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DECLARATIONS OF COMPLIANCE

The report which we have prepared and provided is in accordance with the Chartered Institute for Ecology and Environmental Management (CIEEM) Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

This report has been produced in accordance with British Standard 42020:2013 “Biodiversity, Code of practice for planning and development” and the Chartered Institute of Ecology and Environmental Management’s Guidelines for Ecological Report Writing (CIEEM, 2017).

DATA VALIDITY

This study has been based on the best available data following the guidance of the National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2019). As an evidence base it is recommended that the network mapping is refreshed periodically to take account of changes in policy guidance, site designations, habitat mapping, site condition assessments, species records and other relevant biodiversity data not available or incomplete at the time of writing.

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SUMMARY

1. The original wildlife corridors network stems from the Tyne and Wear Nature Conservation Strategy published in 1988 and adopted by the five original Tyne & Wear Boroughs (Gateshead, Newcastle, North Tyneside, South Tyneside and Sunderland) during the 1990s. However, despite recent conservation successes, successive reports show the picture for biodiversity in the UK is one of alarming decline and the evidence is clear that climate change will have the biggest long-term impacts of all.
2. Whilst subject to modifications and updates over successive Local Plan reviews, the adopted wildlife corridors network pre-dates current national policy and in many cases is not based on the best available data. This study updates the mapping of the wildlife corridors networks consistent with national planning policy and the recently published Nature Networks Evidence Handbook (Natural England, 2020). In addition to published guidance, mapping criteria have been informed, developed and refined by a comprehensive review of best practice from other local authority areas elsewhere in the country.
3. Seven case studies of wildlife corridors networks or local ecological networks were short-listed and critically reviewed. Wildlife corridors networks reviewed include Chichester, Newcastle City and North Tyneside and local ecological networks included Dorset, Liverpool City Region, Hampshire, and Shropshire.
4. The networks reviewed are built on the policy requirements of the National Planning Policy Framework (NPPF) relevant to Local Plans and the mapping of wildlife sites and wider ecological networks. Secondly, all the case studies reviewed were built on the guiding principles of Making Space for Nature - a review of England's Wildlife Sites and Ecological Network chaired by ecologist Sir John Lawton ('The Lawton Report'). The Lawton Report makes clear that the traditional approach of focusing conservation efforts individually on protected wildlife sites such as SSSIs and nature reserves cannot work in isolation. To rebuild nature we need 'coherent and resilient ecological networks'. The Lawton Report is summarised by the simple mantra that we need 'More, Bigger, Better, Joined sites'.
5. The updated network is built on the hierarchy of components identified by the Lawton Report ranked according to their biodiversity importance and priority. 'Core sites' are ranked highest (designated sites and priority habitats) followed by 'secondary features' (including semi-natural greenspaces and linear corridors) 'stepping stones' (habitat patches and features that support species movement across the landscape) and finally 'buffers zones'.
6. The updated 'wildlife corridors network' has been mapped using the identified criteria and based on an up-to-date baseline established from the relevant data sets.

7. Finally, the review sets out recommendations for using the revised network as a key tool for decision making, developing a Nature Recovery Network as set out in the Government's 25 Year Environment Plan (2018) and delivering Biodiversity Gain and Local Nature Recovery Strategies included in the 2019-2021 Environment Bill.
8. The mapping output from this review is based on the best available evidence consistent with the 2019 NPPF and published guidance and is considered sound and robust.

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1 INTRODUCTION

Gateshead Council, South Tyneside Council and Sunderland Council in May 2020 jointly commissioned Burton Reid Associates to provide a review of the wildlife corridors network(s) for the three local authority areas with the production of robust criteria and methodology to determine the location and extent of wildlife corridors in their area.

1.1 The Study

The study aims to provide an evidence base to identify and map the wildlife corridors network within local development plans and to inform future work on nature recovery and biodiversity gains.

1.2 Objectives

- (a) To understand the current baseline of biodiversity assets and features within Gateshead, South Tyneside and Sunderland, the study will undertake a review of relevant desk based information and data such as MAGIC, Environmental Records Information Centre North East (ERIC NE) and other sources including previous evidence studies and strategies.
- (b) Before the updated wildlife corridors network is allocated within the local development plan(s) the study will inform the design of robust criteria and methodology to delineate the updated network(s).
- (c) The study will identify areas with similarities to Gateshead, South Tyneside and Sunderland and critically review examples of local authorities with defined criteria-based wildlife corridors networks and how they integrate into national and local policy.
- (d) The study will define a robust set of criteria and a methodology for determining the extent and location of the updated wildlife corridors network based on the results of the research findings.
- (e) The study will then map the updated wildlife corridors network for each of the three local authority areas applying the selected criteria to the relevant datasets for each of the network components identified.
- (f) The study will provide an evidence base and tool to identify and inform opportunities for future nature recovery and biodiversity gain work and the Councils' vision of wider Green Infrastructure to support the wellbeing of wildlife and people.

2 POLICY AND GUIDANCE

2.1 National Planning Policy Framework 2019

The requirement for Local Planning authorities to map and consider ecological networks within their plans, policies and decisions is referenced in various paragraphs of the National Planning Policy Framework (MHCLG 2019).

2.1.1 Paragraph 170 (d)

‘Planning policies and decisions should contribute to and enhance the natural and local environment by:

d) minimising the impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures’

2.1.2 Paragraph 171

‘Plans should: distinguish between the hierarchy of international, national, and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework; take a strategic approach to maintaining and enhancing networks of habitats and green infrastructure; and plan for the enhancement of natural capital at a catchment or landscape scale across local authority boundaries.’

2.1.3 Paragraph 174

‘To protect and enhance biodiversity and geodiversity, plans should:

a) identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and local designated sites of importance for biodiversity; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation;

b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.

2.2 England's 25 Year Environment Plan

In 2018, the Government published its 25 Year Environment Plan – *A Green Future: Our 25 Year Plan to Improve the Environment* (Defra 2018) which sets out a number of actions to improve the environment in the UK within a generation. The overarching ambition of the 25 Year Plan is to *'leave our environment in a better state than we found it and pass on to the next generation a natural environment protected and enhanced in the future'*.

The Plan refers to a new planned approach towards nature recovery and states that: *'Through changes in the way we manage our land, we will develop a Nature Recovery Network providing 500,000 hectares of additional wildlife habitat, more effectively linking existing protected sites and landscapes, as well as urban green and blue infrastructure. Such a network will deliver on the recommendations from Professor John Lawton'* [Section 2.4.1] *'As well as helping wildlife thrive, the Nature Recovery Network could be designed to bring a wide range of additional benefits: greater public enjoyment; pollination; carbon capture; water quality improvements and flood management'*.

The Nature Recovery Network envisaged by the 25 Year Plan will build on the *Making Space for Nature* report (Lawton et al. 2010) which recommended the 'coherent' ecological network in England to help counter habitat loss and fragmentation and declining habitat quality as a result of a range of pressures including land use changes, the intensification of agricultural management, disturbance, pollution, nutrient enrichment and climate change (Defra 2018).

2.3 Environment Bill 2019-2021

The draft Environment Bill sets out the proposed requirement for authorities to prepare and publish *Local Nature Recovery Strategies* (LNRS). As drafted, the area of a local authority other than a County Council must not be split between local nature recovery strategy areas. The Bill provides that a local nature recovery strategy is to include:

- (a) *a statement of biodiversity priorities for the strategy area, and*
- (b) *a local habitat map for the whole strategy area or two or more habitat maps which together cover the whole strategy area.*

The statement of biodiversity priorities is to include:

- (a) *a description of the strategy area and its biodiversity,*
- (b) *a description of the opportunities for recovering or enhancing biodiversity, in terms of habitats and species in the strategy area,*

(c) *the priorities for habitats and species for recovering or enhancing biodiversity (taking into account the contribution that recovering or enhancing biodiversity can make to other environmental benefits), and*

(d) *proposals as to potential measures relating to those priorities.*

A local habitat map is a map identifying:

(a) *national conservation sites in the strategy area,*

(b) *any nature reserves in the strategy area provided under Section 21 of the National Parks and Access to the Countryside Act 1949, and*

(c) *other areas in the strategy area which in the opinion of the responsible authority -*

i) *are, or could become, of particular importance for biodiversity, or*

ii) *are areas where the recovery or enhancement of biodiversity could make a particular contribution to other environmental benefits.*

A responsible authority must have regard to the guidance when preparing a local nature recovery strategy.

The Environment Bill's passage through parliament was delayed at the time of this study with enactment expected in early 2021.

The NPPF (2019) refers to Nature Recovery Networks in footnote 57 [to paragraph 174(a)] "*Where areas that are part of the Nature Recovery Network are identified in plans, it may be appropriate to specify the types of development that may be suitable within them.*"

2.4 Ecological Networks Guidance

2.4.1 Making Space for Nature (Lawton et al. 2010)

There have been substantial losses of habitats in recent decades: semi-natural habitats now being isolated to small fragments particularly in the lowlands, the largest 20th century decline being that of 97% of species-rich grassland habitats in England and Wales. Across species groups there have been significant declines in particular since the Second World War mainly as a result of changes in land use leading to the loss and/or degradation of habitats. In response to these losses, in 2009 the then Environment Secretary commissioned an independent review of England's wildlife sites and the connections between them

chaired by ecologist Sir John Lawton (the ‘Lawton Report’). The review report *Making Space for Nature – A review of England’s Wildlife Sites and Ecological Network* (Lawton et al. 2010) makes it clear that in terms of future challenges the impacts of climate change, particularly in the longer term, may have the biggest impact of all.

To ‘rebuild nature’ the report encourages the development of a ‘coherent and resilient ecological network’ to help counter these pressures and to allow nature to re-establish and flourish. Lawton et al. (2010) defines an ecological network as:

‘a suite of high quality sites which collectively contain the diversity and area of habitat needed to support species and which have ecological connections between them that enable species, or at least their genes, to move between them. It is this network of cores sites, connected by buffer zones, wildlife corridors, and smaller but still wildlife-rich sites that are important in their own right and can also act as ‘stepping stones’ that we call an ‘ecological network’. Wildlife corridors do not have to be continuous, physical connections: a mosaic of mixed land use, for example, may be all that is needed – it is the permeability of the landscape to the species (or their genes) that matters (Hilty et al., 2006)’.

The Lawton Report takes a wide view of what comprises a ‘wildlife site’ and identifies three tiers:

Tier 1 – those sites whose primary purpose is nature conservation and which have a high level of protection (e.g. SSSIs);

Tier 2 – sites designated for their high biodiversity value but do not have full protection (e.g. Local Wildlife Sites);

Tier 3 – landscape designations with wildlife conservation as part of their statutory purpose (National Parks and AONBs).

The Lawton Report makes clear that ‘coherent and resilient ecological networks’ require the pursuit of four general principles. We need more sites, and that these sites should be bigger, better quality and more connected (coherent) and they should be buffered from external pressures (resilient). The report suggests a simple four word mantra: *more, bigger, better and joined*. The concepts of coherence and resilience are summarised in Box 2.1 below.

Box 2.1 Key concepts for a successful network (Lawton et al. 2010)

A **coherent** ecological network is one that has all of the elements necessary to achieve its overall objectives; the components are chosen to be complementary and mutually reinforcing so that the value of the whole network is greater than the sum of its parts.

A **resilient** ecological network is one that is capable of absorbing, resisting and recovering from disturbances and damage caused by natural perturbations and human activities (including climate change) while continuing to meet its overall objectives of supporting biodiversity and providing ecosystem services.

The five components of ecological networks from *Making Space for Nature* (Lawton et al. 2010) are illustrated in Figure 2.1. and summarised as follows:

Core areas: These are areas of high nature conservation value which form the heart of the network. They contain habitats that are rare or important because of the wildlife they support or the ecosystem services they provide. They generally have the highest concentrations of species or support rare species. Core areas provide places within which species can thrive and from which they can disperse to other parts of the network. They include protected wildlife sites and other semi-natural areas of high ecological quality.

Corridors and stepping stones: These are spaces that improve the functional connectivity between core areas, enabling more mobile species to move between them to feed, disperse, migrate or reproduce. Connectivity need not come from linear continuous habitats; a number of small sites may act as stepping stones across which certain species can move across core areas. Equally a land mosaic between sites that allows species to move is effectively an ecological corridor.

Restoration areas: These are areas where measures are planned to restore or create new high value areas (which will ultimately become core areas) so that ecological functions and species populations can be restored. They are often situated to complement, connect or enhance existing core areas.

Buffer Zones: These are areas that closely surround core areas, restoration areas, 'stepping stones' and ecological corridors and protect them from adverse impacts from the wider environment.

Sustainable Land Use areas: These are areas within the wider landscape focussed on the use of sustainable resources and appropriate economic activities together with the maintenance of ecosystem services. Set up appropriately they help to 'soften the matrix' outside the network and make it more permeable and less hostile to wildlife, including self-sustaining populations of species that are dependent upon, or at least tolerant of certain forms of agriculture. There is overlap in the functions of buffer zones and sustainable use areas, but the latter are less clearly demarcated than buffers, with a variety of land uses.

Lawton et al. (2010) summarises the approach to 'Rebuilding Nature' as follows:

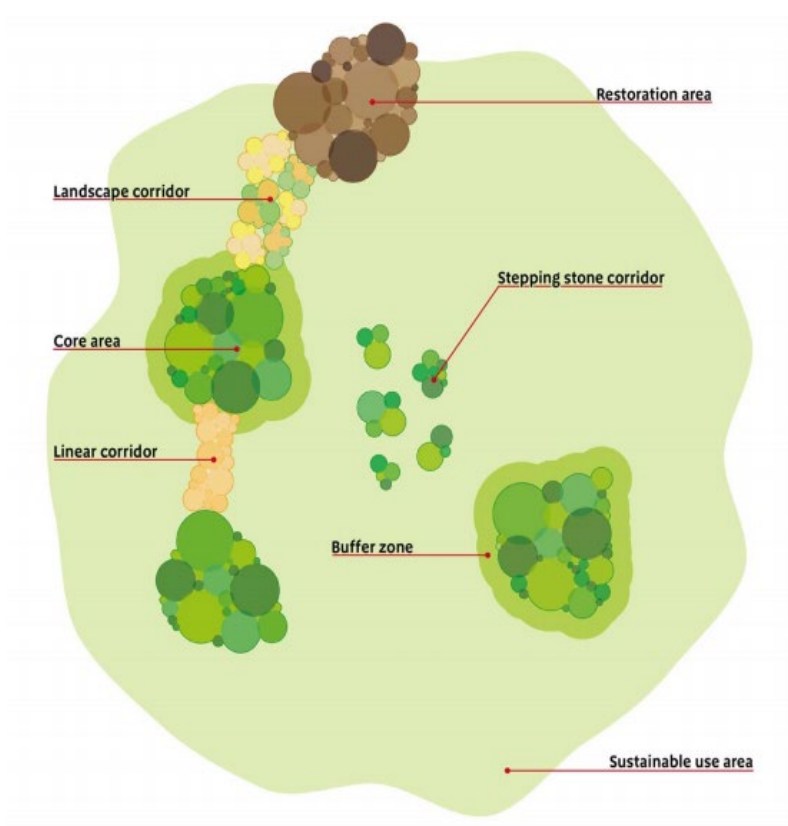
'The essence of what needs to be done to enhance the resilience and coherence of England's ecological network can be summarised in four words: more, bigger, better and joined. There are five key approaches which encompass these, and also take account of the land around the ecological network. We need to:

- (i) Improve the quality of current sites by better habitat management.
- (ii) Increase the size of current wildlife sites.
- (iii) Enhance connections between, or join up, sites, either through physical corridors, or through 'stepping stones'.

(iv) Create new sites.

(v) Reduce the pressures on wildlife by improving the wider environment, including through buffering wildlife sites’.

Figure 2.1 The components of Ecological Networks building on Lawton Principles (Lawton et al. 2010)



2.4.2 Natural England Nature Networks Evidence Handbook (Crick et al. 2020)

The *Nature Networks Evidence Handbook* (Crick et al. 2020) published by Natural England in March 2020 (the ‘Handbook’) continues to build on Lawton principles at its core, outlining some of the practical aspects of implementing a nature network plan as well as describing the tools that are available to help in decision making. The Handbook provides a suite of ecological rules of thumb for designing a nature network which includes a hierarchy of priority actions: (a) improve core wildlife sites (b)

increase the size of core sites (c) increase the number of core sites (d) improve the ‘permeability’ of the surrounding landscape for the movement of wildlife (e) create corridors of connecting habitat. In addition, there is the need to develop a number of Large Nature Areas (c. 5-12,000 ha).

Natural England’s *Nature Networks Evidence Handbook* defines ecological networks as:

‘a number of core, well connected, high quality areas of well-functioning ecosystems, together with those parts of the intervening landscape that are ‘wildlife-friendly’, and which collectively allow wildlife to thrive.’

The 2020 Handbook takes the *Making Space for Nature* report (Lawton et al. 2010) guiding principles ‘more, bigger, better and joined’ further. The Handbook has split ‘joined’ into two because the evidence suggests that providing ‘stepping stones’ and improving the ‘permeability’ of the matrix are usually more important than providing physical corridors through which nature can disperse. Thus, the hierarchy should be:

Better site quality > Bigger sites > More sites > Stepping stones & more permeable matrix > Corridors

Whilst the order of this hierarchy is generally sound, the order can vary according to the species and landscape being considered (for example generalist species such as birds are more likely to rely on the matrix between high quality sites than the sites themselves; and less mobile species such as specialist woodland species are likely to rely on the quality of the connectivity between habitat patches than more mobile species). The Handbook aims to help prioritise the different aspects identified by Lawton et al. and the general rules of thumb for designing nature networks are summarised in Table 2.1.

2.5 Wildlife corridors guidance

The Lawton Report (Lawton et al. 2010) assesses the need for connectivity within ecological networks via stepping stones and corridors. Species’ distributions are dynamic and many species populations exist not as isolated groups but as meta-populations, sets of local populations linked by the dispersal and movement of individuals to adjacent populations. As the distance between individual populations increases, larger (or better quality) habitats are needed to maintain viable populations. Species may also need to move between sites, in particular species whose ranges are expanding or shifting due to climate change, species using resources that are only temporarily available in the landscape (e.g. pioneer plant species), species in which individuals have large ranges, and species that are migratory and or use different habitats for different stages of their life cycles.

As well as providing habitat connectivity through stepping stone habitats and improving the quality of habitat between sites; there are also linear features that already exist which are well suited to enhancing connectivity. These include both natural and man-made corridors such as rivers, canals, road verges, hedges, cycle routes and railway embankments. Managing these in wildlife-friendly ways can improve both ecological connectivity and access to nature for people e.g. wildlife-rich cycle routes. The Lawton Report recommends public bodies and other authorities responsible for canals, railways, roads, cycle ways and other linear features in the landscape, should ensure that they better achieve their potential to be wildlife corridors , thereby enhancing the connectivity of ecological networks, and improving opportunities for people to enjoy wildlife.

Table 2.1: Rules of thumb for the design of nature networks, building on the principles of Lawton et al. (2010): Extracted from Natural England’s Nature Networks Evidence Handbook (Crick et al. 2020)

Better site quality	> Bigger sites	> More sites	> Stepping stones & permeable matrix	> Corridors
Encourage natural processes	Big enough to encourage natural processes – include sufficient area to ensure functioning ecosystems	Add larger sites in preference to smaller sites	For poorly dispersing species sites should be <1 km from each other and <200m apart for highly specialised species within a habitat	Natural corridors are better than human designed corridors
Encourage habitat mosaics		Target areas of unprotected irreplaceable habitat or with a long ecological continuity of un-intensive land management	Expand sites towards existing habitat to reduce space between patches	Use linear landscape features
Create more niches for more species – use ‘ecosystem engineers’ and welcome ecological disturbance.	Provide space for ecosystem dynamism, supporting mosaics and to encourage succession	Target areas with complex or additional topography & geomorphology and with a potential to be climate change refugia	Reduce the intensity and increase the diversity of land use in the surrounding countryside	Ensure corridor habitat matches that in core sites
Increase messiness (variation of physical structure within sites)	Reduce edge effects by decreasing the edge: area ratio	Target areas of important habitat potential in the surrounding area	Increase the cover of semi-natural habitat in landscape to at least 20%	Minimum width of corridors = 100m preferably wider
Restore missing biodiversity by increasing niches or by reintroduction	Join habitat fragments: choose the ones that will create the bigger site	Target degraded areas with potential for high ecosystem service delivery	Stepping stones should provide appropriate resources to avoid becoming ecological traps.	
Maintain rare species	Restore degraded habitat surrounding the site	Ensure connectivity is good for new sites.		
Encourage climate colonists	Enlarge sites to >40ha (or >100 ha for wide-ranging species).			
Reduce edge effects by buffering sites and encouraging graded ecotones to ‘soften the edge’				
Buffer sites with at least a 50-100m buffer strip, possibly up to 500m wide.				
Maintain ecological continuity of management to protect soils.				

