Tamworth Borough Nature Recovery Network Mapping


Broad Meadow © SWT

FINAL REPORT

Staffordshire Wildlife Trust 2021

Table of Contents

1. Executive Summary

Staffordshire Wildlife Trust was commissioned by Tamworth Borough Council to carry out a strategic assessment of the District's biodiversity and habitat networks. This document outlines the existing picture of the District's nature network and describes key locations where habitats may be created or enhanced to contribute to nature's recovery (the Nature Recovery Network), as well as delivering against objectives set out in national planning policy legislation.

Existing data, previous biodiversity opportunity mapping, along with local, regional and national landscape designations and projects were taken into account in this assessment methodology.

The developed methodologies aim to deliver against national policies and are used in conjunction with the Department for Environment Food and Rural Affairs biodiversity metrics 2.0 (beta test version) to carry out a strategic broad scale District level spatial assessment of the 'quality components' described in the metric. This included:

1. Habitat distinctiveness
2. Strategic significance (of habitat areas)
3. Habitat connectivity

By using the results above and specific habitat connectivity modelling software it has been possible to define Habitat Connectivity Opportunity (HCO) areas based on habitat types. This is an important next step in identifying areas which possess existing good habitat connectivity and where there is potential for future habitat creation or restoration to contribute to a more successful nature recovery network.

The HCO areas are described in terms of their key opportunities, threats, key species and other habitats which they support along with any potential 'add-on' benefits (e.g. ecosystem services) which could be derived from having well-connected diverse habitat networks contributing to a healthy nature recovery network.

The opportunity map is not static and as physical habitats change on the ground and are subsequently mapped and monitored, the map itself will evolve with these updates. The opportunity areas themselves are where work to enhance habitats can be focussed, where the opportunity to get the greatest benefits lies.

Analysis and opportunity areas mapped within the nature recovery network completed as part of this study are to a fine scale and based around a more robust defensible methodology that can more clearly deliver against National Planning Policy Framework and Planning Policy Guidance objectives, as well as those likely to emerge as outlined in the Environment Bill (House of Commons, 2019).

2. Introduction

Staffordshire Wildlife Trust were commissioned by Tamworth Borough Council to carry out a strategic assessment of the District's biodiversity and habitat networks, to form part of an evidence base in order to ensure biodiversity is an integral part of policy development.

The project encompassed some additional phase one habitat survey; habitat connectivity analysis mapping and Local Nature Recovery mapping. These elements will enable the District to address the requirements articulated within para 170 and para 174 of the National Planning Policy Framework 2019 - *To provide for the protection and support enhancements to the Districts natural environment through the identification, mapping and safeguarding the components and enabling connectivity, interpretation and integration of the natural resources to deliver overall net gain for biodiversity*.

Geographic Information System (GIS) tools were used in the creation of the Nature Recovery Network maps. A GIS software package called MapInfo was used for the digitisation of habitats and network maps. A second piece of software called Condatis was used to model potential species movement through habitat connectivity, the outputs of which were digitised in MapInfo. These technologies are relatively recent and are continuing to develop therefore the results generated by these software are likely to become more sophisticated and accurate over time.

Ecosystem services are the freely gained human benefits provided by natural processes in properly functioning ecosystems for example flood prevention or climate regulation. Whilst ecosystem services have not been assessed as part of this project it is important to recognise that a strong Nature Recovery Network will also provide strengthened Ecosystem Service benefits.

Policy Background

Since previous opportunity mapping for the District was carried out over 10 years ago, there have been considerable changes both in the knowledge, practical assessment and planning of landscape ecology as well as new policy requirements for councils to consider how to protect, enhance and restore biodiversity and the services that it provides.

Key stimuli in updating spatial environmental objectives were documents such as *Making Space for Nature: A review of England's wildlife sites and ecological networks* report by Lawton *et al*. (2010), the Government's 25 Year Environment Plan (2018) and most recently The Environment Bill.

The fundamental principles behind the Making Space For Nature report are for England's ecological network to be 'more, bigger, better and joined' to ensure the survival of species in the face of multiple pressures at a range of scales. The Government's 25-year environment plan puts more impetus on the statutory need to consider the conservation of biodiversity and ensure that it is effectively accounted for through the spatial planning system and the recently published DEFRA Environment Bill.

