeds and cash roots) and notably fruit and other horticultural crops.. Small areas of lowland heath provide a source of nectar for pollinating insects within the NCA along with areas of un-improved grassland.	In a productive agricultural area including orchards and soft fruit pollinators are critical for the future of insect dependent crops and increases in this service may be required in order to provide greater options for future cropping. This service could be increased by restoration and creation of wetland habitats, conservation headlands and arable field margins. This could have a beneficial impact on biodiversity by linking habitats and creating network of habitats in close proximity.	Opportunities to enhance the agricultural landscape through creation of habitat mosaics where forage and nesting sites are provided for pollinators such as conservation headlands, arable field margins and wildflower mixes. Opportunities for a landscape scale approach which provides the necessary connectivity and extent of habitats to sustain populations of pollinators.
Wealden Greensands (120) SEO 2: Protect, manage and significantly enhance the mosaic and connectivity of semi-natural habitats within the mixed farmed landscape – particularly the internationally important woodland and heathland habitats – for the benefit of biodiversity, pollination, soil and water regulation, landscape character and enhanced adaptation to climate change. SEO 4: : Plan to deliver a network of integrated, well managed green spaces in existing and developing urban areas, providing social, economic and environmental benefits,	**Food provision:** An area of mixed farming that produces significant amounts of cereals and other arable crops. Also livestock, including sheep, pigs and cattle, and notably fruit growing and other horticultural crops – particularly in Kent. Includes some of the most productive agricultural land in Kent, where the ridge is less pronounced and the soils are more fertile. The existing habitats of heathlands, grasslands and woodlands provide important nectar sources and habitats for pollinating insects. Orchard and soft fruit pollinators are important in this NCA given the fruit growing areas.	Pollinators play an important role in food provision and the mixed farming landscape, including arable and fruit, means that pollination services are important in maintaining future food provision and viability of crops within the NCA. A landscape scale approach which creates pollinator habitats in suitable locations throughout the farmed landscape will benefit not only pollinators but will also help to enhance habitat connectivity and biodiversity.	Increase the pollinator habitat through expansion and linking of semi-natural habitats seeking to increase the diversity of habitats in close proximity to food crops requiring pollination. In particular, restoration and expansion of heathland and unimproved grassland habitats plus enhancement of arable areas through creation of conservation headlands, pollen and nectar mixes and arable field margins will help to provide nesting and foraging sites for pollinators.

Romney Marshes (123) SEO 3: Manage and enhance the distinctive agricultural landscape to secure viable and sustainable farming, while protecting heritage assets, managing soils and water resources and supporting the diversity of species that are dependent on this area. Enhance biodiversity through improved connectivity of semi-natural habitats and by creating ecological networks that are resilient to environmental change.	**Food provision**: Of the total area, 74 per cent is under agriculture. The largely arable landscape is characterised by general cropping, producing a significant amount of cereals and other. There is also some permanent grassland producing lamb and limited amounts of beef. There has been a decline in semi-natural habitats and the change in agricultural production systems has reduced the area of nectar sources for pollinating insects, with a significant decline in pollinator numbers over the last 30 years. Remaining areas of semi natural habitats within the NCA are important as nectar sources. The short-haired bumblebee re-introduction to the UK has taken place in Dungeness and Romney Marsh. The creation of flower-rich habitat has been an essential element of the reintroduction.	Pollinator services are important in this NCA given the mixed farmed landscape and production of insect dependent crops. Grazing marsh and other grassland, arable field margins and ditch edges can all provide valuable nectar sources for pollinating insects, especially where increased sward diversity is encouraged. The re-introduction program of the short-haired bumblebee is important for pollination not only within the NCA but across England, as the bumblebees pollinate many important agricultural crops which are critical to sustaining our farming economy in the longer term. The project has encouraged improvements to surrounding farmland including the creation of about 900 ha of nectar- and flower-rich margins to support the bumblebee reintroduction.	Protect, expand and improve the condition of areas of flower-rich habitat in the pastoral and arable landscape, increasing the availability of nectar sources. In particular support ongoing initiatives such as the short-haired bumblebee reintroduction which encourage landowners in creating important corridors and habitat mosaics of flower-rich habitat for pollinator species. Seek opportunities to raise the profile of pollinators through public education and outreach
Greater Thames Estuary (81) SEO 1: Maintain and enhance the expansive, remote coastal landscape – with its drowned estuaries, low islands, mudflats, and broad tracts of tidal salt marsh and reclaimed grazing marsh – maintaining internationally important habitats and their wildlife,… SEO 2: Work with landowners and managers to incorporate measures to improve biodiversity, geodiversity,	Food provision: The NCA contains extensive areas of land (49 per cent per cent) under agricultural management with cultivation of cereal crops dominating extensive areas of ploughed, drained former marshland to produce wheat and barley. Traditional wet pasture is grazed with sheep and cattle and more mixed agriculture occurs on higher ground.	The NCA contains large areas of agricultural land with some food crops which are dependent on insect pollination, and its coastal habitats provide an important refuge for rare pollinator species. The three bumble bee species found on coastal habitat tend to be associated with tall open flower-rich grasslands found on remnant grazing marsh and in	Maintain and enhance the floristic diversity of grazing marsh and other semi-natural habitats to increase the area of habitat suitable for pollinators, and to act as a wildlife corridor between other coastal habitats. Increase the area of, and sustainably manage existing semi-natural habitat, including grazing marsh, to benefit pollinating insects. Work with the farming community to

pollination, water quality, soil quality and climate adaptation and to prevent soil erosion in this important food providing landscape, while maintaining its historic character.	The NCA is important for some of the UK's rarest bumble bees and three priority species are strongly associated with the North Kent and South Essex coastlines: the shrill carder bee, brown-banded carder bee and moss carder bee. Two other UKBAP bumblebee species are also present but have a less strong coastal association: red-shanked carder bee and large garden bumble bee.	particular the sea walls. Flower-rich ex-industrial brownfield sites also provide important habitat for bees. Pollen and nectar margins on arable farms (through agri-environment schemes) can provide important foraging habitat for pollinators. The open mosaic habitat on brownfield sites supports important populations of pollinator species. This is at risk of being lost through development and conversion of sites to more formal greenspace.	encourage sympathetic management for pollinator species and to increase the areas of pollen and nectar margins on arable farms. Protect flower-rich open mosaic habitat on brownfield sites supporting important populations of pollinator species.

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