It should be noted that within the ecological network hierarchy of priorities, Lawton et al. (2010) rank corridors at the bottom of the hierarchy. The assumption is that species will use corridors to move from one site to another. Whilst there is evidence that species use corridors to disperse there is no evidence that creating corridors actually works in a meta-population context to boost population survival. Pragmatically it may be more difficult to establish sufficient new linear habitat to create corridors than it is to establish stepping stones across the landscape. For these reasons Lawton et al. 2010 place the creation of new physical corridors last in the network hierarchy.

In describing ‘corridors’ Natural England’s Nature Networks Evidence Handbook (Crick et al. 2020) suggests that ‘habitat corridors’ that link core sites have been the subject of considerable controversy, but a wide range of evidence suggests that depending on their vegetation structure, size, configuration and management, corridors can be effective for maintaining populations for a wide range of plants and animals and for helping the ecosystem services they provide. The Handbook recommends that habitat corridors are a way to enhance landscape connectivity for some plants and their dispersal agents when other options are not available, particularly for dispersers that are habitat-specialists or have low mobility. However, they do not work in all situations, some species may be more likely to use them than others, and their usefulness may depend on their composition, length and width and the matrix within which they sit. Well-designed corridors on balance have been shown to be effective in improving connectivity between core areas for a wide range of species, increasing movement rates by circa 50% and are particularly important for species that are specific to particular habitats and immobile species, especially plants.

The design of corridors needs to take into account that natural corridors are more effective than human-designed corridors and the habitat within a corridor needs to be as close to the habitats in the core sites as possible. The width of the corridor is also important and will be affected by edge effects. For some species that become corridor dwellers to move between core sites, the corridor needs to be as wide as their home range. The Handbook recommends corridors need to be designed with particular species in mind but a corridor of at least 100m and probably more than 200m wide to provide a largely unaffected interior habitat due to edge effects. As with the Lawton Report, the Handbook places ‘corridors’ at the bottom of the network hierarchy when other options are not available.

Although wildlife corridors are ranked last in the ecological and nature network hierarchy by the guidance, the importance of wildlife corridors as a key component of the green infrastructure network should also be emphasised alongside ecological functionality considerations. There is a raft of evidence of the wellbeing benefits of contact with nature, particularly in view of Covid-19 restrictions, and the importance of access to green space and wildlife within neighbourhoods (RSPB 2020; Lovell et al. 2020).

2.6 Stepping stones guidance

Article 10 of the Habitats Directive (Council Directive 92/43/EEC 1992) states that Member States will develop ‘..policies encouraging the management of features of the landscape which are of major importance for wild flora and fauna’ such as ‘... stepping stones’ and other features that are ‘essential for the migration, dispersal and genetic exchange of wild species.’ (Lawton et al. 2010).

Lawton et al. (2010) describe how species will often need to move between wildlife sites or habitat patches via stepping stones or the wider environment, without using continuous corridors. Ponds are important habitats for a wide diversity of wildlife and can provide stepping stones for many species that use fresh water habitats to move across the landscape. Whether a site is considered a stepping stone or a core site is largely subjective and context-dependant. For example Local Wildlife Sites are a key part of an ecological network particularly if they provide stepping stones to link and protect internationally and nationally important wildlife sites.

Natural England’s *Nature Networks Evidence Handbook* (Crick et al. 2020) describes ‘stepping stones’ as small patches of habitat that occur between large wildlife sites and are transiently used areas between larger sites (functionally connected rather than physically connected like corridors). Improving the connectivity of the landscape can be done by reducing the intensity of farming practice, improving the diversity of land use or by increasing the amount of semi-natural habitat or ‘messiness’ within a landscape. Peterken (2002) cited in Crick et al. (2020) suggests a rule of thumb that a landscape should contain 30% woodland cover to ensure connectivity for woodland animals although this rule of thumb is considered simplistic (Taylor et al. 2006). The impact of permeable land cover is considered as context specific. However, a general rule of thumb suggests at least 20% cover of semi-natural habitat would help to improve connectivity and resilience of populations in the wider countryside and in core sites (Crick et al. 2020). To ensure adequate connectivity between core sites or stepping stones, placement is important. The Handbook provides a summary of evidence relevant to England. Whilst it is noted that dispersal will be moderated by the permeability of the intervening landscape matrix it can be concluded from the evidence that habitat patches need to be less than 200m apart for specialist species and less than 1km apart for generalist species (Table 2.2).

2.7 ‘Buffers’ guidance

Lawton et al. (2010) highlights five key approaches to rebuild nature and address the weaknesses of the current series of wildlife sites. One of the key principles in rebuilding nature is to reduce pressures on wildlife by improving the wider environment, including through buffering wildlife sites. Buffering wildlife sites can help to improve resilience and help sites to work at a larger ecosystem scale (i.e. the concept of ‘bigger’ is not restricted to the land area of wildlife sites *per se* (Crick et al. 2020). Natural England’s *Nature Networks Evidence Handbook* describes how buffer areas of reduced intensity of land management around core sites (Lovell & Sullivan 2006, cited in Crick et.al 2020) can help to reduce the negative impacts of

the edge effects and promote the potential benefits of ecotones. These zones can help to reduce the impacts of adverse land management within the surrounding countryside, such as pesticide spray drift and human or pet disturbance, and are intrinsic to the design of UNESCO Biosphere Reserves (Ishwaran et al. 2008 cited in Crick et al. 2020). For example, a study of the ranging behaviour of urban domestic cats, suggests that a buffer zone of 300-400m would be required to protect a site from their predation impacts (Thomas et al. 2014 cited in Crick et al., 2020).

Box 2.2 Illustrative examples of maximum distances required to allow the regular dispersal or colonisation of species from one block of habitat to another [source: Natural England Nature Networks Evidence Handbook (Crick et al. 2020)]

- Woodland specialist vascular plant seed dispersal: <200 m (Peterken 2002; Jacquemyn et al. 2003)
- Dormice: <1000 m (Bright et al. 1994, Peterken 2002)
- Red Squirrels : <600 m (Peterken 2002)
- For woodland flora and fauna: <2 km (Humphries et al. 2013)
- For specialist species in semi-natural habitats there is a gap crossing threshold of c. 100 m and stepping stones appear to be more effective than corridors in this situation (Doerr et al. 2010).
- For specialist species (mainly birds and mammals) in semi-natural habitats, there is an inter-patch crossing threshold (using all available stepping stones and corridors) of c. 1100 m (Doerr et al. 2010).
- Snakes and amphibians appear to have a maximum dispersal distance of 1 km (Vos & Chardon 1998)
- Chalk grassland macro-moths benefit from recreation of grassland patches that are < 1 km from a large area (>10 ha) of calcareous grassland (Alison et al. 2016)
- Colonisation of arable land that is reverted to grassland by invertebrates is most successful if <500 m from an existing patch of species rich grassland and at most 2 km distant (Woodcock et al. 2015)
- Snails show reduced colonisation of patches > 100 m apart (Knop et al. 2011)

Buffer zones can provide qualitatively better habitat than the surrounding countryside, allowing species to thrive and thus bolster populations inside the core sites. A 50m buffer strip can be valuable for amphibians and reptiles (Semlitsch & Bodie 2003, cited in Crick et al. 2020). Buffer zones of 500m around Natura 2000 sites in Europe hold more red list plants than outside these zones (van der Sluis et al. 2016, cited in Crick et al. 2020).

Buffer zones can also reduce the impact of edge effects by providing a softer transition between the core site and the surrounding countryside (Fischer et al. 2006, cited in Crick et al. 2020). Agri-environment measures often promote the use of grassland buffer strips along water-courses to reduce the rate of nutrient run-off. This is important for the water quality of freshwater conservation sites alongside the fields or downstream, and benefits wildlife populations there (McCracken et al., 2015; Noij et al. 2012 cited in Crick et al. 2020). The size of a potential buffer strip may vary according to the size of the core site and the nature of the threats that might affect it from the surrounding landscape. Thus the extent of buffering will need to be undertaken pragmatically and should be reviewed in light of the impacts observed in the core site. Although the evidence on the size of buffer strips is limited, the information above on the penetration of edge effects into habitats, suggests that buffer areas around biodiversity sites (Table 2.1) should be at least 50m wide, preferably more than 100m wide, and may need to be up to 500m wide (Crick et al. 2020).

2.8 Differences between wildlife corridors/ecological networks and nature recovery networks

Natural England's *Nature Networks Evidence Handbook* (Crick et al. 2020) makes clear that to make a nature network in contrast to an ecological network [or in this review the wildlife corridors network] people need to be involved from the earliest stages in planning and design, to create an overarching vision for the network, taking into account their needs and the services that a landscape provides. To be successful nature networks should be designed to deliver multiple public benefits 'ecosystem services' and encourage greater engagement and connection with the natural environment. These ecosystem services include flood regulation, water quality, soil quality, air quality and noise reduction, local climate regulation, pollination, nursery populations and habitats and cultural services (Crick et al. 2020). There is a significant emphasis on the role of ecological networks as part of the overarching nature recovery network and thus the ecological [wildlife corridors] network evidence base will be a key part of the future local nature recovery network design process.

3 THE BIODIVERSITY OF GATESHEAD, SOUTH TYNESIDE AND SUNDERLAND – AN OVERVIEW

3.1 The Study Area

Gateshead, South Tyneside and Sunderland are located in the North East region of England and were originally three of the five Boroughs of the metropolitan county of Tyne and Wear with Newcastle City and North Tyneside. The five boroughs became unitary authorities in 1986. The three local authority areas are part of the historic county of Durham. The area became heavily populated during the industrial revolution and the growth of coal mining and ship building. These industries declined during the last century and have now been replaced by manufacturing and service activities. The area has two National Character Areas classifications (Natural England) namely [The Tyne and Wear Lowlands](#) and the [Durham Magnesian Limestone Plateau](#). The area's natural environment varies greatly and is characterised by the coast (South Tyneside and Sunderland), riverside with tidal mudflats, wooded river and stream valleys with Magnesian Limestone landscapes. The key biodiversity characteristics for the study area are:

- High concentration of designated sites. Internationally important sites for wading birds including Turnstone and Purple sandpiper (Northumbria Coast SPA and Ramsar site) and vegetated sea cliffs on Magnesian Limestone exposures (Durham SAC);
- Only place in the world to support the Blue Moor Grass/Small Scabious Magnesian Limestone Grassland (CG8 grassland) – a rare community of lowland calcareous grassland;
- Nationally rare species include rare Frog orchid, Purple milk-vetch and Dingy skipper butterfly;
- Widespread urban and industrial development around key settlements with fragmented semi-natural habitats. A strong influence of the historic mining history in the former ex coalmining towns and villages with distinctive surrounding areas of allotments and pony paddocks. Former mining and industrial sites restored to provide new pastures and woodland on spoil heaps, ponds and lakes around former open cast mines and a network of green corridors along former railway lines and wagon ways;
- Outside of main settlements the landscape is dominated by large scale agricultural fields predominantly arable, with low hedges and few trees on plateau tops incised with stream valleys and denes;
- Dramatic coastline with exposed cliffs of limestone and boulder clay, small sheltered bays and headlands with flower-rich Magnesian Limestone grassland. Steep-sided wooded coastal denes, sand dunes and beaches that support large populations of wading birds;
- Limestone escarpment, heavily quarried but supporting a rich mosaic of limestone, scrub and grassland;
- Small fragmented patches of limestone grassland and relic heath supporting rare plants and invertebrates;

- Rivers and streams with tidal mudflats supporting migratory salmon and wading bird species;
- Open mosaic habitat on brownfield land; and
- Mixed woodland estates, planted woodland areas and steep wooded river valleys.

3.2 Durham BAP

The Durham Biodiversity Action Plan contains action plans for species and habitats of particular importance to the biodiversity of the area. Habitat and Species Biodiversity Action Plans were produced by Durham Biodiversity Partnership. Since 2013 these have been under the custodianship of the North East England Nature Partnership (NEENP). The Durham BAP identifies 32 habitats and 74 species as important within the region. These are listed in Appendix A.

3.3 Tyne and Wear Nature Conservation Strategy 1988

The original wildlife corridors network stems from the Tyne and Wear Nature Conservation Strategy published in 1988 and adopted by the five original Tyne & Wear Boroughs (Gateshead, Newcastle, North Tyneside, South Tyneside and Sunderland). The Strategy had several ranks of corridor including 'Strategic' and 'Local' and subsequently became part of the Boroughs' Unitary Development Plans in modified forms within each Borough.

The original approach to mapping and defining wildlife corridors was to identify areas of land at a landscape scale to connect and buffer existing nature conservation sites. The wildlife corridors allocated in the three local authorities have evolved over successive Local Plan timeframes. As well as being afforded safeguards through each authority's respective Local Plan biodiversity policies, the wildlife corridors serve as key components of each authority's Green Infrastructure networks. Identifying both wildlife corridors and wider green infrastructure (GI) networks in Local Plans has required cross-boundary working under the planning authorities' 'duty to cooperate'. Although these networks are defined in separate Local Plan documents they have been developed with regard to cross-boundary issues in consultation with neighbouring authorities.

¹ The duty to cooperate was created in the [Localism Act 2011, and amends the Planning and Compulsory Purchase Act 2004](#). It places a legal duty on local planning authorities, county councils in England and public bodies to engage constructively, actively and on an ongoing basis to maximise the effectiveness of Local and Marine Plan preparation in the context of strategic cross boundary matters.

3.4 Biodiversity Overview of Gateshead, South Tyneside and Sunderland

Whilst collectively Gateshead, South Tyneside and Sunderland has a rich and a varied biodiversity landscape with high concentrations of designated sites relative to the area's size, each council area has unique biodiversity characteristics in their own right. The following sections give a general overview of: the key biodiversity features of each of the three council areas; the local policies which provide for the protection and enhancement of the wildlife corridors ; an overview of the previously mapped corridors; and the strengths and weaknesses of the previous wildlife corridors network.

3.5 Gateshead Biodiversity

3.5.1 Gateshead Biodiversity Overview

Gateshead supports a wide range of biodiversity assets including designated sites, transport routes and green spaces. Gateshead has 8 SSSIs (Gibside, Lower Derwent Meadows, Pockerey Farm Pond, Ridley Gill, Ryton Willows, Shibdon Pond, Thornley Wood and Strother Hills). According to most recent Natural England SSSI condition monitoring assessments, Pockerey Farm Pond and Ryton Willows are classed as Unfavourable – Declining, Gibside is classed as Unfavourable – Recovering whilst the others are classed as Favourable. Gateshead's SSSIs have a variety of habitats including standing open water, neutral lowland grassland, fen, marsh and swamp and broadleaved mixed and yew woodland. There are 13 Local Nature Reserves and 140 Local Wildlife Sites (LWS).

Gateshead's key wildlife habitats include Ancient semi-natural woodland, rivers and streams, extensive inter-tidal mudflats, ponds and wetlands, open mosaic habitats on previously developed land and semi-improved neutral, acid, wet and waxcap grasslands. Key species are amphibians (including Great crested newt and Common toad), mammals (otter and badger) birds including red kite and kittiwake, breeding, passage and winter waders and wildfowl including curlew, redshank, little ringed plover, teal and shelduck. Key butterfly species include dingy skipper, grayling and small heath, with fish including salmon, eels and wild brown trout.

Gateshead, by comparison to the other Tyne and Wear Boroughs, has a greater area of semi-natural habitat including woodland, river corridor and open parkland. Wooded river corridors are a major feature of the available biodiversity resources in Gateshead (Entec 2011a).

3.5.2 Gateshead Policies and Strategies

Planning for the Future Core Strategy and Urban Core Plan for Gateshead and Newcastle upon Tyne 2010-2030:

Policy CS18 Green Infrastructure and the Natural Environment (Adopted Policy)

'A high quality comprehensive framework of interconnected green infrastructure that offers the ease of movement and an appealing natural environment for people and wildlife can be achieved by:

1. *Maintaining, protecting and enhancing the integrity, connectivity, multifunctionality and accessibility of the Strategic Green Infrastructure Corridor Network.*
2. *Protection, enhancement, management of green infrastructure assets which include:*
 - i. *Biodiversity and geodiversity assets including designated sites, designated wildlife corridors and priority habitats and species,*
 - ii. *Distinctive landscape character, recognising the particular importance of our rivers and topography, and*
 - iii. *Trees, woodlands and hedgerows.'*

Gateshead Unitary Development Plan 2007:

Policy ENV51 Wildlife corridors (Saved Policy)

'A network of wildlife corridors will be protected by resisting development or recreational use which would seriously impair their integrity or value to wildlife. Exceptionally, damaging developments may be allowed where habitats would be enhanced or where suitable replacement land is provided to retain the integrity of the corridor.'

Making Spaces for Growing Places Submission Draft Local Plan Document for Gateshead (October 2018):

MSGP38 Biodiversity and geodiversity (Emerging Policy)

1. *Where appropriate, development proposals must demonstrate how they will:*
 - a) *avoid/minimise adverse impacts on biodiversity and geodiversity in accordance with the mitigation hierarchy; and*
 - b) *provide net gains in biodiversity.*

2. Where development which is likely to adversely affect biodiversity and/or geodiversity is to be approved, the Council will require planning conditions and/or obligations to secure the provision, maintenance and monitoring of appropriate mitigation and/or compensation measures.

3. Proposals for development or land use that would adversely affect a Site of Special Scientific Interest, either directly or indirectly, will only be permitted where the reasons for the development, including the lack of an alternative solution, clearly outweigh the nature conservation value of the site and the national policy to safeguard the national network of such sites.

4. Proposals for development or land use that would adversely affect a Local Wildlife Site or Local Geological Site, either directly or indirectly, will only be permitted where:

a) the developer can demonstrate that there are no reasonable alternatives; and

b) the case for development clearly outweighs the need to safeguard the intrinsic value of the site.

5. Proposals for development or land use that would adversely affect the ecological, recreational and/or educational value of a Local Nature Reserve will only be permitted where:

a) the developer can demonstrate that there are no reasonable alternatives; and

b) the case for development clearly outweighs the need to safeguard the ecological, recreational and/or educational value of the site.

6. Development proposals that would have a significant adverse impact on the value and integrity of a Wildlife Corridor will only be permitted where suitable replacement land, or other mitigation, is provided to retain, and where possible enhance, the value and integrity of the corridor.

Newcastle City Council and Gateshead City Council Green Infrastructure Strategy Report

Entec (2011a) provides a comprehensive evidence base for the Gateshead and Newcastle upon Tyne Core Strategy including the identification of ecology and biodiversity features as part of the overall GI resource. The evidence base includes statutory designated sites, non-statutory designated sites (LWS for Gateshead), Wildlife Corridors, Phase 1 Habitat Survey, Durham BAP habitats and species, the River Tyne Bat Survey, the River Tyne Winter Birds Survey, the River Tyne Intertidal Habitat Study, Biodiversity Action Plan Reporting (BARS) ERIC species records including otter, badger, breeding birds, amphibians, red squirrel and water vole. The Green Infrastructure Strategy Report (Entec 2011b) informed by the Green Infrastructure Study - Evidence Base (Entec 2011a) identifies a number of 'Opportunity areas' including the River Tyne, Wardley Manor Park, Team Valley and Gateshead Town Centre.