The emerging Environment Bill sets out environmental principles directed toward the restoration and enhancement of nature and plots a course for how these should be achieved through Nature Recovery Network mapping at a local level ('Local Nature Strategies') and will be a key document in driving the way that these networks are developed and delivered.

Additionally, updated guidance through the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019) and Planning Practice Guidance (PPG) (Ministry of Housing, Communities and Local Government, 2019) have served to put more emphasis on the protection and conservation of nature and our natural resources through spatial planning, providing further justification for the need to have a Nature Recovery Network in place to create a roadmap of where these enhancements could and should go.

The Environment Bill intends to bring in mandatory biodiversity net gain provision, and the use of biodiversity metrics to assess this provision. The Biodiversity Metric 2.0 provides a means of assessing changes in biodiversity value (losses or gains) brought about by development and changes in land use management. The metric is habitat based and gives consideration to improved ecological connectivity.

Habitat opportunity maps are designed to be used in conjunction with biodiversity metrics, in particular Biodiversity Metric 2.0. They can also be used to both inform the metric and target the location and application of future ecological enhancements contributing to a functional nature recovery network.

3. Review of previous biodiversity opportunity mapping assessments

Before using new methods of spatially assessing and targeting opportunities for the enhancement of biodiversity, it is important to ensure that they:

1. Can provide additional detail which complements existing objectives.
2. Can provide standalone detail in addition to existing objectives which can be used as evidence in its own right.

The previous methodologies used for biodiversity opportunity mapping throughout the county were based largely on local expert knowledge and stakeholder engagement via practical mapping exercises. Stakeholders and local experts were asked to highlight areas geographically that they saw as priorities for specific habitat and species conservation within a local authority (LA) area. The results of this were sense checked by Staffordshire Wildlife Trust, using available environmental data synthesized into a combined opportunity map and report. These defined spatial landscape areas and detailed conservation priorities within each LA area. The resulting map was effective in that by using expert knowledge, alongside ecological data, as opposed to purely relying on available datasets it was possible to produce an opportunity map with zero white space (areas of a map which have no information). This is something which is important to inform decision making on a broad scale and to develop a nature recovery network.

Whilst new methodologies provide a level of additional detail and scientific rigour, local expert knowledge is still vital to ensure that spatial analyses and metrics make sense in a local context.

4. Existing evidence base review

Gathering a robust evidence base is the first step to inform the assessment of opportunities to enhance habitats. The evidence base enables the production and justification of opportunity areas and the assessment of the potential to provide ecosystem services. An inventory of available datasets is one way of bringing together an evidence base forming a platform on which to carry out further analysis.

4.1 Available environmental datasets

A list of relevant Geographic Information Systems (GIS) datasets available for use in completing the mapping assessment are listed in Appendix C, these include datasets held by Staffordshire Ecological Record (SER).

Using the data held by SER and SWT along with publicly available datasets accessible either through an Open Government License (OGL) or through Creative Commons licensing identified in the Natural Capital Committee workbook (Natural Capital Committee, 2017) it was possible to bring together a comprehensive inventory of datasets for review.

Many of the datasets in the inventory are raw or primary data generated directly from information gathered from either desk based or field surveys and remote sensing.

Identification of the coverage and quality of a local authority's environmental dataset provides the baseline for analysis. The results then show how the environment can be protected and enhanced to continue to provide both public and further environmental benefits. By aggregating datasets it is possible to build a composite assessment of the biodiversity within an area without any white space

A breakdown of the extent of the habitats dataset can be found in Appendix A

4.2 National Character Areas in Tamworth Borough

There are 159 National Character Areas (NCA) in England, each of which is distinctive with a unique 'sense of place'. These broad divisions of landscape form the basic units of cohesive countryside character, on which strategies for both ecological and landscape issues can be based. The Character Area framework is used to describe and shape objectives for the countryside, its planning and management. These NCA areas are very broad and can encompass a number of different objectives and opportunities depending on the designated landscape and its respective character, biodiversity and challenges.