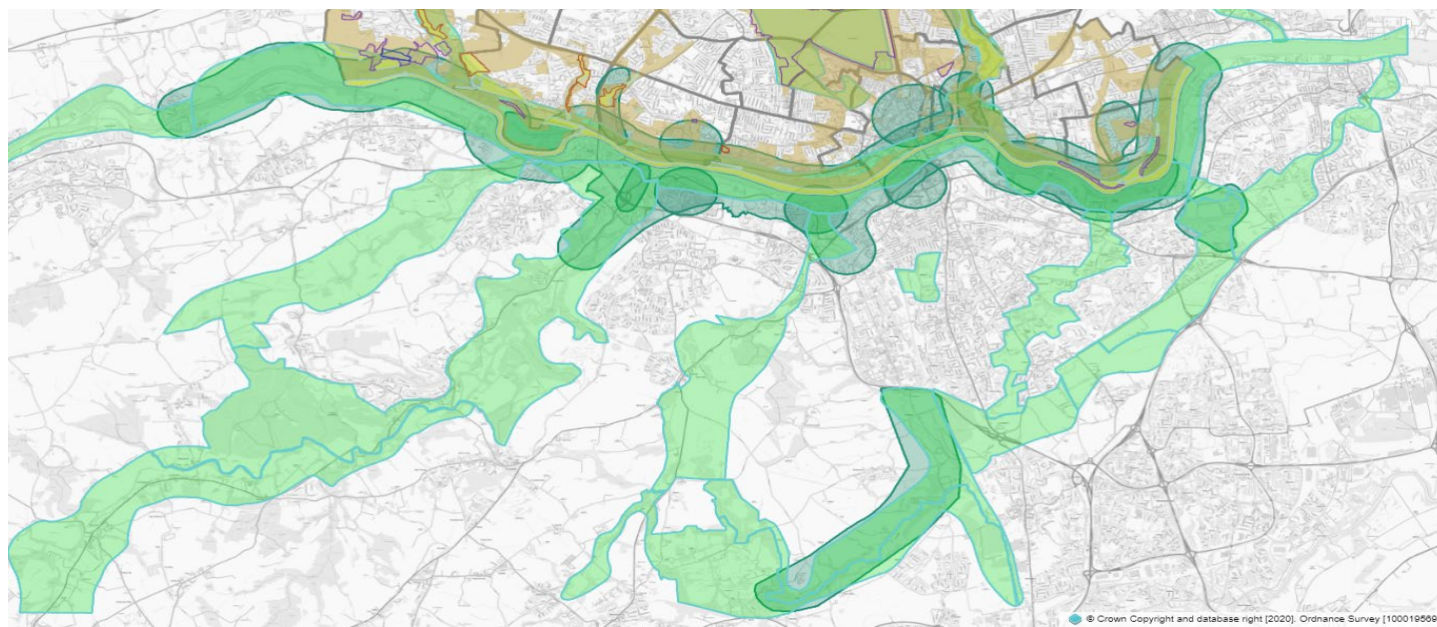
The Green Infrastructure Strategy Report (Entec 2011b) seeks to achieve wildlife benefits within strategic green infrastructure corridors, sympathetic design and management to avoid conflict with users, ensuring all green infrastructure corridors act as wildlife corridors by removing or addressing gaps, and protect, monitor and promote Local Wildlife Sites across Newcastle and Gateshead and to designate the banks of the Tyne as a single LWS. Research during the production of the GI evidence study (Entec 2011a) identified a number of issues in relation to enhancement and creation of wildlife sites. A number of these issues relate to the River Tyne and are addressed in the Green Infrastructure Study River Tyne Report (Entec 2011c).

3.5.3 Gateshead Previous Wildlife corridors

Gateshead's Wildlife corridors are described by Durkin (2009) as landscape areas through which plants and animals are able to move, usually based on some feature of the landscape such as a river, stream, disused railway line or linear woodland or heathland. Small linear features such as hedgerows and road verges often referred to as wildlife corridors or wildlife links in their own right, are treated as components of the landscape-scale wildlife corridors defined here. Within each wildlife corridor there is usually a number of high quality wildlife sites designated as SSSI, Local Wildlife Site or Local Nature Reserve. Linking these sites there will be linear features and some habitats such as ponds may be present discontinuously but with wildlife able to move from one to the other providing they are not too far apart. Gateshead's wildlife corridors have been based on a 500m zone on either side of each watercourse or linear feature. The edges of the corridor are reduced where appropriate by up to 100 metres to follow a hard boundary such as a road or urban edge. Corridor widths have been increased in some locations beyond 500m to include LWS and BAP habitat boundaries. Prior to this 2020 review 10 Wildlife corridors had been designated. The wildlife corridors and their habitats of importance are listed as follows.

- Stanley Burn Wildlife Corridor – woodland valleys, ancient semi-natural woodlands close to burns;
- Blaydon Burn Wildlife Corridor – woodland valleys, ancient semi-natural woodland close to burns, grasslands on sandy soils;
- Bobgins Burn Wildlife Corridor – woodland valleys, ancient semi-natural woodlands close to burns;
- Milkwell Burn Wildlife Corridor - woodland valleys, ancient semi-natural woodland;
- River Tyne Wildlife Corridor – river, mudflats, saltmarshes and occasional rocky shore;
- River Derwent Wildlife Corridor – river, woodland valley, ancient semi-natural woodland;
- River Team Wildlife Corridor – river, salt marsh habitats, wet grassland and ponds, ancient semi-natural woodlands;
- Washingwell Wildlife Corridor – woodlands and species rich grasslands;
- Follingsby Wildlife Corridor – small burns, disused railway lines, relict acid grassland and heath habitats; and
- Windy Nook Wildlife Corridor – disused railway lines, golf courses, nature reserves, playing fields, domestic gardens, parks and other open spaces.

Figure 3.1: Gateshead's Previous Wildlife Corridors (Source [Wildlife and Ecology Map | Newcastle City Council Mapping](#))



3.6 South Tyneside Biodiversity

3.6.1 South Tyneside Biodiversity Overview

South Tyneside has a wide variety of wildlife habitats with international, national and local designated sites including the Northumbria Coast SPA and Ramsar Site designated for its overwintering birds of international importance (Turnstone and Purple sandpiper) and Durham Coast SAC designated for vegetated sea cliffs on magnesian limestone. Important key habitats include species rich magnesian limestone grasslands – plants include common rock rose, cowslips, carline thistle, salad burnet and quaking grass. CG8 grassland, a globally rare magnesian limestone grassland which is characterised by blue moor grass and Small scabious. Open mosaic habitats on previously development land are also important habitats, with one site in South tyneside supporting regionally important colonies of dingy skipper and grayling butterflies. Outside of urban areas, open agricultural land, grassland and hedgerows provide feeding habitat for farmland and wintering birds. The Borough has 5 SSSIs, 7 LNRs and 52 Local Wildlife Sites and 6 Local Geology sites.. The three SSSIs in Council or National Trust ownership (Durham Coast (South Tyneside units), Harton Down Hill and Cleadon Hill) were most recently assessed by Natural England's condition monitoring programme as being in Favourable condition. Boldon Pastures and West Farm Meadow are in Unfavourable condition with West Farm Meadow classed as declining.

Whilst many of South Tyneside's Local Wildlife Sites are Council owned with regular monitoring and management, more than half are in private ownership with many of these suffering from lack of management and subsequent decline (South Tyneside Council 2013). Grasslands are particularly vulnerable to lack of management. There is limited tree cover, however this has increased substantially over recent decades with the planting of restored post-industrial areas. The Great North Forest initiative also saw the planting of a significant number of trees. Street trees are also an important part of the urban landscape.

Other key habitats include semi-improved, neutral and waxcap grassland, rivers and streams supporting otter, eel, wild brown trout and water vole (previously a regional stronghold but with recent declines). The River Tyne and the River Don are an important biodiversity resource, providing a variety of habitats including mudflats, saltmarsh and reedbeds. Sites around Boldon and Whitburn have been identified as important features for wintering birds evidenced by a suite of ornithological studies including Boldon Flats (E3 Ecology 2016) and Whitburn Wader Survey (E3 Ecology 2020).

3.6.2 South Tyneside Policies and Strategies

South Tyneside Local Development Framework Core Strategy (June 2007):

Policy EA3: Biodiversity and Geodiversity (Adopted Policy)

'To optimise conditions for wildlife, implement the Durham Biodiversity Action Plan and tackle habitat fragmentation the Council will:

- A *secure and enhance the integrity of designated sites;*
- B *maintain, enhance, restore and add to biodiversity and geological conservation interests;*
- C *ensure that new development would result in no net loss of biodiversity value of any of the following Priority Habitats:*
 - i) *magnesian limestone grassland;*
 - ii) *coastal sand dunes;*
 - iii) *maritime cliffs and slopes;*
 - iv) *mudflats;*
 - v) *rivers and wetlands;*
 - vi) *species rich neutral grasslands;*

- vii) rocky shores;
- D reduce the fragmentation of, improve or extend existing Priority Habitats;
- E create new Priority Habitats, especially in the Habitat Creation Zones of:
 - i) Cleadon Hills;
 - ii) Downhill;
 - iii) River Don Valley;
 - iv) Wardley Colliery;
- F protect and strengthen populations of Priority or other protected species;
- G enhance the biodiversity value of wildlife corridors, and
- H where appropriate, restrict access and usage in order to conserve and area's biodiversity value.

South Tyneside Local Development Framework Development Management Policies (June 2007):

Policy DM7 Biodiversity and Geodiversity Sites (Adopted Policy)

'We will protect and enhance the important environmental assets of the borough, including part of the most northerly outcrops of magnesian limestone in the country. We will promote and support high quality schemes that enhance nature conservation and management, preserve and restore historic and natural environmental character, and maximise benefits for geological conservation and the enhancement of biodiversity in line with the Durham Biodiversity Action Plan targets. All proposals for development:

- A must ensure that any individual or cumulative detrimental impacts on sites are avoided; and
- B will only be permitted where they would not adversely affect the integrity, natural character or biodiversity and geodiversity value of:
 - i) designated Sites of Special Scientific Interest;
 - ii) designated Local Wildlife Sites;
 - iii) designated Local Geodiversity Sites;

- iv) *designated Local Nature Reserves;*
- v) *the Cleadon Hills, Boldon Downhill and South Boldon areas of high landscape value and significance;*
- vi) *Wildlife Corridors ; and*
- vii) *other land that forms part of the borough's strategic green infrastructure; as shown on the Proposals Map.*

Development within or outside these designations will only be approved where the benefits of development clearly outweigh any adverse impact on the site, and any broader impacts on the national network of Sites of Special Scientific Interest. Exceptions will only be made where no reasonable alternatives are available. In such cases, we will use planning conditions and/or planning obligations to mitigate or compensate for the harmful effects of the development, and through good design seek opportunities to incorporate biodiversity and geodiversity features into the development.

The South Tyneside Local Plan Pre-Publication Draft (Regulation 18) August 2018:

Policy NE1: Strategic Approach towards the Natural Environment (Strategic Policy) (Emerging)

'The protection and enhancement of the natural environment will be delivered by:

- a) *Conserving and enhancing the natural environment, ensuring appropriate protection is given to designated and non-designated assets, including their wider settings;*
- b) *Ensuring the protection and enhancement of the Borough's biodiversity and geological resources and preserve local, national and international priority species and habitats whilst promoting their restoration, re-creation and recovery. We will seek measurable gains for biodiversity including establishing coherent ecological networks that are more resilient to current and future pressures;*
- c) *Protecting against the loss of the Borough's trees, woodland and hedgerows and irreplaceable habitats whilst securing new tree planting and habitat creation particularly that which would contribute towards flood risk management;*
- d) *Providing new and maintaining existing high quality and accessible open space and green infrastructure to create networks of greenspace for people, flora and fauna and allow species*

adaptation and migration.

- e) *Improve and protect water and groundwater quality, including the River Tyne and River Don and other rivers and watercourses, and where appropriate and feasible the opening up of watercourses to assist in flood risk management;*
- f) *Addressing the local causes of water, air, light, noise and all other forms of pollution and the contamination of land, reducing the impact on local communities and meeting the requirements of the Water Framework Directive;*
- g) *Contribute to the mitigation of the likely effects of climate change, taking full account of flood risk, water supply and demand and where appropriate coastal change.*

The South Tyneside Local Plan Pre-Publication Draft (Regulation 18) August 2018:

Policy NE2: Biodiversity, Geodiversity and Ecological Networks (Strategic Policy) (Emerging)

Appropriate avoidance, protection and enhancement measures should be incorporated into the design of development proposals at an early stage, to minimise impacts on and provide measurable net gains for biodiversity. Detrimental direct and indirect impacts of development on biodiversity and geodiversity, whether individual or cumulative, should be avoided. Where this is not possible mitigation, or lastly compensation, must be provided as appropriate. Where sites are designated for their biodiversity or geodiversity, planning decisions will reflect the hierarchical approach as set out below..”

The South Tyneside Local Plan Pre-Publication Draft (Regulation 18) August 2018:

Policy NE3: Green Infrastructure (Strategic Policy) (Emerging)

‘We will deliver a good quality and accessible network of green spaces through the Borough to provide a range of social, economic and environmental health benefits for all. This will be done by:

... c) Strengthening existing wildlife corridors and supporting opportunities for biodiversity improvement and net gains’

SPD3: Green Infrastructure Strategy (South Tyneside Council 2013)

South Tyneside's Green Infrastructure Strategy has been adopted as a Supplementary Planning Document (SPD) and expands on Core Strategy Policy SC6 'Providing for Recreational Space, Sports and Leisure' and Development Management Policy DM7 'Local Biodiversity and Geodiversity Sites'. Four key Green infrastructure corridors have been identified, namely: River Corridors – Rivers Tyne and Don and associated tributaries, Coastal Corridor, Green Belt Corridor, Railway Mineral Lines and wherever possible these corridors should be protected and enhanced.

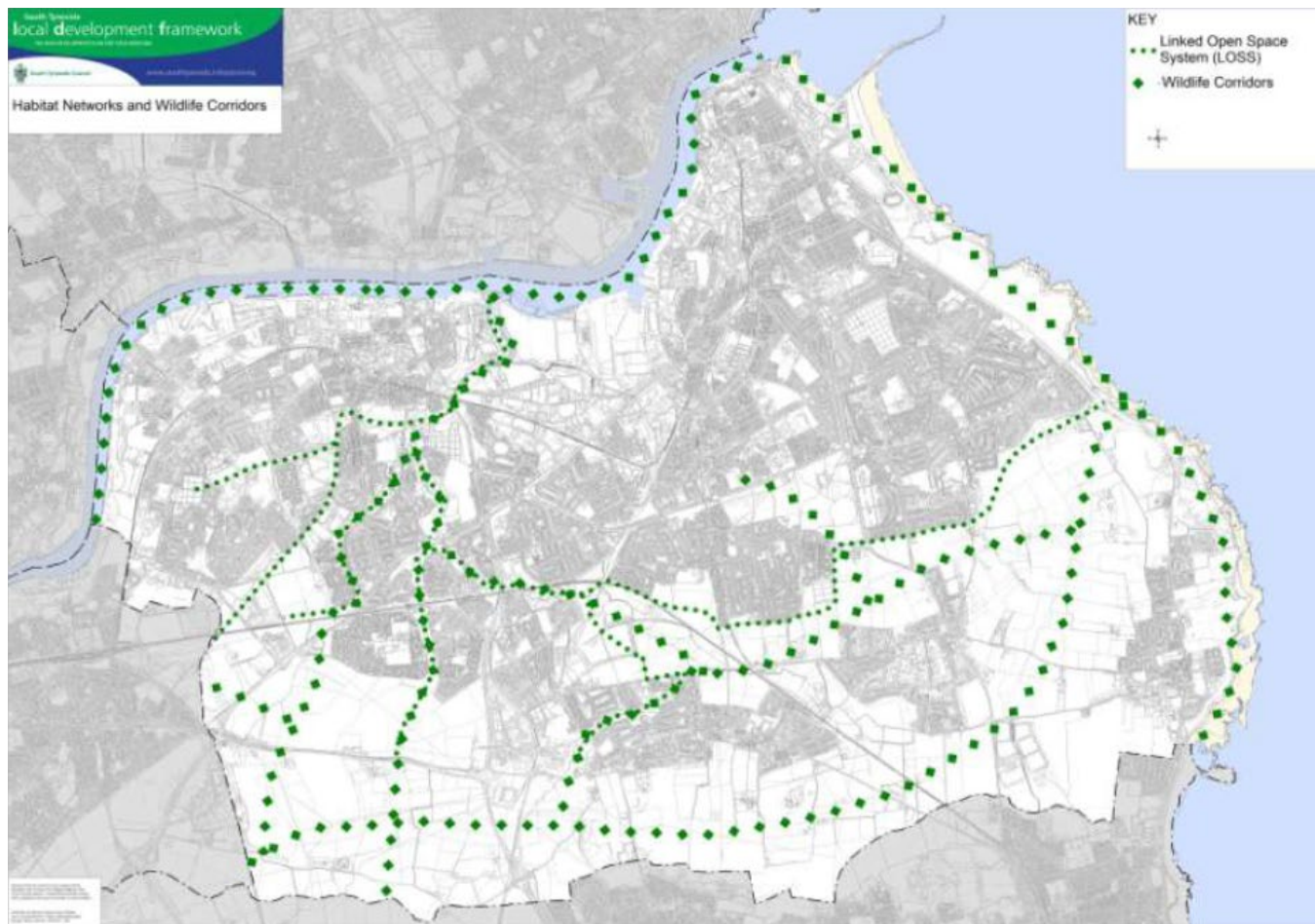
3.6.3 South Tyneside Previous Wildlife corridors

South Tyneside's wildlife corridors stem from the Tyne & Wear Conservation Strategy with the aim of linking designated sites and other areas of value to nature throughout Tyne & Wear. Nine wildlife corridors identified with their priority habitats are:

- South Pier to Trow Point – coastal sand dunes;
- Trow Point to Whitburn Steel – coastal grasslands, maritime cliffs and magnesian limestone grassland;
- Cleadon North Farm to Cleadon Hill – magnesian limestone grassland;
- Cleadon Lane to Marsden – magnesian limestone grassland;
- River Tyne – mud flats salt marsh and otter;
- Bede's World to River Tyne – mud flats salt marsh and otter;
- West Fellgate Farm to River Don – rivers and streams;
- Boldon Fellgate Farm to River Don – water vole and otter; and
- Boldon North Bridge to Bede's World – water vole and otter.

The primary corridors run east-west through the previous Green Belt between South Tyneside, Sunderland, Gateshead and Follingsby and north-south along the coast and along the Rivers Tyne and Don and its tributaries.

Figure 3.2: South Tyneside Previous (South Tyneside Council 2013)



3.7 Sunderland Biodiversity

3.7.1 Sunderland Biodiversity Overview

As a city, Sunderland has a relatively rich and varied biodiversity landscape and in terms of land cover is one of the greenest cities in the country (WYG 2018). The landscape includes coast, riverside, coastal denes and magnesian limestone grassland. Parts of the coast are internationally protected by the Northumbria Special Protection Area (SPA) and Ramsar Site, designated for its internationally important wintering birds (Turnstone and Purple sandpiper) and the Durham Coast Special Area of Conservation (SAC) designated for its species rich magnesian limestone grassland. Sunderland has 17 SSSIs (Clauxheugh Rock and Ford Limestone Quarry, Dawson's Plantation, Durham Coast, Eppleton Grassland, Fulwell Quarry and Carley Hill Quarry, Gully Law, Hastings Hill, Herrington Hill, Hetton Bogs, High Moorsley, Humbledon Hill Quarry, Hylton Castle Grassland, Joe's Pond, Moorsley Banks, South Hylton Pasture, Tunstall Hills and Ryhope Cutting and Wear River Bank.

Key habitats includes ancient semi-natural woodland, rivers and streams, ponds and wetlands, open mosaic habitats on previously developed land, semi-improved neutral and acid grassland and magnesian limestone grassland. Important key species are amphibians including great crested newt, palmate newt and smooth newt, and mammals including otter, water vole and bats. Important bird species include breeding, passage and wintering waders and wildlife including purple sandpiper, turnstone, eider, sanderling, curlew and redshank. butterflies include dingy skipper and Sunderland's key farmland bird species include skylark, grey partridge and yellow hammer.

3.7.2 Sunderland Policies and Strategies

Sunderland City Council Core Strategy and Development Plan (2015-2033):

Policy NE1 Green and Blue Infrastructure (Adopted)

'1. To maintain and improve the Green Infrastructure Network through and enhancing, creating and managing multifunctional greenspaces and blue spaces that are well connected to each other and the wider countryside, development should:

- i. *Incorporate existing and/or new green infrastructure features within their design and improve accessibility to the surrounding area;*
- ii. *Address corridor gaps and areas of weakness where feasible;*
- iii. *Support the management of existing wildlife corridors , including reconnecting vulnerable priority habitats (see policy NE2);*

- iv. *apply climate change mitigation and adaptation of measures, including flood risk and watercourse management;*
- v. *link walking and cycling routes to and through the corridors , where appropriate;*
- vi. *include and/or enhance formal and natural greenspace and blue space provision;*
- vii. *protect and enhance landscape character;*
- viii. *have regard to the requirements of the Green Infrastructure Delivery Plan and make contributions proportionate to their scale toward the establishment and on-going management; and*
- ix. *protect, enhance and restore watercourses, ponds, lakes and water dependent habitats.*

2. *Development that would sever or significantly reduce green infrastructure will not normally be permitted unless the need for and benefits of the development demonstrably outweigh any adverse impacts and suitable mitigation and/or compensation is provided.*

Sunderland City Council Core Strategy and Development Plan (2015-2033):

Policy NE2 Biodiversity and geodiversity (Adopted)

‘1. *Where appropriate, development must demonstrate how it will:*

- i. *provide net gains for biodiversity; and*
- ii. *avoid (through locating on an alternative site with less harmful impacts) or minimise adverse impacts on biodiversity and geodiversity in accordance with the mitigation hierarchy.*

2. *Development that would have an impact on the integrity of European designated sites that cannot be avoided or adequately mitigated will not be permitted other than in exceptional circumstances. These circumstances will only apply where there are:*

- i. *no suitable alternatives*
- ii. *imperative reasons of overriding public interest*
- iii. *necessary compensatory provision can be secured to ensure that the overall coherence of the Natura 2000 network of European sites is protected; and*

iv. *development will only be permitted where the council is satisfied that any necessary mitigation is included such that, in combination with other development, there will be no significant effects on the integrity of the European Conservation sites.*

3. *Development that would adversely affect a Site of Special Scientific Interest, either directly or indirectly, will be required to demonstrate that the reasons for the development, including the lack of an alternative solution, clearly outweigh the nature conservation value of the site and the national policy to safeguard the national network of such sites.*

4. *Development that would adversely affect a Local Wildlife Site or Local Geological Site, either directly or indirectly, will demonstrate that:*

- i. *there are no reasonable alternatives; and*
- ii. *the case for development clearly outweighs the need to safeguard the intrinsic value of the site;*

5. *Development that would adversely affect the ecological, recreational and/or educational value of a Local Nature Reserve that will demonstrate:*

- i. *there are no reasonable alternatives; and*
- ii. *the case for development clearly outweighs the need to safeguard the ecological, recreational and/or educational value of the site.*

6. *Development that would have a significant adverse impact on the value and integrity of a wildlife corridor will only be permitted where suitable replacement land or other mitigation is provided to retain the value and integrity of the corridor.*

Sunderland Green Infrastructure Strategy (WYG 2018)

A GI partnership defined a number of GI corridors as priority areas for GI protection and enhancement. These were fundamentally based upon the formation of wildlife corridors to connect existing nature conservation assets within greenfield areas, running around and between Sunderland's settlements and employment sites. Following industrial changes in the area major reclamation schemes particularly around former colliery areas such as Ryhope, Silkworth, New Herrington and Hetton have enabled a network of recreation and cycle routes, country parks and more formal greenspaces including parks, golf courses and allotments. However, the most deprived areas of Sunderland have the lowest quality greenspaces (WYG 2018).

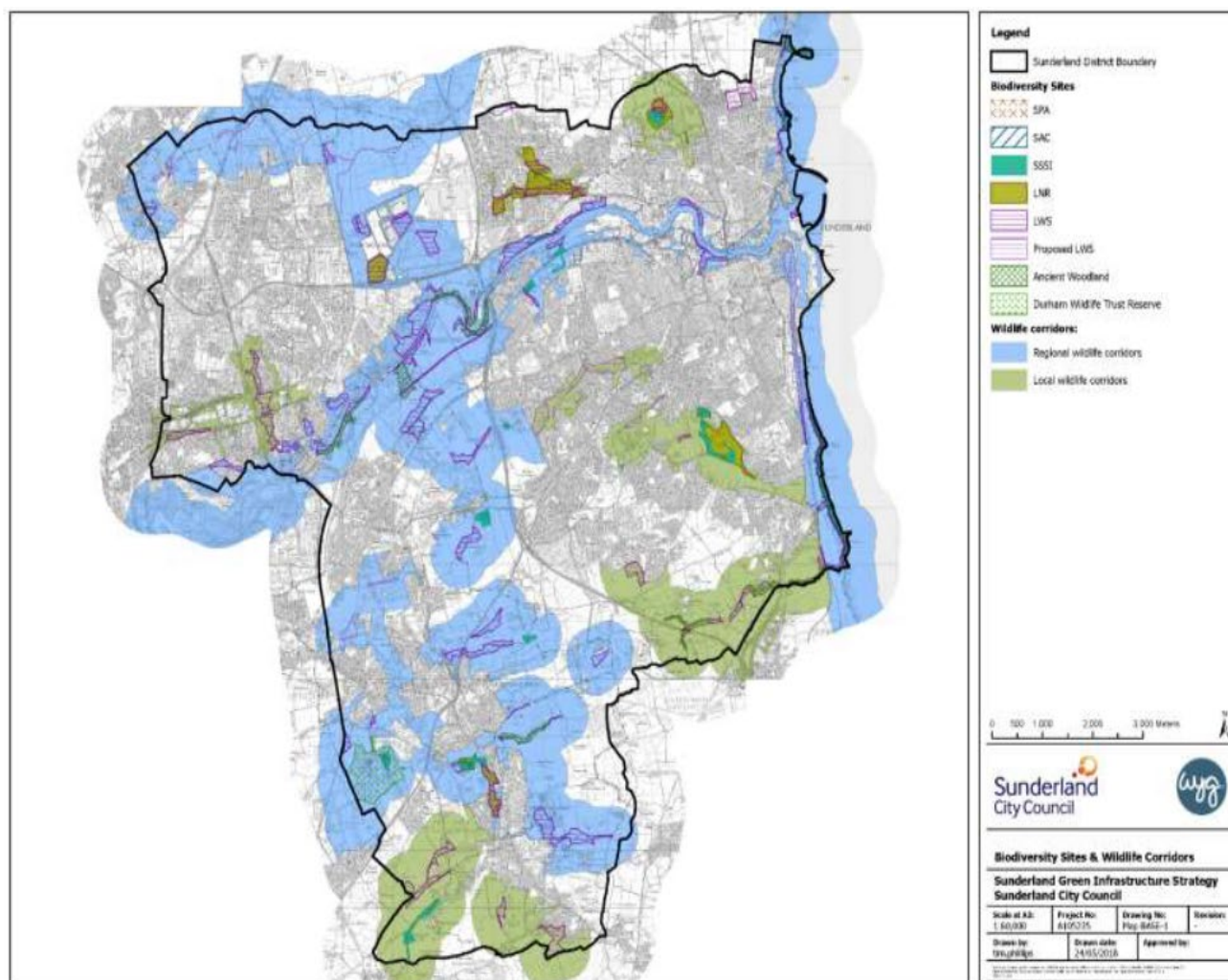
3.7.3 Sunderland Previous Wildlife corridors

Sunderland's Green Infrastructure Corridors stem originally from the 1988 Tyne and Wear Nature Conservation Strategy, where they were initially defined on a wildlife corridor basis to connect and buffer existing nature conservation sites. Originally in Sunderland 3 strategic corridors and 11 local wildlife corridors (Figure 3.1) were identified, and included broken arrow lines where improvement to corridor connectivity was needed. These were broadly incorporated into the UDP in 1998. They have since evolved, concurrently with the development of Green Infrastructure into planning policy to include a holistic view of the function that GI performs. Sunderland's Green Infrastructure Strategy (WYG 2018) describes the current wildlife corridors below within the context of the wider GI network upon which Sunderland's GI corridors are largely based.

- The GI Corridors include a 300m buffer from designated wildlife sites, to promote landscape scale wildlife corridors and habitat connectivity.
- Greenspaces within 30m of designated sites were identified and categorised in relation to their greenspace audit, combined biodiversity assessment scores which categorises greenspaces according to their likely biodiversity value. For example, mown amenity grassland scored poorly, whereas old meadows with a diversity of grasses and herbs scored highly.
- For the purposes of the GI functionality mapping, greenspaces adjacent to designated sites with low biodiversity scores were assigned more points to reflect the need and opportunity to provide biodiversity enhancements through habitat improvements to expand, buffer and connect existing wildlife sites.
- Whilst the biodiversity mapping was intended to also incorporate designated wildlife site condition scores, to identify designated sites in unfavourable and/or declining condition, it was not possible to acquire the data at the time of study.
- Greenspaces along the River Wear riparian corridor tended to have good biodiversity credentials, contributing to the value and functioning of this as a major wildlife corridor. Similarly, the Country Parks and golf courses form valued biodiversity assets, providing refuges for wildlife within the countryside and open spaces that intersperse some of the settlement breaks.

- Opportunities include areas around the Nissan Manufacturing Plant which lie close to the more valued woodland and marshy grassland habitats of Peepy, Hylton Plantation and Severn Houses which could, for example, aid populations of priority and protected species.
- Amenity spaces around Downhill and Washington Road, (bordering Hylton Dene Local Nature Reserve) and land north of St. John Bosco Roman Catholic School (south of Downhill Meadows Local Wildlife Site) also appear to offer ‘easy-wins’ in biodiversity terms. The Community North Sports Complex incorporates a network of wooded habitats around its functional sports pitches which provide opportunities to connect and extend Downhill Meadows LWS.
- Similarly, areas around the East End and Port of Sunderland have obvious potential to expand and enhance habitats associated with the open mosaic habitats along the coast; Marrying this with the Primary Employment Area allocation will be challenging and the sympathetic development of these, less ecologically valuable areas, may present a favourable alternative to development on the adjacent land of existing ecological value.

Figure 3.3: Sunderland Previous Wildlife Corridors (WYG 2018)



3.8 Strengths and weaknesses of the previous Wildlife Corridors

Based on this 2020 evidence review, the previous wildlife corridors can be considered successful in pioneering Local Plan policy safeguards to protect and enhance the wider ecology network at a landscape scale for over three decades. The success of the wildlife corridors network in terms of providing access to nature for people is demonstrated from the respective evidence bases for the Councils' Green Infrastructure strategies (Entec 2011a, 2011b; South Tyneside Council 2013; WYG 2018). However some evidence suggests that deprived areas have the lowest greenspace quality. In the case of Sunderland City this is evidenced by Sunderland's Greenspace Audit (Sunderland Green Infrastructure Strategy, WYG 2018).

A number of biodiversity conservation successes are also evident within the context of national and regional species recoveries such as Otter and more locally in terms of habitat restoration and creation.

The area of semi-natural habitat, particularly new woodland and wetland has increased (Entec 2011a) outside of main settlements and statutory designated sites during the lifetime of the wildlife corridors network through industrial land restoration and initiatives such as Great North Forest (South Tyneside Council 2013). A number of Local Wildlife Sites have been designated and there is now relatively high coverage, particularly in Gateshead which supports a greater area of semi-natural habitats such as broadleaved semi-natural woodland and river corridors compared with neighbouring Boroughs (Entec 2011a). Council owned Local Wildlife Sites are benefitting from regular monitoring and management many of which are reported by the local authorities to be in good condition.

Previous studies (South Tyneside Council 2013, Entec 2011a) show a significant proportion of Local Wildlife Sites are privately owned and many suffering from neglect and subsequent deterioration. Grasslands in particular are susceptible to permanent damage due to lack of management (South Tyneside Council 2013). A Phase 1 Habitat review in Gateshead carried out by Durkin in 2008 against habitats present in 1998 observed an overall decline in grassland quality caused by intensive grazing and loss of both brownfield and greenfield sites to development (Entec 2011a). This decline remains evident in 2020 based on both local knowledge of the landscape and examination of aerial imagery. In response to the Lawton Report the establishment of coherent and resilient ecological networks is a Local Plan requirement of the NPPF which the wildlife corridors network as a 'system based' approach has already achieved to some degree. However, whilst subject to modifications and updates over successive Local Plan reviews, the adopted wildlife corridors network pre-dates the NPPF and published guidance on establishing local ecological and wider nature networks and in some cases its delineation can be subjective and not supported by defined evidence based and robust criteria.

4 WILDLIFE CORRIDOR/ECOLOGICAL NETWORK CASE STUDIES

4.1 Case Study Review

A key objective of this evidence study is to undertake a critical review of best practice and approaches to mapping wildlife corridors elsewhere in the country. The results of the findings of the analysis will then be used to identify and refine robust criteria upon which the updated wildlife corridors network is mapped. With a focus on areas with similarities to Gateshead, South Tyneside and Sunderland, the objective is to collate examples of local authorities with defined criteria-based wildlife corridors networks and how they integrate into national and local policy and decision making.

For the purposes of this study a range examples of mapped networks from different local authority areas used to inform Local Plan making and planning decisions have been reviewed. The case studies selected are listed in Table 4.1 below.

Table 4.1: Initial desk based review of wildlife corridor/ecological networks in other local authority areas (case studies reviewed in detail are highlighted in bold)

Local Authority Area	Name of network
Barrow Borough	Wildlife corridors
Bolsover District	Wildlife corridors (Green Infrastructure network)
Bristol City	West of England Nature Recovery Network
Chichester District Council	Strategic Wildlife Corridors
Dorset County	Ecological Networks
Hampshire County	Ecological Network
Hambleton Borough	Green Infrastructure Corridors
Herefordshire County	Ecological Network
Liverpool City Region	Ecological Network
North Tyneside District Council	Wildlife Corridors
Newcastle City	Wildlife Enhancement Corridors
Shropshire County	Environmental Network
Somerset County	Ecological Network
South Ribble Borough	Wildlife Corridors
Warwickshire, Solihull and Coventry	Green Infrastructure Network
Waveney District	Green corridors

4.2 Wildlife corridors Terminology

The previous wildlife corridors network has been embedded in Local Plan policy for the three local authority areas for several years, originating from the 1988 Tyne and Wear Nature Conservation Strategy and periodically updated (e.g. Durkin 2009). The majority of the network as currently mapped and allocated pre-dates the 2019 NPPF, 25 Year Environment Plan (Defra 2018) and Environment Bill (2019-2021). It has also become evident during this study that the term ‘wildlife corridor’ has different applications and interpretations in different local authority areas both in the ecological and planning senses. For the purposes of this review the term wildlife corridors in the planning sense is interpreted as being synonymous with wider ‘local ecological networks’ described in Section 2 of this review and mapped in other local authority areas in accordance with paragraph 174 of the 2019 NPPF (Section 2.1.3).

This interpretation is not considered to be a departure from the purpose of the previous wildlife corridors network as defined by Durkin (2009) (Section 3.5.3) because they include many of the same landscape scale ‘Lawton’ components of ‘ecological networks’ as evidenced by the review of case studies summarised below.

4.3 Approach to Identification of Case Studies

Case studies were identified firstly, via existing knowledge of mapped wildlife corridors and ecological networks in other local authority areas elsewhere in the country; secondly, via a desk based search of Local Plan documents (adopted and emerging) including Local Plans, Development Plan Documents (DPDs) Supplementary Planning Documents (SPDs), planning guidance, neighbourhood plans, biodiversity, green infrastructure and landscape strategies and evidence review documents; and thirdly, through consultation with the Association of Local Government Ecologists (ALGE). Local authority areas reviewed during the initial desk study are listed in Table 4.1.

4.4 Shortlisting of Case Studies

The desk study identified examples of Local Plan and/or supporting documents which include specific policy wording (either as supporting text or within policies) and in some cases policy mapping for wildlife corridors. In many cases wildlife corridors are considered as components of wider networks either within the context of ‘ecological networks’ as required by NPPF (for example South Ribble Borough Council Local Plan, Bolsover Local Plan, Barnsley Biodiversity and Geodiversity SPD) and/or wildlife corridors are included as one of a number of functions provided by or a specific component or typology of wider green corridor/ green infrastructure networks (for example Northallerton, Brompton and Romanby Landscape & Open Space Strategy (Hambleton District); Waveney Open Space Needs Assessment).

The desk study also identified a number of local authorities which have adopted or approved county-wide ecological networks mapped by local nature partnerships as part of the evidence base for Local Plans. Examples include: Liverpool City Region Ecological Network, Shropshire Environmental Network, Somerset Ecological Network, Dorset Ecological Network, Herefordshire Ecological Network and Warwickshire, Coventry and Solihull Green Infrastructure Strategy. Case studies were then selected for detailed review based on the following criteria:

- clear documentation of approach to methodology;
- clear evidence based selection criteria and approach to mapping;
- accessibility to mapping;
- evidence of application of networks being integrated within the planning system within the context of national and local policies (adopted and emerging);
- examples of practical application to inform development management decisions; and
- geographical, ecological and development requirement similarities to Gateshead, South Tyneside and Sunderland.

The initial scope of this review was to focus on areas with similarities to Gateshead, South Tyneside and Sunderland to critically review a minimum of 5 examples of local authorities with defined criteria based wildlife corridors networks and how they integrate into national and local planning policy. A total of 7 areas were short-listed to fully represent the above case study criteria. Case studies shortlisted for further review are highlighted in bold in Table 4.1. Those selected represent both urban and rural local authority areas, include an example of networks based on habitat permeability 'Least-Cost' modelling (Chichester), areas where habitat permeability modelling existed but was discounted (Hampshire and Liverpool), and areas without modelling (Shropshire, Newcastle City and North Tyneside). All case studies analysed in detail were based on Lawton Report network components and ecological networks as defined by National Planning Policy Guidance (Section 2).

4.5 Approach to analysis of case studies

The shortlisted case studies were reviewed against a series of criteria and the analysis is presented in Tables B.1 to B.4 (Appendix B) as follows:

- **Geographical context:** Lead partners, geographical/ecological context, similarities to Gateshead, South Tyneside and Sunderland, access to methodology (Table B.2);
- **Policy context:** Main planning policy documents, supporting documents, specific Local Plan policies and inclusion of Biodiversity Opportunity Areas (potential networks, restoration areas, sustainable land use) within the network (Table B.3);

- **Network methodology and selection criteria:** Network components, data and approach to identification and mapping of the network (Table B.4); and
- **Mapping:** output, access to mapping, use of mapping within planning, limitations (Table B4).

5 CRITERIA AND METHODOLOGY

5.1 Wildlife Corridors Review Findings

The objectives of the Wildlife Corridors Review are:

- Review examples of local authorities with defined criteria-based wildlife corridors networks and how they integrate into national and local policy;
- Develop a robust set of criteria and a methodology for determining the wildlife corridors based on research and findings; and
- Based on newly formed criteria and methodology map all wildlife corridors for the local authorities.

Following the review and analysis of case studies in other local authorities (Section 4) it is evident that there is no standard recognised methodology for identifying and delineating wildlife corridors. Also, it is evident that the term ‘Wildlife Corridor’ has different meaning and application ranging from individual high quality linear habitat features such as hedgerows and river corridors to broad brush strategic landscape scale areas of land between key wildlife sties. This review has also evidenced that there has been much debate over the hierarchical importance of wildlife corridors (e.g. Catchpole 2006; Lawton et al. 2010; Crick et al. 2020) and their planning status (e.g. Entec 2011a).

What is evident is that both wildlife corridors and green corridors are a fundamental component of wider Green Infrastructure (GI) networks considered important to the wellbeing of both wildlife and people (Crick et al. 2020; Lovell et al. 2020).

Whilst the review found no standard methodology and criteria for allocating wildlife corridors, the case studies analysed (Section 4) were found to be underpinned by two common themes:

- the requirements of the *National Policy Planning Framework* (MHCLG 2019) on ecological networks; and
- ecological network principles and components described in *Making Space for Nature: A review of England’s Wildlife Sites and Ecological Network* (Lawton et al. 2010) ‘the Lawton Report’.

5.2 Establishing the baseline and data collection

Establishing the baseline for an ecological network using the Lawton principles involves identification of Core Sites, Corridors and Stepping Stones across a study area. To achieve this for the Gateshead, South Tyneside and Sunderland local authority areas, biodiversity data were collated using readily available national and local datasets.

5.2.1 Existing data

The key datasets used are listed below and were combined to form the various components of the wildlife corridors network:

- International and National Wildlife Designations (Natural England);
- Local Nature Reserves (Natural England/Local Planning Authorities);
- Local Wildlife Sites (Local Planning Authorities);
- Proposed Local Wildlife Sites (Local Planning Authorities);
- Local Geological Sites (Local Planning Authorities);
- Ancient Woodland (Natural England);
- Priority Habitats (Natural England);
- Open Mosaic Habitat/Brownfield Land (Natural England/Local Planning Authorities);
- Ponds and watercourses (Ordnance Survey);
- Non-priority woodland (Forestry Commission/Ordnance Survey); and
- Greenspace layers (Local Planning Authorities/Ordnance Survey).

Datasets were obtained in ESRI Shapefile format either via the local authorities (some datasets provided by ERIC NE under licence) or downloaded from open source data portals. They were then imported into QGIS as a series of different layers for processing. A further breakdown of these datasets is provided in Table 5.1.

Table 5.1 Gateshead, South Tyneside and Sunderland Wildlife Corridors Review Data Sources

Designated Site/habitat type	Data Source	Data provider
International designations <ul style="list-style-type: none"> • Durham Coast Special Area of Conservation (SAC) • Northumbria Coast Ramsar • Northumbria Coast Special Protection Area (SPA) 	<ul style="list-style-type: none"> • Natural England Open Data Geoportal datasets for SAC's, SPA's and RAMSAR sites. 	Natural England
Sites of Special Scientific Interest	<ul style="list-style-type: none"> • Natural England Open Data Geoportal SSSI Dataset. 	Natural England

Designated Site/habitat type	Data Source	Data provider
Local Nature Reserves	<ul style="list-style-type: none"> • Natural England Open Data Geoportal • Local Nature Reserves (England) • LNR dataset • LNR_Gateshead 	<p>Natural England</p> <p>Sunderland City Council</p> <p>Gateshead Council</p>
Local Wildlife Sites (LWS)	<ul style="list-style-type: none"> • All LWS dataset 	Sunderland City Council
Local Geological Sites	<ul style="list-style-type: none"> • LWS shapefiles • Local Wildlife Sites _Region • LWS_MSGP_Gateshead 	<p>Sunderland City Council</p> <p>South Tyneside Council</p> <p>Gateshead Council</p>
Proposed Local Wildlife Sites	<ul style="list-style-type: none"> • PLWS (Proposed Local Wildlife Site) 2017 	Sunderland City Council
Ancient Woodland	<ul style="list-style-type: none"> • Natural England Open Data Geoportal Ancient Woodland (England) Dataset • Ancient Woodland_Gateshead 	<p>Natural England</p> <p>Gateshead Council</p>
Priority Habitats	<ul style="list-style-type: none"> • Natural England Open Data Geoportal • Priority Habitat Inventory (North) (England) 	Natural England
Open Mosaic Habitat/Brownfield	<ul style="list-style-type: none"> • Natural England Open Data Geoportal • Open Mosaic Habitat (draft) version 05.07.2018. • Brownfield Land Register-Gateshead 	<p>Natural England</p> <p>South Tyneside Council</p> <p>Gateshead Council</p>
Ponds and watercourses	OS Mastermap Topography	Sunderland City Council
Greenspace layers	<ul style="list-style-type: none"> • Citywide Greenspace Audit 2020 • All Open Space_region • LWS_MSGP_Gateshead • ANGS (assessable Natural greenspace) • OS Open Greenspace 	<p>Sunderland City Council</p> <p>South Tyneside Council</p> <p>Gateshead Council</p> <p>Gateshead Council</p> <p>Ordnance Survey</p>
Infrastructure Corridors	OS Mastermap Topography*	*Sunderland City Council

* Sunderland City Council provided OS Mastermap topography layers for all three Local Planning Authority areas

5.3 Criteria

The Gateshead, South Tyneside and Sunderland wildlife corridors network is comprised of the following components:

5.3.1 Core Sites

The building blocks of an ecological network designed in accordance with the Lawton principles are referred to as ‘**Core Sites**’. These are sites of high nature conservation value that are of most importance for biodiversity in terms of sustaining wildlife populations and providing sites from which species can disperse. In consultation with the three local authorities the following designations, habitats and features were classified as ‘Core Sites’ within the Gateshead, South Tyneside and Sunderland wildlife corridors network:

- International and National wildlife designations (e.g. Special Areas of Conservation, Special Protection Areas, Ramsar Sites, Sites of Special Scientific Interest);
- Ancient Woodland (including Ancient Semi-natural Woodland and Plantations on Ancient Woodland Sites);
- Locally designated sites (including Local Wildlife Sites, Local Nature Reserves, Local Geological Sites and Proposed Local Wildlife Sites);
- Priority habitats (Habitats of principal importance listed on S41 of the NERC Act 2006); and
- Ponds and watercourses (Depending on certain criteria, ponds and watercourses can be priority habitats, however in the absence of site specific data, all ponds and watercourses are considered to be core sites).

The Core Sites component of the wildlife corridors network was created by combining the above datasets into a single layer.

5.3.2 Secondary Features and Stepping Stones

Corridors and stepping stones are habitats/features within the wider landscape that provide connectivity and permeability between core sites. As detailed within Natural England’s *Nature Networks Evidence Handbook* (Crick et al. 2020) wildlife sites within an ecological network can be connected in three main ways:

- Physically, by corridors of habitat that is similar to that found in the core sites which they connect;
- Functionally by mobile species, through the means of ‘stepping stones’ - patches of suitable habitat that are transiently used areas between two large wildlife sites; or
- Through the ‘matrix’ i.e. the land between sites, which can be more or less ‘permeable’ for the movements of species, but cannot be classed as ‘habitat’ where the organism can live and sustain itself for periods of time.

For the purposes of the Gateshead, South Tyneside and Sunderland wildlife corridors network, habitats providing physical connectivity to core sites have been referred to as **‘Secondary Features’**. Habitats that are physically disconnected from Core Sites, but which are considered likely to provide a permeability/connectivity role or act as areas of refuge have been referred to as **‘Stepping Stones’**.

The secondary features and stepping stone components of the network were mainly generated using greenspace layers/audits provided by the local authorities. The following greenspace typologies were used to identify secondary features and stepping stones:

- Semi-natural greenspace/Accessible Natural Greenspace;
- Allotments/Community Gardens;
- Cemeteries and church grounds;
- Parks and formal gardens; and
- Golf Courses

Playing fields, child play areas, and small areas of amenity grassland were excluded from the assessment based on the assumption that these habitats are generally of limited value for biodiversity. In addition, very small areas of greenspace (<0.25ha) were excluded on the basis that they are unlikely to perform any significant connectivity function. Private gardens have also been excluded and whilst they can provide important resources for biodiversity especially in an urban context it was not considered necessary to map secondary features or stepping-stones to this level of detail.

As well as greenspace information, the National Forestry Inventory together with ordnance survey mapping and aerial imagery (Google Earth Pro) were used to identify other features with connectivity potential including non-priority woodland and areas of semi-natural vegetation alongside infrastructure routes such as railway corridors .

The secondary features are considered to be of particular importance within urban areas in that they provide an important buffering and connectivity role where they fall adjacent to a core site in heavily urbanised zones.

5.3.4 Buffer zones

The final component of the Gateshead, South Tyneside and Sunderland wildlife corridors network are the buffer zones. An analysis of approaches to buffer zones is provided in Section 2.7 and individual case studies in Appendix B (Table B.3). Further to discussions with the LPAs following an analysis of buffer width approaches from the case studies (Appendix B) a 250 m buffer has been applied to all core sites (500m for international sites). This width is considered consistent with Natural England guidance (Table 2.1). Whilst some of the case studies reviewed have applied a hierarchy of buffer widths according to habitat

type and/or the site designation spatial hierarchy (e.g. North Tyneside and Shropshire [Table B.3]) it was agreed that the application of a standard buffer is more practical enabling a consistent approach to delineation of the wildlife corridors network across the Local Plan areas.

Consultation with the LPAs resulted in the buffer zones being refined further to avoid heavily urbanised areas where space was absent or only very limited (as mentioned previously, connecting secondary features play an important role in providing a buffer in urban zones). The buffer zones are therefore for the most part confined to rural/suburban areas or where space around a core site allows.

Further refinement of the buffer zones also resulted in areas of existing built development being excluded. For the Sunderland wildlife corridors network, larger sites undergoing construction, allocated sites or other sites which had already received planning permission were also removed.

Together the **core sites**, **secondary features**, **stepping stones** and **buffer zones** form the wildlife corridors network. Table 5.3 provides further breakdown of these different components.

5.4 Mapping

Core sites, **secondary features**, **stepping stones** and **buffer zones** were mapped using QGIS software (Version 3.10 A. Coruna) a free and open source geographic information system. OS Mastermap Topography was used as the base layer. This is a large-scale digital database of the detailed surface features of the landscape that is highly accurate and provides a clear picture of what is on the ground. Datasets used to generate the different layers of the network were obtained in ESRI Shapefile format and imported into QGIS processing. The layers generated and which form the components of the are detailed in Table 5.2 below. As with the previous wildlife corridors network (Section 3.3) the updated mapping has been developed having regard to ecological features and networks within the neighbouring authorities of Newcastle City and North Tyneside (along The River Tyne) and Durham and Northumberland.

Table 5.2 Layers of the for Gateshead, South Tyneside and Sunderland Wildlife Corridors Network.

Layer	Layer type	Attribute information
	Polygon	A simple layer which combines all components of the into one layer.
Core Sites	Polygon	Feature ID, Site Name, Site type, additional info, LPA, layer, Area (ha), 8 figure grid reference.
Secondary Features	Polygon	Feature ID, typology, additional info, LPA, layer, Area (ha), 8 figure grid reference.
Stepping Stones	Polygon	Feature ID, typology, additional info, LPA, layer, Area (ha), 8 figure grid reference.
Buffer Zones	Polygon	A simple layer combining all buffer zones.
Watercourses	Line	Feature ID, Theme, Descriptiv1, Descriptiv2, 8 figure grid ref, length.

Please note that overlaps exist between different core sites, for example there are many overlaps between Local Wildlife Sites and priority habitats. Only priority habitats which fall outside of international, national, local wildlife site designations and ancient woodland have been mapped. This approach was taken as priority habitats fall lower in the hierarchy in terms of the protection they receive when compared to designated sites. In addition, many of the core sites are designated on the basis of the presence of priority habitats and it was not considered necessary to duplicate this information.

Despite having different levels in terms of the hierarchy Local Nature Reserves and Local Wildlife Sites have not been excluded from each other. The main reason for this is because, despite overlaps, boundary extents can differ between the different designations and removing pieces of one designation from another could lead to confusion in terms of the extents and boundaries.

5.5 Gap Analysis

Some habitats are not shown on the mapping either due to lack of available data or being too small to show on maps e.g. species rich hedgerows and veteran trees. Where present their importance should be considered under the relevant policies within the NPPF. Similarly, if an important habitat is subsequently discovered (e.g. due to ecological surveys, local knowledge, updated datasets) then they should also be considered under the NPPF in terms of opportunities to enhance the wider network.

There are undeveloped areas within the wider landscape that fall outside of the wildlife corridor network for Gateshead, South Tyneside and Sunderland. It is recognised that farmland in particular forms part of the wider landscape through which species will be moving. Within the Lawton Report (2010) softening of the wider landscape referred to as the ‘matrix’ to make it more permeable and less hostile to wildlife is prescribed via implementation of ‘Sustainable land use areas’. It is also acknowledged that there can be overlap between these and the function of buffer zones. Within the farmed landscape softening of the matrix is usually achieved through environmentally friendly farming techniques. In the context of planning and decision making for Gateshead, South Tyneside and Sunderland, buffer zones around core sites are considered to be more relevant, therefore sustainable land use areas are not included at the current time.

5.6 Limitations

The quality of baseline information is extremely important when designing an ecological network and in this instance the network has been created based on readily available GIS data and its reliability is therefore only as good as the data provided. Some of the datasets used are several years old e.g. the Priority Habitat Inventory was created in 2013. Some inconsistencies were noted in relation to this dataset, (particularly in relation to deciduous woodland parcels) and as a result, there is reduced confidence in this data at some locations. In addition, no ground truthing or gathering of data in the field has been carried out and was beyond the scope of this review. It is therefore possible that there are occasional discrepancies between maps and what is present on the ground. The network should therefore be viewed as being dynamic and subject to periodic review and updates as new information becomes available. It should also be acknowledged that the network is likely to change over time in response to changes in land use, including (but not limited to):

- the delivery of current allocated development sites;
- the development of potential future allocated development sites;
- the designation of new protected nature conservation sites;
- the de-designation of existing protected nature conservation sites where they no longer satisfy the criteria for designation and are considered to be unrecoverable;
- changes in the distribution, extent and quality of habitats and species resulting from the delivery of biodiversity recovery measures; and
- changes in the distribution, extent and quality of habitats and species resulting from changes in agricultural practices.

Whilst at the time of production the outcome and full implications of the recent white paper on planning reform (*Planning for the Future*, Ministry of Housing, Communities and Local Government 2020), the Agriculture Bill 2019 - 21 which received Royal Assent on the 11 November 2020 to become the Agriculture Act 2020 and the anticipated Environment Bill 2019 – 2021 are not fully understood; it is considered their collective impact on the natural environment, including biodiversity and ecological connectivity, will be considerable.

Current guidance (Crick et al. 2020) advocates the application of local knowledge to the best available data when designing ecological and nature networks. These limitations mirror those for national and local policy making elsewhere and are not considered a risk to the robustness of the evidence base. It is considered that the mapping is based on the best available evidence consistent with the NPPF and is therefore considered both robust and sound.

Table 5.3 Components of the Wildlife Corridors Network and their selection criteria

Core Sites				Secondary Features	Stepping Stones	Buffer Zones
International Sites	National Sites	Local Sites	Other			
Designated as being of international importance	Designated as being of national importance	Sites of county nature conservation importance	Other sites which are not subject to designation but are of recognised importance to biodiversity.	Semi-natural habitat providing links for movement between core sites.	Patches of habitat forming areas of refuge/helping to facilitate movement across the landscape (maximum distance 1km from core areas)	Zones around core sites helping to protect them from the wider impacts of the environment.
Durham Coast Special Area of Conservation (SAC)	Sites of Special Scientific Interest (SSSI's)	Local Nature Reserves (LNR)	Ancient Woodland (including plantation on ancient woodland sites)	Semi-natural greenspace/ Accessible Natural Greenspace Linear features (e.g. hedgerows, old railway lines)	Semi-natural greenspace/ Accessible Natural Greenspace	A newly created layer whereby Core sites have been buffered to 250m (international designations to 500m). Further refinement of the buffer zones also resulted in areas of existing built development being excluded. For the Sunderland network, larger sites undergoing construction, allocated sites or other sites which had already received planning permission were also removed.
Northumbria Coast Ramsar		Local Wildlife Sites (LWS)	Priority Habitats	Allotments/Community gardens, Parks and formal gardens, Cemeteries, golf courses (categorised as 'other greenspace')	Allotments/Community gardens, Parks and formal gardens, golf courses, Cemeteries (categorised as 'other greenspace')	
Northumbria Coast Special Protection Area (SPA)		Local Geological Sites (LGS)	Ponds	Other non-priority woodland	Other non-priority woodland	

6 UPDATED MAPPING

6.1 The 2020 Wildlife Corridors Network

The updated mapping has been produced on behalf of Gateshead, South Tyneside and Sunderland Councils using both open source data and records provided under licence by ERIC Environmental Records Centre for the North East. The wildlife corridors network is made up from a series of layers incorporating different data sets based on a hierarchy of components including ‘**core areas**’ (designated sites and priority habitats) ‘**secondary features**’ (physical linkages between sites) ‘**stepping stones**’ (functionally linked habitats) and ‘**buffers**’ (250m around core sites, 500m around international sites to reduce future pressures to important wildlife sites particularly from changes in land use and climate change, and seek opportunities to enhance the network).

Wildlife sites and features mapped as part of the network can appear in more than one category. Where this is the case the higher designation takes precedence and it is categorised accordingly (for example a linear feature may be designated and therefore categorised and buffered as a ‘core site’).

It is important to highlight that not all parts of the wider ecological ‘network’ are mapped. For example, hedgerows and individual ponds may not have been included, but may still be part of the functionality of the wider network depending on their location. It should also be noted that there may be gaps within datasets and therefore some sites may not have been included that are of sufficient quality to be considered a secondary feature or stepping stone, particularly on sites with restricted access. Such sites could therefore provide opportunities to enhance the overall coherence of the network. Much of the survey data is several years old and therefore the network is dynamic and will evolve as new data becomes available. Equally, pressures on the network may change over time (e.g. invasive species or plant and animal disease or in response to climate change) and therefore the mapping should be updated accordingly to help protect and manage the resilience of the wider network.

6.2 The 2020 Wildlife Corridors Network Mapping

The mapping will be held by the individual LPAs and ERIC NE as GIS layers. Figures are included as an Annex to this document as follows:

Figure 6.1: Wildlife Corridors Network (Gateshead, South Tyneside and Sunderland);

Figure 6.2.1 Gateshead Wildlife Corridors Network (Core Sites, Secondary Features, Stepping Stones, Buffers)

Figure 6.2.2 Gateshead Wildlife Corridors Network (Core Sites and Buffer Zones);

Figure 6.2.3 Gateshead Wildlife Corridors Network (Secondary Features and Stepping Stones);

Figure 6.2.4 Gateshead Wildlife Corridors Network (Key Wildlife Species)

Figure 6.3.1 South Tyneside Wildlife Corridors Network (Core Sites, Secondary Features, Stepping Stones, Buffers)

Figure 6.3.2 South Tyneside Wildlife Corridors Network (Core Sites and Buffer Zones);

Figure 6.3.3 South Tyneside Wildlife Corridors Network (Secondary Features and Stepping Stones);

Figure 6.3.4 South Tyneside Wildlife Corridors Network (Key Wildlife Species);

Figure 6.4.1 Sunderland Wildlife Corridors Network (Core Sites, Secondary Features, Stepping Stones, Buffers);

Figure 6.4.2 Sunderland Wildlife Corridors Network (Core Sites and Buffer Zones);

Figure 6.4.3 Sunderland Wildlife Corridors Network (Secondary Features and Stepping Stones);

Figure 6.4.4 Sunderland Wildlife Corridors Network (Key Wildlife Species).

6.3 Public Access to the wildlife corridors network

Whilst many of the sites included within the wildlife corridors network provide ready access to nature for a wide range of users including country parks and nature reserves a number of sites are privately owned with no public access. The emphasis of the wildlife corridors network is about providing movement for wildlife rather than movement for people and therefore does not equate to a right of access.

7 THE WILDLIFE CORRIDORS NETWORK AND PLANNING

7.1 Planning Policy

The wildlife corridors network as mapped, together with local knowledge and other relevant data (e.g. individual species surveys) enables the local authorities to demonstrate compliance with the relevant paragraphs of the 2019 NPPF:

- Paragraph 8c: Sustainable Development;
- Paragraph 20d: Conservation of the natural environment;
- Paragraph 118: Encouraging multiple benefits and opportunities to achieve environmental gains;
- Paragraph 170: Protection of biodiversity sites, recognition of benefits of natural capital and ecosystem services and providing biodiversity net gains;
- Paragraph 171: Allocation of land with least environmental value, maintaining and enhancing networks of habitats, planning of enhancement of natural capital at a landscape or catchment scale across local authority boundaries;
- Paragraph 174: Identifying, mapping and safeguarding habitats and wider ecological networks including the hierarchy of international, national and local sites and the wildlife corridors and stepping stones between them; promotion of priority habitats and ecological networks, pursuing opportunities for measurable biodiversity net gains; and
- Paragraph 175: Determining planning applications relating to biodiversity and habitat including irreplaceable habitats

As mapped, the wildlife corridors network is also compliant with and continues to achieve the relevant Local Plan policies (Section 3) of each of the authorities. The mapped network serves as both the updated wildlife corridors network and is consistent with the NPPF and published guidance as a local ‘ecological network’ which will in turn serve as the evidence base for the Councils’ future work on nature recovery and biodiversity gain (Section 7.4 and Section 8.2).

7.2 Use of the Wildlife Corridors Network in Local Plans

It is recommended that, as well as using the network as an evidence base to inform development planning decisions, the wildlife corridors network continues to be safeguarded in Local Plan policies mapping as well as within strategic policies. The wildlife corridors network as mapped is consistent with Paragraph 174 of the 2019 NPPF and based on the best available data and therefore considered a robust and sound tool for allocation policies in Local Plans.

The wildlife corridors network can also inform land use decisions outside allocations through local and national policy safeguards thus adding to the enhancement of coherence and resilience of the network throughout the plan period (e.g. through the appropriate location of GI provision and prioritising opportunities for biodiversity offsetting and net gain as informed by the future statutory Local Nature Recovery Strategy (LNRS) [Section 7.4]).

7.3 Use of the Network for Development Management

In addition to informing Local Plans, the wildlife corridors network provides a sound evidence base for master planning including neighbourhood planning, as well as for designing and determining individual planning proposals. This will ensure that planning proposals can be designed in a way that contributes to the protection and enhancement of a coherent and resilient network and thus supports nature recovery.

Applications that fall outside of the network should still be subject to screening for biodiversity potential in accordance with the NPPF paragraph 175 and the relevant wildlife legislation on protected species and habitats. Where there is evidence of high biodiversity quality not mapped within the network (for example sites with hedgerow networks and individual ponds that fulfil ‘secondary feature’ or ‘stepping stone’ criteria set out in Table 5.3) such sites could provide opportunities to enhance the coherence and resilience of the network and should be considered accordingly.

Areas mapped within the network outside of statutory designated sites at the time of writing have no legal designation other than the protected species that are present and their habitats, or if they are functionally linked to a habitats site (such as SAC, SPAs and Marine sites included within regulation 8 of the Conservation of Habitats and Species Regulations 2017 [as amended]). The network is evidence based and consistent with current guidance therefore weight can be given to those areas of the wildlife corridors network accordingly.

Existing local policies require that proposals affecting wildlife corridors must be accompanied by appropriate mitigation and enhancement measures according to the mitigation hierarchy². This local policy provision would equally apply to the updated wildlife corridors network. More stringent safeguards would apply to parts of the network falling within core sites consistent with the site designation hierarchy. Other parts of the network where development would be less constrained (e.g. development within buffer zones) can contribute towards the enhancement of the network.

2 The biodiversity ‘mitigation hierarchy’ as set out in [NPPF paragraph 175 a](#)

7.4 Local Nature Recovery Strategies (LNRS)

Under the Environment Bill (Section 2.3) the Secretary of State is required to appoint a responsible authority (which includes local authorities and Natural England) to lead on the production of a Local Nature Recovery Strategy (LNRS). Each LNRS will be required to identify biodiversity priorities and opportunities in terms of habitats and species, for recovering or enhancing biodiversity whilst taking into account the contribution these priorities can make to other environmental benefits (such as carbon sequestration, flood management, soil and water quality). Local Nature Recovery Strategies will be a key vehicle to implement mandatory biodiversity net gain through the planning system as well as linking to the targeting of other funding streams including the new Environmental Land Management Scheme (ELMS). LNRSs will also be used to deliver local nature networks consistent with the Government's aim to deliver the Nature Recovery Network included in the Government's 25 Year Environment Plan.

Under the Environment Bill, there will also be a statutory requirement on responsible bodies to publish reporting on biodiversity gains delivered and planned through the planning system. The wildlife corridor network can therefore be taken forward as a key evidence tool to inform the spatial nature recovery strategies which in turn will need to be reflected within each authority's Local Plan.

7.5 Planning White Paper 2020

At the time of writing the National Planning Policy Framework (MHCLG, 2019) is expected to be revised during 2021 when new planning legislation comes into force following the Government's White Paper *Planning for the Future* (MHCLG, August 2020) on planning reform. The White Paper proposes a new approach to Local Plan making and a focus on simplifying land use plans which should first identify land for development and sites that should be protected, and second to be clear about the type of development that can take place in those areas.

Under current White Paper proposals the new style Local Plans would comprise an interactive web based map and areas and sites would be annotated and colour coded as either *Growth*, *Renewal* or *Protected*.

Areas that are *Protected* would justify more stringent controls than areas identified for *Growth* and *Renewal* and will include statutory designated sites such as Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs) and non-statutory sites such as Local Wildlife Sites. For protected areas the plan key and accompanying text would explain what is permissible by cross reference to the revised NPPF. The Planning White Paper proposes the National Planning Policy Framework (NPPF) would become the primary source of policies for development management.

It is assumed for the purposes of this review that 2019 NPPF guidance on the protection and enhancement of wildlife networks will continue.

8 RECOMMENDATIONS FOR FUTURE WORK

8.1 Green Infrastructure

Whilst not all parts of the wildlife corridors network are open to the public with many areas being on private land, a number of publicly owned or managed wildlife sites are important for providing access to nature for people to improve health and wellbeing particularly for those living in urban areas. This has been most recently evidenced during a surge in people visiting parks, beaches and nature reserves during the Covid 19 pandemic by a range of studies reviewed by Natural England as part of *A rapid scoping review of health and wellbeing evidence for the Framework of Green Infrastructure Standards* (Lovell et al., 2020). The existing and emerging local policies protecting and enhancing the wildlife corridors network should continue to contribute to the wider benefits of Green Infrastructure for communities and neighbourhoods.

8.2 Nature Recovery Networks and Biodiversity Opportunity Areas

Components of ecological networks as described by the Lawton Report and Natural England's Nature Networks Evidence Handbook guidance that have not been mapped are 'Restoration Areas' and 'Sustainable Land Use Areas'. These were considered too wide ranging for the purposes of Local Plan policy mapping, and this is evidenced by the case study reviews. Often described as 'Biodiversity Opportunity Areas' these are particularly important for increasing the resilience of the ecological network, including in response to climate change. Biodiversity Opportunity areas can be used to help identify potential areas for delivering biodiversity gain through the planning system. Local habitat maps identifying opportunities for recovering or enhancing biodiversity form part of local nature recovery strategies included in the Environment Bill (Section 2.3). Biodiversity/Habitat Opportunity mapping will therefore be a key component of designing the local Nature Recovery Network building on the foundation of the wildlife corridors network. Biodiversity priorities and opportunity areas will need to be identified working with partner organisations and stakeholders as part of the Local Nature Recovery Strategy (LNRS) and Nature Network design process in accordance with national guidance (Crick et al. 2020).

8.3 Additional Data for Nature Recovery Network Mapping

Based on published guidance (Crick et al. 2020) the following data sets can be incorporated into the wildlife corridor mapping as part of the biodiversity component of the Nature Recovery Network:

- [Landscape Character Areas](#)
- [National Habitat Networks Mapping](#) (Natural England)

- Key species areas
- Habitat and species connectivity
- Geology and Soils
- Natural processes
- Ecosystem services
- Historic Environment mapping
- Social-cultural mapping
- Stakeholder mapping

8.4 Monitoring and Review

The mapping methodology has been designed so that data can be added to the wildlife corridors network as new data becomes available. Some site survey data is now several years old, particularly data relating to Local Wildlife Sites and Priority Habitats. Funding opportunities to re-survey existing and potential wildlife sites, given their importance to the coherence of the network outside of protected sites should be a priority. Other survey data gaps include hedgerow survey and mapping could be added to the mapping of the wider local nature recovery network. The survey and mapping of important roadside verges and agricultural land supporting important farmland bird assemblages should also be considered as part of the local nature recovery network together with the wider environmental benefits (e.g. flood management, soil quality) these areas could support.

9 CONCLUSION

As well as providing a robust evidence base for informing Local Planning decisions, this comprehensive review and the resulting mapping of the wildlife corridors network, provides the framework for Gateshead, South Tyneside and Sunderland Councils to achieve Local Plan policies and NPPF requirements relevant to the establishment, protection and enhancement of coherent and resilient ecological networks.

The network mapping will also be a key tool for informing and developing local nature recovery strategies (LNRS) included in the Environment Bill and for prioritising where biodiversity gains are best delivered to achieve the greatest benefits for nature recovery. The mapping output from this review is based on the best available evidence consistent with published guidance and the 2019 NPPF and is considered sound and robust.

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11 ABBREVIATIONS

Table 11.1 List of Abbreviations

Abbreviation	
ALGE	Association of Local Government Ecologists
AONB	Area of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
BARS	Biodiversity Action Reporting System
BNG	Biodiversity Net Gain
BOA	Biodiversity Opportunity Area
CBA	Core Biodiversity Area
CDC	Chichester District Council
CSUCP	Core Strategy and Urban Core Plan
DLNP	Dorset Local Nature Partnership
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ERIC North East	Environmental Records Information Centre North East
GIS	Geographical Information System
HIPS	Heathland Infrastructure Projects
LDF	Local Development Framework
LCR	Liverpool City Region
LEN	Local Ecological Network
LNP	Local Nature Partnership
LNR	Local Nature Reserve
LNRS	Local Nature Recovery Strategy
LPA	Local Planning Authority
LWS	Local Wildlife Site
MBG	Merseyside Biodiversity Group
MCZ	Marine Conservation Zone
NEENP	North East England Nature Partnership
NIA	Nature Improvement Area
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
OS	Ordnance Survey
PAWS	Planted Ancient Woodland Site
RIGS	Regionally Important Geological Site
RNWAS	Restored Native Woodland on Ancient Site
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SANGS	Suitable Alternative Natural Greenspace

SEcN	Shropshire Ecological Network
SLCI	Site of Local Conservation Interest
SEN	Shropshire Environmental Network
SNCI	Site of Nature Conservation Importance
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UA	Unitary Authority
WEC	Wildlife Enhancement Corridor

12 APPENDICES

Appendix A: Durham Biodiversity Action Plan Priority Habitats and Species (updated 2016)

Table A.1 Durham Biodiversity Action Plan Priority Habitats

DURHAM BIODIVERSITY ACTION PLAN LOWLAND PRIORITY HABITATS
Source: Biodiversity Priorities (neenp.org.uk)
Woodland Habitats:
<ul style="list-style-type: none">• Native Hedgerows• Veteran Trees, Parkland and Wood Pasture• Woodland and Scrub (Ancient Semi-Natural Woodland including PAWS and RNWAS, Other Broadleaf Woodland, Wet Woodland Scrub)
Wetland Habitats:
<ul style="list-style-type: none">• Ponds, Lakes & Reservoirs• Lowland Fen (Reedbed, Lowland Fen habitats)• Rivers and Streams (Floodplain, Grazing Marsh, Exposed Riverine Sediments)
Lowland Habitats:
<ul style="list-style-type: none">• Brownfield Sites• Built Structures• Coastal Habitats (Marine Grassland, Coastal Soft Cliffs and Slopes, Strandline)• Lowland Heath (Acid Grassland)• Lowland Meadows & Pasture• Magnesian Limestone Grassland (CG8 Grassland)• Transport Corridors• Waxcap Grassland

Table A.2 Durham Biodiversity Action Plan Priority Species

DURHAM BIODIVERSITY ACTION PLAN PRIORITY SPECIES
Source: Biodiversity Priorities (neenp.org.uk)
BIRDS
<ul style="list-style-type: none">• Barn Owl• Coastal Birds (Roseate Tern, Little Tern, Sanderling, Purple Sandpiper, Dunlin, Redshank, Lapwing, Curlew, Avocet, Cormorant, Fulmar, Golden Plover, Kittiwake, Razorbill, Ringed Plover, Shelduck, Turnstone).• Farmland Birds (Corn Bunting, Linnet, Tree Sparrow, Skylark, Reed Bunting, Yellow Wagtail, Lapwing, Curlew, Snipe, Redshank, Peregrine, Cuckoo, Grasshopper Warbler, Grey Partridge, Kestrel, Mistle Thrush, Swallow, Yellowhammer).• Nightjar.• potted Flycatcher.• Upland Birds (Black Grouse, Hen Harrier, Merlin, Yellow Wagtail, Curlew, Snipe, Redshank, Lapwing, Golden Plover)
Urban and Garden Wildlife:
<ul style="list-style-type: none">• House Sparrow, Starling, Song Thrush, House Martin, Swift
Ponds Lakes and Reservoirs:
<ul style="list-style-type: none">• Black-necked Grebe, Little Ringed Plover, Pochard
Lowland Fen Action Plan:
<ul style="list-style-type: none">• Reed Bunting, Bittern
Rivers & Streams Action Plan:
<ul style="list-style-type: none">• Grey Wagtail
Woodland and Scrub Action Plan:
<ul style="list-style-type: none">• Spotted Flycatcher, Marsh Tit, Lesser Redpoll, Pied Flycatcher, Red Kite, Tree Pipit, Willow Warbler, Willow Tit, Woodcock
FISH
<ul style="list-style-type: none">• Freshwater Fish (Eel, Salmon, Wild Brown Trout)
HERPETILES
<ul style="list-style-type: none">• Grass Snake• Great Crested Newt• Reptiles (Adder, Common Lizard, Slow Worm)
INVERTEBRATES
<ul style="list-style-type: none">• Chalk Carpet moth• Cistus Forrester• Dark Green Fritillary

DURHAM BIODIVERSITY ACTION PLAN PRIORITY SPECIES

Source: [Biodiversity Priorities \(neenp.org.uk\)](https://neenp.org.uk)

INVERTEBRATES Cont.d

- Glow Worm
- Grayling
- Least Minor moth
- Mud Snail
- Northern Brown Argus
- Small-Pearl bordered fritillary
- White-clawed Crayfish
- White-letter Hairstreak

MAMMALS

- Badger
- Bats
- Brown Hare
- Dormouse
- Harvest Mouse
- Hedgehog
- Otter
- Pine Marten
- Polecat
- Red Squirrel
- Water Vole
- Water Shrew

PLANTS

- Black Poplar
- Juniper
- Pale Bristle-Moss
- Yellow Marsh Saxifrage

Appendix B: Local Planning Authority Wildlife Corridors /Ecological Network Case Study Analysis

Table B.1 Local Planning Authority Wildlife Corridors/Ecological Network Case Studies Reviewed- Overview

Table B.2 Wildlife Corridors/Ecological Network Case Studies: Policy Context

Table B.3 Wildlife Corridors/Ecological Network Case Studies Network: Methodology and Criteria

Table B.4 Case Studies: Mapping

Table B.1 Local Planning Authority Wildlife Corridors/Ecological Network Case Studies Reviewed- Overview

	Local Authority Area (s)	Name of Network	Lead Body/partners	Geographical/Ecological Context	Similarities of area to Sunderland, Gateshead, South Tyneside	Access to written methodology
1	Chichester District Council (CDC)	Chichester District Council Strategic Wildlife Corridors	Chichester District Council Sussex Biodiversity Partnership	Chichester District is located on the south coast in the county of Sussex. The District plan covers those areas outside of the South Downs National Park. The District itself (both within and outside the plan area) has a number of designated sites including 10 European sites, 38 SSSIs and 130 LWS.	Comparatively richer in biodiversity. Similarities with Gateshead, South Tyneside and Sunderland in view of Chichester's housing requirements (12,350) during emerging plan period within the non-designated parts of the landscape of similar scale and nature to Gateshead (11,000), South Tyneside (7,000) and Sunderland (13,410) [based on respective adopted plans (Sunderland and Gateshead) and emerging (South Tyneside) Local Plans.	Chichester District Council Strategic Wildlife corridors Local Plan Review Background Paper December 2018 Appendix 1 – Forest Research Methodology
2	Dorset Council; Bournemouth, Christchurch Poole Council	Dorset Ecological Networks Dorset Higher Potential Ecological Networks	Dorset Local Nature Partnership: Dorset Environmental Records Centre , Dorset AONB, Dorset Council, Dorset Wildlife Trust; Natural England, BCP Council	Dorset Local Partnership area covers the Dorset Council Unitary Authority area [previously East Dorset, North Dorset, Purbeck, West Dorset, Weymouth & Portland] which is predominantly rural and Bournemouth, Christchurch and Poole Council Unitary Authority Area (predominantly urban). The two new authorities were formed in 2019. The area is biodiversity rich with a number of designated sites.	Dorset is largely rural however there are close similarities with the newly formed Bournemouth, Christchurch and Poole Unitary Authority. BCP is the 9 th largest Unitary Authority in the country by population with 400,000 residents, 6 miles of beaches 14 miles of riverside and 2 natural harbours. Constrained by both greenbelt and coast, there are large development pressures on the BCP area based on current plan new housing requirements (Bournemouth 14,600; Poole 14,200 and Christchurch 8,490).	Dorset Ecological Networks Guidance (Dorset LNP, October 2020)

	Local Authority Area (s)	Name of Network	Lead Body/partners	Geographical/Ecological Context	Similarities of area to Sunderland, Gateshead, South Tyneside	Access to written methodology
3	Hampshire County Council (plus 15 local authorities)	Hampshire Ecological Network	Hampshire Local Nature Partnership Hampshire Biodiversity Information Centre	The network mapping covers the administrative county of Hampshire which includes 11 district councils, 2 unitary authorities, New Forest National Park and part of South Downs National Park.	Hampshire is a coastal county with a high number of international sites including River Itchen SAC, New Forest SAC, Solent Maritime SAC, Thames Basin Heaths SPA. Is considered by the BAP for Hampshire one of the most wildlife rich areas of the country with examples of key species including Brent Goose, Water vole and Nightjar. Hampshire County Council population figures confirm the County has the highest population in the UK -1.85 million including Portsmouth and Southampton (compared with 1.1 million for former Tyne & Wear) with significant development pressure. Projected housing need figures are calculated at 4,160 homes per year to 2036 in the South Hampshire Partnership Area (covering South Hampshire LPAs excluding Test Valley, Winchester City and East Hampshire)	Mapping the Hampshire Ecological Network (Hampshire Biodiversity Information Centre, March 2020)

	Local Authority Area (s)	Name of Network	Lead Body/partners	Geographical/Ecological Context	Similarities of area to Sunderland, Gateshead, South Tyneside	Access to written methodology
4	Liverpool City Region: Halton Borough Council, Knowsley Council, Liverpool City Council, St Helen Council, Sefton Council, Wirral, West Lancashire Borough Council	Liverpool City Region Ecological Network	Merseyside Environmental Advisory Service (Local Environmental Records Centre)	<p>Liverpool City Region is a Combined Authority formed in 2010 bringing together Liverpool City Region's six local authorities.</p> <p>The area is of international importance to overwintering water birds (over 0.5 million birds) dependant on estuaries and coasts. Inland water courses and wetlands are considered crucial in linking habitats and species populations. Drier habitats including Ancient semi-natural woodland, lowland heath and grassland are often found in small patches and highly fragmented.</p> <p>The Core Biodiversity area covers 36.5% of the City Region (20.5% land area) including Ramsar (14,860ha,) SPAs (16, 560 ha) SACs (10, 260 ha Habitats of Principal Importance (28,424 ha and 815km linear habitats) and Priority BAP Habitats (7,153 ha).</p>	<p>Coasts and estuaries are key strategic ecological assets with ongoing threats from a number of directions including coastal squeeze from changes in climate and development pressure.</p> <p>Watercourses and wetlands have been seriously affected by last century's demand for economic growth with many being classed as 'Heavy Modified' under the Water Framework Directive.</p> <p>In similarity to Gateshead, South Tyneside and Sunderland, highly fragmented grasslands are the most vulnerable habitats to change of use from development pressure, changes in management, or poor management. Like Gateshead, South Tyneside and Sunderland there have been increases in woodland cover - around 8% increase due to the success of the Mersey Forest.</p> <p>Population size LCR is comparable (1.5 million (6 districts)) with the former Tyne & Wear combined area (1.1 million (5 districts)) and with higher projected new homes requirements over 25 years (3,423 per annum for Liverpool City alone) according to the Region's Housing and Employment Land Market Assessment (SHELMA) 2017</p>	<p>Liverpool City Region Ecological Network Report</p> <p>Liverpool City Region Ecological Network User Guide</p>

	Local Authority Area (s)	Name of Network	Lead Body/partners	Geographical/Ecological Context	Similarities of area to Sunderland, Gateshead, South Tyneside	Access to written methodology
5	Newcastle City Council	Newcastle's Wildlife Enhancement Corridors	Newcastle City Council	<p>Newcastle has 5 SSSIs (comprising Lowland Bog, Fen, Marsh, Swamp and Neutral Grassland) and 6 LNRs owned and managed by the City Council. The majority of southern Newcastle is predominantly developed interspersed with areas of amenity grassland. The Town Moor, located in the centre of Newcastle, provides a large extent of semi-improved neutral grassland. To the north the majority of land is arable with areas of improved and poor semi-improved neutral grassland.</p> <p>The Denes comprise four areas of Ancient Semi-natural Woodland (ASNW) along with Gosforth Woods and Prestwick Carr. Other habitats include hedgerows, ponds, water courses, plantation woodland, marshy grassland and scrub and trees throughout the City. 12 Key species are identified in the Newcastle and North Tyneside joint BAP including Dingy skipper, Otter, Farmland Birds, Hedgehog, Bumblebees and Brown Hare.</p>	<p>Newcastle City is a neighbouring authority to Gateshead separated by the River Tyne and one of the five boroughs along with Sunderland, South Tyneside, Gateshead and North Tyneside within the Tyne & Wear conurbation.</p> <p>The City is very similar to Gateshead, South Tyneside and Sunderland with a relatively dense population of 292,000 (2010). This compares with Sunderland (278,000), South Tyneside (148,000) and Gateshead (202,500)</p> <p>Newcastle shares a joint Core Strategy and Urban Core Plan with Gateshead Council.</p> <p>Housing requirements for the City within the current Local Plan (2010-2030) are 21,000 compared with Sunderland (13,410) South Tyneside (7,000) and Gateshead (11,000).</p>	Newcastle's Wildlife Enhancement Corridors (Supporting Evidence no. 171 (SD) for Planning for the Future - Core Strategy and Urban Core Plan for Gateshead and Newcastle)

	Local Authority Area (s)	Name of Network	Lead Body/partners	Geographical/Ecological Context	Similarities of area to Sunderland, Gateshead, South Tyneside	Access to written methodology
6	North Tyneside Council	North Tyneside's Wildlife corridors	North Tyneside Council	2 sites of Special Scientific Interest (SSSIs), 28 Local Wildlife Sites, 7 Local Nature Reserves and 30 Sites of Local Conservation Interest, Ramsar and SPA site. North Tyneside Coquet to St Mary's Marine Conservation Zone (MCZ)	<p>North Tyneside is a coastal neighbouring authority to South Tyneside separated by the River Tyne and one of the five Districts, along with Sunderland, South Tyneside, Gateshead and Newcastle City, within the Tyne & Wear conurbation.</p> <p>The Borough is very similar to Gateshead, South Tyneside and Sunderland with a relatively dense population of 201,000 (2011). This compares with Sunderland (278,000), South Tyneside (148,00) and Gateshead (202,500)</p> <p>Housing requirements for North Tyneside are higher for the current plan period, requiring 16,593 homes, compared with Sunderland (13,410) South Tyneside (7,000) and Gateshead (11,000).</p>	North Tyneside Council Green Infrastructure Strategy
7	Shropshire County	Shropshire Environmental Network	Shropshire County Council	Around 23% of the County is part of the Shropshire Hills AONB. NNRs, SSSIs and non-Statutory Wildlife Sites cover 6% of the land area and 7% of the land area is woodland with a higher than average proportion of ancient woodland.	<p>Shropshire is a rural county with a population of 320,000 with a low population density.</p> <p>The housing requirement for Shropshire is around 30,800 dwellings (2016-2038).</p>	Shropshire Council Environmental Networks Shropshire Environmental Network User Guide

Table B.2 Wildlife Corridors/Ecological Network Case Studies: Policy Context

	Local Authority Area (s)	Name of Network	Policy Documents	Supporting Documents	Local Policies	NPPF	Lawton Review Guidance	Biodiversity Opportunity Mapping
1	Chichester District Council	Chichester District Council Strategic Wildlife corridors	Local Plan 2014-2029 Local Plan Review 2035	Strategic Wildlife corridors Local Plan Review Background Paper	Policy S40 Strategic Wildlife corridors (Emerging) Policy DM29 Biodiversity (Emerging)			Mapped but not used as selection criteria for strategic wildlife corridors as found to be too broad for policy mapping (S Evans pers. Comm.) BOAs included as supporting evidence for LP Review.
2	Dorset Council (Unitary Authority) Bournemouth Poole Christchurch Council (Unitary Authority)	Dorset Ecological Networks	Dorset Council emerging Local Plan BPC emerging Local Plan Individual LDP plans relevant during new UA plan making	Dorset Ecological Networks Guidance Document (Dorset LNP, October 2020)	Dorset LNP recommends specific new Local Plan policies to retain and enhance the ecological network wider than current wildlife corridors , steppingstones and biodiversity outside designated sites			Mapped separately as 'Higher Potential Ecological Networks' to target future restoration or to improve connectivity
3	Hampshire County Council (plus 15 local authorities)	Hampshire Ecological Network	Individual LPA adopted and emerging Local Plans.	Mapping the Hampshire Ecological Network (Hampshire Biodiversity Information Centre, March 2020) South Hampshire Green Infrastructure Implementation Plan	The network mapping has been developed in consultation with each of the Local Planning authorities. Examples of specific emerging Local Plan policies include Pre-Submission Havant Borough Local Plan Policy E14 (the Ecological Network) .			BOAs have been mapped in consultation with stakeholders. BOAs considered too broad brush for defining ecological networks for use in planning at the local scale, plus excluded large parts of the county. A more precise delineation of the network is required and BOAs is retained as part of the 'strategic ecological network'(HBIC 2020)

	Local Authority Area (s)	Name of Network	Policy Documents	Supporting Documents	Local Policies	NPPF	Lawton Review Guidance	Biodiversity Opportunity Mapping
4	Liverpool City Region (Combined Authority) Halton Borough Council, Knowsley Council, Liverpool City Council, St Helen Council, Sefton Council, Wirral, West Lancashire Borough Council	Liverpool City Region Ecological Network	Individual LPA adopted and emerging Local Plans.	Liverpool City Regional Ecological Network Framework Liverpool City Region Ecological Network Final Report	LCR Ecological Network formally approved by the six heads of planning plus West Lancashire Borough Council as the evidence base for their Local Plans. Specific biodiversity policies e.g. Halton Borough Council emerging Local Plan policy HE1: Natural Environment			Nature Improvement Areas are defined as large, discrete areas that are intended to deliver a step change in nature conservation, offer significant improvements for wildlife and people through sustainable use of natural resources, provide opportunities to restore and create wildlife habitats and enhance connectivity between local sites. NIA mapping is based on Natural England Guidance (2012).
5	Newcastle City	Newcastle's Wildlife Enhancement Corridors	Core Strategy and Urban Core Plan 2010-2030	Newcastle City Council Green Infrastructure Delivery Framework	Core Strategy and Urban Core Plan 2010-2030 Policy CS18: Green Infrastructure and the Natural Environment Policies NC1.4 NC1.5: Protection of Wildlife corridors (Saved 2007 policies)			Biodiversity creation areas are identified within Newcastle's Wildlife Enhancement Corridors as 'Low Biodiversity Value' (Red) habitats where 'Priority will be to create and restore new habitat within these areas.'

	Local Authority Area (s)	Name of Network	Policy Documents	Supporting Documents	Local Policies	NPPF	Lawton Review Guidance	Biodiversity Opportunity Mapping
6	North Tyneside Council	North Tyneside's Wildlife Corridors	North Tyneside Local Plan 2017-2032	North Tyneside Green Infrastructure Strategy	Local Plan Policy DM5.7 wildlife corridors S5.4 Biodiversity and Geodiversity DM5.5 Managing effects on Biodiversity and Geodiversity			No specific BOA mapping. Biodiversity Asset Buffers and Strategic Wildlife Routes are both mapped within the Green Infrastructure Strategy as part of the wider Wildlife corridors network. These are considered important for their linkage value to the wider environment and not necessarily for their intrinsic ecological value. They indicate the major open passageways between and into open areas.
7	Shropshire County	Shropshire Environmental Network	Emerging Local Plan 2016-2038	Shropshire Council Environmental Networks	Core Strategy Policy CS17 Emerging: DP15			Identified in mapping as Restoration Areas and Sustainable Land Use Areas.

Table B.3 Wildlife Corridors/Ecological Network Case Studies Network: Methodology and Criteria

	Name of Network	Network components/ selection criteria	Methodology
1	Chichester District Council Strategic Wildlife Corridors	<ul style="list-style-type: none"> • Chichester Harbour SPA • LWS • Ancient Woodland • Bat Records • Protected Species Records • Rare Species Records Notable Bird Records • Bat Network (including treelines, hedgerows and partials of woodland used by bats) (least-cost model output) • Wetland Water vole Network (watercourse, ditches and rifes) (least-cost model output) • Barn Owl Habitat 	<p>Four north to south strategic wildlife corridors linking South Downs National Park to Chichester Harbour AONB based on key habitats and species data with ‘least-cost’ habitat modelling. BOAs mapped as supporting evidence but excluded from policies mapping.</p> <p>The mapping of the proposed strategic wildlife corridors by Chichester District Council has identified distinct ecological networks connecting South Downs National Park in the north to Chichester and Pagham Harbours in the south. Includes local wildlife sites, priority habitats such as ancient woodland, protected and rare species and bat records. The water vole network as identified by Forest Research least-cost modelling (Watts et al.2010) has been found to be particularly useful in identifying corridors in the form of hedges and tree lines, which are used by bats, and ditches and rifes used by water voles. Data were included from two main sources; first habitat connectivity modelling by Forest Research, and secondly data from individual species recording and more general wildlife surveys. The habitats data identifies areas that are very likely to provide suitable habitats for key indicator species, such as bats and water voles, which are known to use linear and interlinked habitats. These habitats will also support a broad assemblage of plant and animal species in addition to the headline indicator species. Where several habitat networks overlap this is an indicator of a more significant wildlife corridor which have been mapped accordingly. The species network modelling output was found to be too spatially wide ranging for certain species for the purposes of Local Plan policies mapping. Habitat and species data sets were found to be useful in terms of identifying key wildlife movement corridors. These corridors were then reinforced by the overlapping network mapping for water vole, bats and supported by barn owl habitat data (S. Evans, pers. comm.)</p> <p>Buffers:</p> <p>The Forest Research ‘Least-Cost’ modelling of species habitat networks included within the corridors incorporate Euclidean buffers drawn around individual habitats based on species movement outside of the core area. Buffers are then extended or compressed according to adjacent habitat permeability scoring. These buffers have been modelled for specific species. Where buffers intersect, a network is created. Bat and water vole networks are incorporated into each wildlife corridor alongside barn owl habitat.</p>

	Name of Network	Network components/ selection criteria	Methodology
2	Dorset Ecological Network	<ul style="list-style-type: none"> ● International sites (SACs, SPAs, Ramsar) ● National sites (NNR, SSSI, MCZ) ● Local Sites (LWS, Dorset Wildlife Trust Reserves, SNCI, Monitored Conservation Verges, Veteran Tree Sites, churchyards (Great Heath Project), most Local Geological Sites ● Wildlife corridors and stepping stones (Dorset Landscape Monitoring 2019 dataset) high quality habitats over 1ha and open spaces with moderate biodiversity interest (undesigned sites)/railways and trailways. Mineral restoration sites, rivers ponds and wetlands. ● Sensitive sites not mapped publicly ● Higher Potential Ecological Network: mineral sites before restoration, low score wildlife sites, quality habitat under 1ha, playing fields, green space and proposed HIPS/SANGS 	<p>Ecological network comprising core sites, corridors , stepping stones, buffers and connectivity mapping based on designated sites, habitats and species and AONB landscape permeability study core areas. BOAs mapped as ‘Higher Potential Ecological Network’.</p> <p>Dorset Ecological Network maps have been produced by Dorset Local Nature Partnership (DLNP) working with Dorset Environmental Records Centre with support from DLNP partners. The Dorset Ecological Network is made up from a series of layers, each incorporating the different data sets. Together the sites, wildlife corridors and buffer areas create a functioning ecological network based on Lawton principles (More, Bigger, Better, Joined). Where sites can appear in more than one category (e.g. local nature reserves may be part of a SSSI (national site) the site is mapped as national. Some areas of valuable habitat such as species-rich hedgerows and road verges, ponds and veteran trees are often too small in area to be mapped but form part of the ecological network as corridors or stepping stones in their own right and should be considered as such. Further locations of good habitat through local knowledge is also considered part of the network irrespective of mapping.</p> <p>The Network mapping extends into the marine environment in so far as designated marine sites. Further work is needed to map local features in the marine environment and to develop a policy framework relating to marine planning policy. Higher Potential Ecological Network maps are comprised of areas that are not yet part of the functioning network but which could play an important part in the future. They may also be the areas which have the best potential.</p> <p>Buffers: Specific buffer distances have not been specified within the network methodology other than a buffer of c.40m around larger areas of undesignated high quality habitat within the Dorset Landscape Monitoring dataset mapped as part of the Higher Ecological Network.</p>

	Name of Network	Network components/ selection criteria	Methodology
3	Hampshire County Council (plus 15 local authority areas)	<p>The network is hierarchal with the following components:</p> <ul style="list-style-type: none"> • Biodiversity Opportunity Areas (Strategic Network) • Core Statutory Sites (Ramsar sites, SPAs, SACs, SSSIs, NNRs, LNRs) • Core non-statutory sites (Ancient Woodland, LWS (SINCs), inland water (including rivers and ponds) priority habitats, fen, marsh, swamp broad habitats and important wader and brent goose sites • Network Opportunity Areas (broad habitats (woodland/scrub, neutral or calcareous grassland that are not quite of Priority Habitat quality) • Hedgerows (optional), grassland/arable with 80% in EA floodzone, all polygons with recent wader or brent goose records, priority habitat suitability areas with a 5+score. • Green Grid Areas (urban optional) 	<p>Ecological network based on statutory and non-statutory designated core sites, priority habitats with optional hedgerows and optional urban green grid areas</p> <ul style="list-style-type: none"> • All components of network are polygon based • The core sites and network opportunity mapping do not overlap • If a polygon is part of a higher level it is not part of a lower level <p>BOAs, hedgelines and 'Green Grid Areas' (urban optional) can be overlain to add further knowledge to the network.</p> <ul style="list-style-type: none"> • The ecological network is spatially precise, all polygons which form part of the network opportunities layer are MasterMap polygons. Core statutory and non-statutory sites are mostly digitised to MasterMap polygons but there are a few sites where boundaries are not yet digitised to MasterMap boundaries. The reasons why a polygon is part of a specific layer is set out in the appropriate attribute table. <p>HBIC decided not to use the BEETLE Least-Cost modelling approach (Watts et al. 2010) due to:</p> <ul style="list-style-type: none"> • Funding and time constraints linked to complexities of modelling • Lack of technical information beyond generating arbitrary permeability scores for aggregated habitats and species dispersal distances for just a few focal species • Availability of habitat suitability mapping • The ease at which the network can be refreshed based on habitat, species and site mapping <p>Previously HBIC developed and mapped Biodiversity Opportunity Areas (BOAs) as part of a regional project to identify those areas of strategic importance that offered the greatest opportunity for landscape-scale habitat and management restoration. BOAs were produced in consultation with stakeholders and based on HBIC's Habitat Suitability Model in combination with existing habitats, site designations, geology and history mapping. BOAs were considered too broad brush for defining ecological networks for use in planning at the local scale, plus they excluded large parts of Hampshire. A much more precise delineation of the network was required, whilst retaining BOAs as the 'strategic ecological network' for landscape scale projects.</p> <p>See http://documents.hants.gov.uk/biodiversity/BOAOverviewMap.pdf</p> <p>Buffers:</p> <p>Buffers have not been applied to core sites on the basis that impacts would be considered on a site, habitat and species basis and the application of statutory consultation zones/standing advice requiring screening of most development proposals. Network Opportunity Areas are mapped as part of the network outside of core sites alongside optional urban green grid areas.</p>

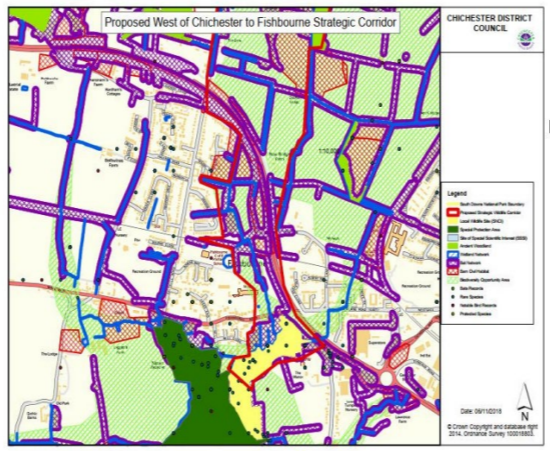
	Name of Network	Network components/ selection criteria	Methodology
4	Liverpool City Region Ecological Network	<p>LCR Ecological Network comprises:</p> <ul style="list-style-type: none"> • A Core Biodiversity Area (CBA) comprising designated sites (statutory and non-statutory) and priority habitats • Linear features • Stepping Stone sites • Nature Improvement Area 	<p>Regional Ecological Network developed over a decade comprising core sites (designated sites and priority habitats) linear features and stepping stones and wider Nature Improvement Areas.</p> <p>The LCR Ecological Network has brought together all available data sets to identify and evaluate natural assets in the City Region. It is based on the best available data and information at national and local levels. A total of 87 data sets that are capable of being mapped have been used to compile the LCR Ecological Network mapping, supported by a range of descriptive sources such as Landscape Character Assessments (available on Districts' websites) and National Character Area profiles (Natural England, 2013-2014), Conservation Advice for Marine Sites (Natural England 2015) and Biodiversity Action Plans [MBG, (1999) (Cheshire Wildlife Trust, Various)].</p> <p>These descriptive sources have been invaluable in guiding the landscape-scale approach to delivering the vision of protecting, restoring and reconnecting biodiversity in the City Region. They have also informed the preparation of a nature improvement area by providing information on functional links between natural assets. The LCR network report also includes a detailed mapping report that describes the method used to analyse these data sets and map the outputs of those analyses and how the outputs were interpreted. This work was undertaken using a Geographical Information System (GIS) which enables use of digitised data.</p> <p>Buffers:</p> <p>Buffers are not identified as a specific component of the network. Opportunities to buffer key sites are included within specific opportunities for core habitat within individual 'Nature Improvement Areas' (One of 12 project areas in England). The LCR Ecological Network includes 17 Nature Improvement Areas mapped consistent with Defra NIA guidance and taking into account strategic allocations. These areas contain core areas, stepping stones and linear features plus opportunity areas for habitat management and creation.</p>

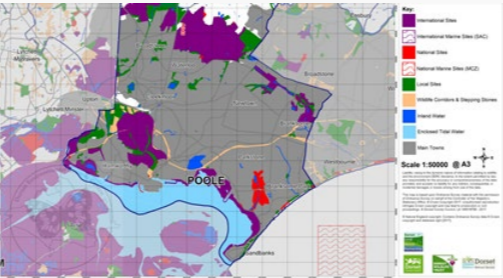
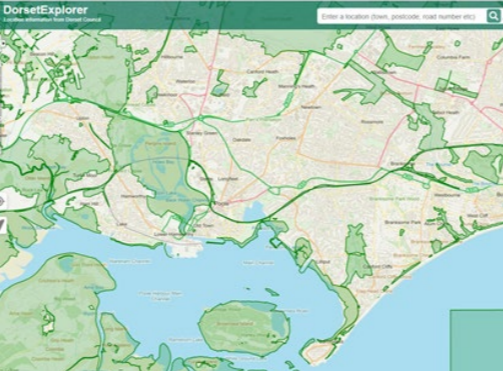
	Name of Network	Network components/ selection criteria	Methodology
5	Newcastle City Council	<p>Newcastle's Wildlife Enhancement Corridors (WEC) comprise:</p> <ul style="list-style-type: none"> • Existing greenspace • High Biodiversity Value habitats • Medium Biodiversity Value habitats • Low Biodiversity Value habitats • Designated (core) Wildlife Sites (SSSIs, LWSs, SLCIs, and LNRs) 	<p>A mapped functional 'wildlife enhancement network' based on a ranked scoring of all areas of habitat and green space. Network links identified and plotted between core areas with potential buffer, links and stepping stones to produce larger habitat areas.</p> <p>In order to produce Newcastle's Wildlife Enhancement Corridors (WEC) for the LDF, a baseline map with all existing green space was produced in line with Natural England's recommendations for opportunity mapping and habitat networks (Catchpole. 2006 & 2007); this provides a robust footing on which to build Newcastle's new wildlife enhancement network.</p> <p>To achieve these Enhancement Corridors an evaluation system for the quality of Newcastle's urban wildlife habitat was required; based on sound ecological principles. Wildlife groups, environmental organisations and groups and individuals involved in biodiversity implementation and management were consulted to give their views and scores on the value of different urban habitats for wildlife.</p> <p>This enabled a scoring system to be compiled which reflected the wildlife value of land within the network. Establishment of these Wildlife Enhancement Corridors were guided by the need to protect, restore and recreate BAP priority habitats and increase the population of BAP species. From the results of this scoring system blocks of land within the network were assigned a priority status, these were mapped using a traffic light system as follows:</p> <ul style="list-style-type: none"> • Low Biodiversity Value: (Creation) Priority to create and restore new wildlife habitat within these areas; • Intermediate Biodiversity Value: (Buffer and Link) Improvements required to link or buffer existing sites or provide corridors and 'stepping stones' for wildlife; • High Biodiversity Value: (Protect and Manage) The main aim to protect, manage and maintain these areas of high ecological value; and • Designated Wildlife Sites (SSSIs, LWS, SLCI, and LNRs). <ol style="list-style-type: none"> 1. The above habitats were mapped in a desktop exercise using existing information, Geographic Information Systems (GIS), Ordnance Survey maps and aerial photographs). 2. Clusters of habitats/sites which form the core wildlife areas were identified. 3. Network links were identified and plotted between the core areas. 4. Potential buffer, links and stepping stones were created to produce large habitat areas, and to create a functional wildlife enhancement network. These areas were ranked/scored using a scoring system and assigned a priority status of red, amber or green depending on their score. 5. Outside the network, wildlife habitats and sites are managed and protected, and can be buffered by habitat creation and/or appropriate management. <p>Buffers:</p> <p>Newcastle's Wildlife Enhancement Corridor include all green spaces mapped using the above traffic light system Low/Intermediate/High. Those in the intermediate category include 'buffer sites/linking sites/connectors' as land parcels adjoining designated wildlife sites.</p>

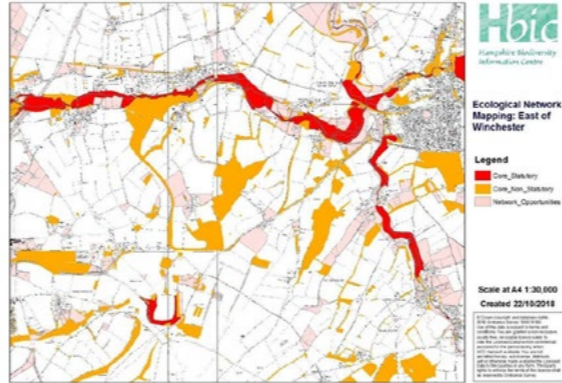
	Name of Network	Network components/ selection criteria	Methodology										
6	North Tyneside Council	<p>North Tyneside’s Wildlife corridors have 3 components of equal standing;</p> <ul style="list-style-type: none"> • Strategic Wildlife Corridors; • Local Wildlife Corridors; and • Stepping Stones 	<p>North Tyneside’s Wildlife Corridor components (wildlife corridors , strategic wildlife routes, stepping stones, biodiversity assets and buffers) are mapped and identified within North Tyneside’s Green Infrastructure Strategy.</p> <p>The approach to mapping within the Green Infrastructure Strategy (2015) acknowledges there is no definitive methodology for producing a Wildlife Corridor Map. External resources include National Planning Policy, the government’s 2011 White Paper ‘The Natural Choice’, and partnership working with neighbouring local authorities, in-house biodiversity officers, biodiversity partners and based on available data. Mapping of the corridors fell into 4 stages:</p> <ol style="list-style-type: none"> 1. Map all nationally and locally designated wildlife sites. All designated sites were given a specific buffer dependant on their importance: <table border="1" data-bbox="887 877 1917 1071"> <thead> <tr> <th>Feature</th> <th>Buffer</th> </tr> </thead> <tbody> <tr> <td>SSSIs and Ramsar sites</td> <td>150m</td> </tr> <tr> <td>LWSs over 20ha</td> <td>150 m</td> </tr> <tr> <td>All other LWSs</td> <td>100m</td> </tr> <tr> <td>All SLCIs</td> <td>100m</td> </tr> </tbody> </table> <p>Any proposed development which falls within a buffer zone must consider the impact upon the designated site. The method is in line with Natural England’s recommendations for opportunity mapping and habitat networks (Catchpole 2006) to provide a robust footing on which to build North Tyneside’s new wildlife corridors.</p> <ol style="list-style-type: none"> 2. Working in partnership with North Tyneside’s ecologist, Northumberland Wildlife Trust and the Natural History Society of Northumberland, key strategic routes in North Tyneside were identified linking Newcastle with Northumberland. Strategic and local wildlife corridors were mapped based on aerial data and local knowledge. 3. Undesignated but key green spaces that lay outside the corridors were mapped as ‘stepping stones’ as they were vital in linking up existing corridors . <p>Buffers: See 1. Above</p>	Feature	Buffer	SSSIs and Ramsar sites	150m	LWSs over 20ha	150 m	All other LWSs	100m	All SLCIs	100m
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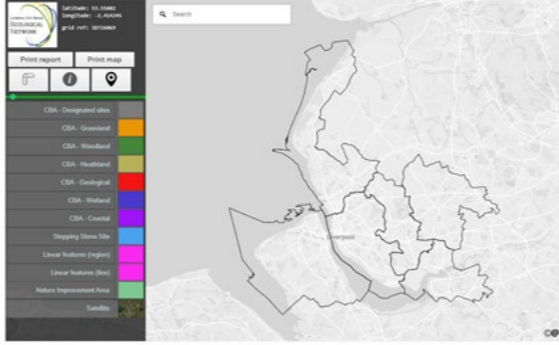
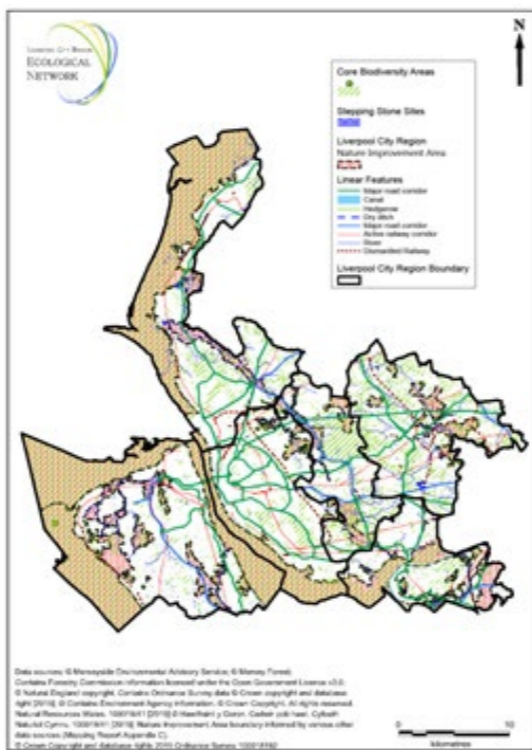
	Name of Network	Network components/ selection criteria	Methodology																																							
7	Shropshire County	<p>Shropshire Environmental Network</p> <p>Core Areas: designated sites, priority habitats, ancient woodland, significant areas of protected/priority species</p> <p>Corridors and Stepping Stones: existing natural & semi-natural habitat, linear features including water courses, verges, disused railway lines. Stepping Stones: lakes, pond clusters, farm woodlands</p> <p>Restoration areas: where measures can restore/create high value areas</p> <p>Buffers: widths have been set according to site/habitat type (see opposite).</p> <p>Sustainable land use areas</p>	<p>The Shropshire Environment Network (SEN) consists of the Shropshire Ecological Network (SEcN) plus historic environment sites and access routes. The components of the SEcN are based on those described in <i>'Making Space for Nature: A review of England's Wildlife Sites and Ecological Network'</i> (the 'Lawton Report'). The core components of the network (Core Areas, Corridors and Stepping Stones, Restoration Areas, Buffers and Sustainable Land Use Areas) are mapped and grouped into a series of GIS layers. Core Areas, Corridors and Buffer layers are designed to be viewed together whereas Restoration and Sustainable Land Use layers are viewed separately. Where there is overlap between Core Areas, Corridors and Buffers the area is designated as the highest priority of the three layers with Core Area highest priority and Buffer lowest.</p> <p>Buffers: Buffers have been set according to habitat as follows (meters from site/habitat boundary)</p> <table border="1" data-bbox="884 829 1914 1417"> <thead> <tr> <th>Feature</th> <th>Habitat</th> <th>Buffer (metres from boundary)</th> </tr> </thead> <tbody> <tr> <td>SAC/Ramsar site</td> <td>All habitats</td> <td>1000m</td> </tr> <tr> <td>SAC/Ramsar site</td> <td>wetland</td> <td>Water catchment area</td> </tr> <tr> <td>SSSI/NNR</td> <td>wetland</td> <td>Water catchment area or greater 500m (whichever is greater)</td> </tr> <tr> <td>SSSI/NNR</td> <td>Other habitats</td> <td>250m</td> </tr> <tr> <td>SSSI/NNR</td> <td>geological</td> <td>500m</td> </tr> <tr> <td>Ancient woodland</td> <td></td> <td>500m</td> </tr> <tr> <td>Local Wildlife Site</td> <td>wetland</td> <td>500m</td> </tr> <tr> <td>Local Wildlife Site</td> <td>Other habitats</td> <td>250m</td> </tr> <tr> <td>Local Geological Site (RIGS)</td> <td></td> <td>50m</td> </tr> <tr> <td>Local Nature Reserve</td> <td></td> <td>100m</td> </tr> <tr> <td>Priority habitat/habitat for priority species</td> <td>wetland</td> <td>500m</td> </tr> <tr> <td>Priority habitat/habitat for priority species</td> <td>Other habitats</td> <td>250m</td> </tr> </tbody> </table>	Feature	Habitat	Buffer (metres from boundary)	SAC/Ramsar site	All habitats	1000m	SAC/Ramsar site	wetland	Water catchment area	SSSI/NNR	wetland	Water catchment area or greater 500m (whichever is greater)	SSSI/NNR	Other habitats	250m	SSSI/NNR	geological	500m	Ancient woodland		500m	Local Wildlife Site	wetland	500m	Local Wildlife Site	Other habitats	250m	Local Geological Site (RIGS)		50m	Local Nature Reserve		100m	Priority habitat/habitat for priority species	wetland	500m	Priority habitat/habitat for priority species	Other habitats	250m
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SAC/Ramsar site	wetland	Water catchment area																																								
SSSI/NNR	wetland	Water catchment area or greater 500m (whichever is greater)																																								
SSSI/NNR	Other habitats	250m																																								
SSSI/NNR	geological	500m																																								
Ancient woodland		500m																																								
Local Wildlife Site	wetland	500m																																								
Local Wildlife Site	Other habitats	250m																																								
Local Geological Site (RIGS)		50m																																								
Local Nature Reserve		100m																																								
Priority habitat/habitat for priority species	wetland	500m																																								
Priority habitat/habitat for priority species	Other habitats	250m																																								

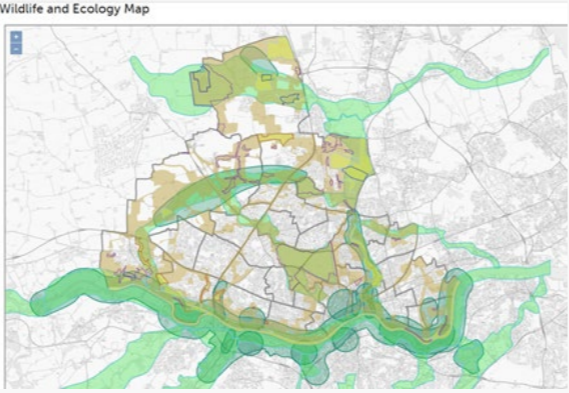
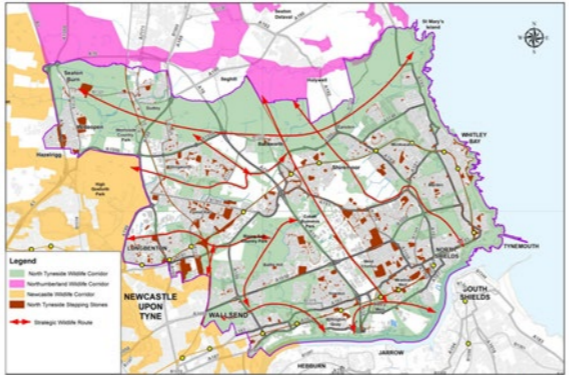
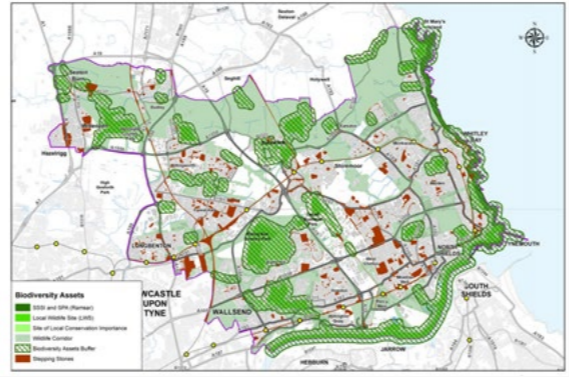
Table B.4 Case Studies: Mapping

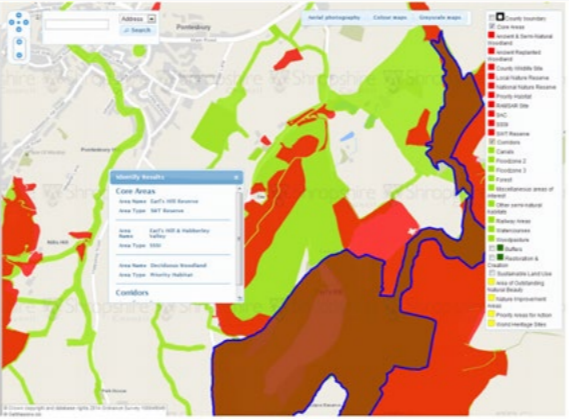
	Name of Network	Mapping Output	Mapping Access	Application of mapping within Local Planning process	Limitations
1	Chichester District Council	<p>The ecological networks, in addition to high concentrations of species records and the location of priority habitats and designated sites, has enabled the council to identify four Strategic Wildlife Corridors which connect Chichester Harbour to South Downs National Park.</p> <p>Corridor boundaries are based primarily on habitat boundary and landscape features including hedgelines and water courses.</p>	<p>A set of pdf maps showing wildlife corridors are available as supporting evidence of the Local Plan Review page of the Council’s website</p> <p>Appendix 2 – Westernbourne Chalk Stream to Compton tributaries Biodiversity Opportunity Area</p> <p>Appendix 3 – Fishbourne and chalk streams Biodiversity Opportunity Area</p> 	<p>Under the emerging plan the Council will apply an additional layer of planning restraint to the countryside protection policies within these strategic wildlife corridors to ensure connectivity between South Downs National Park and Chichester Harbour AONB is maintained in the long-run.</p>	<p>Given wide geographical spread across the plan area northern lapwing, chalk-hill butterfly and dormouse networks were excluded from criteria whilst bats, barn owl and water vole were included. (S Evans, CDC pers. comm).</p> <p>Biodiversity Opportunity Areas have not been included in Strategic Wildlife Corridor policy mapping due to their wide geographical spread. These are included as Chichester District Council Local Plan Review Supporting Evidence . (S Evans, CDC Pers. Comm.)</p> <p>Many species under-recorded.</p>

	Name of Network	Mapping Output	Mapping Access	Application of mapping within Local Planning process	Limitations
2	Dorset Ecological Network	Dorset Ecological Network has been mapped as a series of data layers for each individual planning area [West Dorset, Weymouth and Portland; North Dorset, Purbeck Christchurch & East Dorset, Bournemouth and Poole].	<p>Maps are available as pdfs https://dorsetlnp.org.uk/dorsets-ecological-networks/</p> <p>Extract: Poole Ecological Network</p>  <p>or as an interactive layer on Dorset Explorer: https://explorer.geowessex.com/</p> <p>Extract: Poole Ecological Network</p> 	As new unitary authorities the Local Plans of the previous districts are still relevant. It is anticipated new plans will bring the ecological networks together as part of the evidence base for Local Plan policies with specific policies protecting and enhancing the ecological network, future Nature Recovery Networks and opportunities for delivery of Biodiversity Net Gain. A training webinar is being planned for planners at the local authorities.	The Dorset Ecological Network will need to be periodically updated as revised datasets and funding becomes available.

	Name of Network	Mapping Output	Mapping Access	Application of mapping within Local Planning process	Limitations
3	Hampshire	<p>A draft ecological network was produced in 2016 by HBIC and has been road tested by LPAs and updated to reflect changes in designations and habitat mapping . The mapping was updated in 2018 and 2020. Updates on datasets and change in network extent are detailed in the 2020 guidance document update.</p>	<p>Pdf maps and GIS layers are available for each local authority area from HBIC. The Meta data is publicly available on the Hampshire County Council website:</p>  <p>The map shows a network of ecological corridors in red and yellow, connecting various core sites. A legend on the right identifies 'Core_Sites', 'Core_Sites_Mat', and 'Network_Corridors'. The map is titled 'Ecological Network Mapping: East of Winchester' and includes a scale of 1:30,000 and a creation date of 22/10/2018.</p>	<p>Emerging Local Plans include LEN policy in line with NPPF and duty to cooperate. For example Havant Borough Council Pre-Submission Local Plan Policy E14 ‘The Local Ecological Network’ includes detailed policy wording whereby all development is expected to conserve and enhance the LEN, result in BNG, avoid fragmentation of the LEN and provide an assessment and mitigation plan including management and maintenance. The policy also extends towards protection of core sites and strategic collaboration with neighbouring authorities towards water and air quality.</p>	<p>Limitations of the methodology and mapping are detailed in the HBIC network mapping report. Site designation and survey data is up to date. The Habitat layer is currently being translated into a new OS MasterMap layer which will pick out all new development and new woodland planting etc.</p>

	Name of Network	Mapping Output	Mapping Access	Application of mapping within Local Planning process	Limitations
4	Liverpool City Region Ecological Network	<p>GIS Mapping output is described in detail in Appendix 4 of the LCR Ecological Network Report including data sets within each of the network components (Core Biodiversity Areas, Linear Features, Stepping Stone Sites, Nature Improvement Areas)</p>	<p>Maps are available online as an interactive map: http://www.lcreconet.uk/map/</p>  <p>LCR Interactive Mapping User Guide</p> <p>PDF extract from LCR Ecological Network Final Report</p> 	<p>The LCR Ecological Network is part of the District’s evidence for Local Plans (core strategies, unitary development plans, development plan documents and neighbourhood plans) and supports decision taking on individual planning proposals. Model policies have been developed (strategic and development management) and tailored for each individual district to encompass model policy intent.</p> <p>The LCR Ecological Network provides an agreed evidence base to guide and focus activity around potential land assets that could benefit from improvements through conservation management. Where such areas are lost these may need to be replaced according to the mitigation hierarchy. Measures of success of the Ecological Network are included within the evidence base such as change in area of natural assets, funding draw down and policy approaches in Local Plans.</p>	<p>Data limitations replicate those at a national level and are not considered to affect the robustness of the evidence base. Data are of different age, coverage, accuracy and precision. Original Phase 1 survey data is now several years old and subject to land management changes, particularly in urban settings.</p> <p>Much of the habitat survey data is desk based using aerial photography and limited field survey and does not provide complete coverage. Some habitat mapping from BAP inventories is considered to be of lower confidence e.g. where data sets include inaccuracies in habitat classification or combine potential locations of habitat through predictive modelling.</p>

	Name of Network	Mapping Output	Mapping Access	Application of mapping within Local Planning process	Limitations
5	Newcastle's Wildlife Enhancement Corridors	Wildlife Enhancement Corridors are mapped as components of the interactive Newcastle City wildlife and ecology map.	<p>An interactive map of the wildlife and ecology sites in Newcastle is accessible on the Council's website</p>  <p>The map shows various green spaces and corridors across Newcastle, with different colors representing different types of habitats and corridors.</p>	Policy CS18 Green Infrastructure and Natural Environment provides for the 'Protection, enhancement, and management of green infrastructure assets which include biodiversity and geodiversity assets, including designated sites, designated wildlife corridor, and priority habitats and species.	<p>Limitations are not specifically identified within the methodology.</p> <p>Limitations are therefore assumed to be those common with other case studies relating to age of data and potential gaps in field survey data.</p>
6	North Tyneside District Council	Mapping output is provided within the North Tyneside Green Infrastructure Strategy as a key component of the green infrastructure network. The mapping forms part of the wider landscape scale with neighbouring authorities (Newcastle and Northumberland) and mapped alongside Strategic Wildlife Routes (linear connectivity links) and Stepping Stones (undesigned green space)	<p>Maps are accessible within the North Tyneside Green Infrastructure Strategy</p>   <p>The top map shows the wider landscape scale with various green infrastructure elements. The bottom map provides a detailed view of biodiversity assets, including local wildlife sites, local conservation importance, and stepping stones.</p>	<p>Development proposals within a wildlife corridor as shown on the Local Plan Policies Map (2017-2032) must protect and enhance the quality and connectivity of the corridor. All new developments are required to take account of and incorporate existing wildlife links into their plans at design stage. Developments should seek to create new links and habitats to reconnect isolated sites and facilitate species movement.</p> <p>Policy DM5.7 Wildlife corridors</p>	<p>Limitations are not specifically identified within the methodology included within the Green Infrastructure Strategy.</p> <p>Limitations are therefore assumed to be those common with other case studies relating to age of data and potential gaps in field survey data.</p>

	Name of Network	Mapping Output	Mapping Access	Application of mapping within Local Planning process	Limitations
7	Shropshire County	Shropshire Environmental Network	<p>Interactive map accessible via Shropshire Environmental Network</p> 	<p>Applicants are asked to check the SEN and developments crossing the network must ensure the network is protected and enhancement measures proposed. If development is likely to sever the network and cannot be mitigated can alternative sites be found?</p> <p>Enhancement should restore or create priority habitats. Enhancement to the network can add value to development e.g. more accessible green space.</p> <p>Pre-app advice is advised.</p>	<p>Mapping is caveated in that white areas cannot be assumed to not have biodiversity value. Where value is present or recognised later, policies protecting the network may still apply.</p>

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