Tamworth Borough is covered by 3 NCA's (Appendix H), The Trent Valley Washlands occupy the Western half of the Borough, The Mease/Sence Lowlands occupy the North-eastern part of the borough and Arden occupies the South-eastern area. Key statements of environmental opportunities for each of the NCAs are as follows:

Trent Valley Washlands

- Carefully plan and manage new development within the NCA to ensure that landscape character and ecosystem services are strengthened, that heritage features, wildlife habitats, woodland and the hedgerow network are enhanced, and that opportunities for creation of multifunctional green infrastructure are realised so that this landscape is resilient to the forces of change that it is experiencing.
- Manage and enhance the Trent Valley Washlands' river and flood plain landscape to combine its essential provision and regulation of water role with landscape enhancement, nature conservation, climate regulation, farming, recreation and a resource for understanding geodiversity.
- Protect, manage and enhance the pastoral landscape of the Trent Valley Washlands, seeking to join up and expand areas of pasture and associated attributes and habitats, to preserve heritage features, enhance biodiversity and geodiversity, protect farmland and provide additional recreational opportunities.
- Protect and enhance the historic environment of the Trent Valley Washlands and their characteristic historic landscape. Increase awareness of the richness of this resource, protect it from neglect and physical damage, and ensure that future development complements and enhances the sense of history of the NCA.

Mease/Sence Lowlands

- Protect and appropriately manage this important network of natural and manmade rivers, streams, ponds, canals and other wetland habitats for its internationally important populations of white-clawed crayfish, spined loach and bullhead fish and their contribution to sense of place, water quality and climate regulation.
- Manage and conserve the woodland habitat of the landscape and plan to expand appropriately scaled woodland cover, particularly in The National Forest, to increase people's access and enjoyment and to secure opportunities to enhance biomass and biodiversity and manage the impact of climate change.
- Protect and appropriately manage the historic character, settlement pattern and features of this landscape, in particular its ancient woodlands, veteran trees, landscaped parklands and areas of archaeological interest, including ridge and furrow.
- Protect the overall strong rural, open and tranquil character of this well-ordered lowland agricultural landscape; increase the opportunity to encourage sustainable food production; and enhance access to and enjoyment of the wider countryside for both residents and visitors.

Arden

- Manage and enhance the valuable woodlands, hedgerows, heathlands, distinctive field boundaries and enclosure patterns throughout the NCA, retaining the historic contrast between different areas while balancing the needs for timber, biomass production, climate regulation, biodiversity and recreation.
- Create new networks of woodlands, heathlands and green infrastructure, linking urban areas like Birmingham and Coventry with the wider countryside to increase biodiversity, recreation and the potential for biomass and the regulation of climate.
- Conserve and enhance Arden's strong geological, industrial, and cultural resource, to increase public access, enjoyment, recreation and to retain a sense of place and history.
- Enhance the value of Arden's aquatic features such as the characteristic river valleys, meadows and standing water areas like Bittell Reservoirs to increase resource protection, such as regulating soil erosion, soil quality and water quality.

4.3 Minerals Safeguarding Zones in Tamworth Borough

There is a need to consider minerals safeguarding zones in the nature recovery network mapping as these areas present both challenges and opportunities from a nature conservation perspective. Whilst the nature recovery network mapping is not spatially aligned on the minerals safeguarding zones. It is important to recognise that that these areas could potentially have a huge impact on the nature recovery network in future, either positively, negatively or both. Where overlaps exist between the maps, there is opportunity to deliver multiple outcomes.

The likelihood is that much of the safeguarding area will never undergo any mineral extraction, planning any developments within a mineral safeguarding zone must be considered to ensure that this will not prevent mineral extraction on potential future extraction sites.

It is possible that high quality habitats may be lost as a result of mineral extraction, a mineral safeguarding zone may also provide protection to important habitats by protecting them from other types of developments.

Post extraction habitat restoration should be guided by the nature recovery network map to create habitats which will most suitably contribute to habitat connectivity within the landscape. In doing this it is possible for mineral extraction sites to contribute to the creation of a diverse and well-connected landscape.

Land within the minerals safeguarding zone may never be actively worked in the long term but could be of great value in terms of contributing to diverse well connected habitats and landscape either if no mineral extraction were to occur or through well planned sympathetic habitat restoration.

4.4 Data used and limitations

It is important to determine the limitations of any datasets identified to ensure that the best possible dataset(s) are used to give the best outcomes for connectivity mapping.

A number of factors can influence whether a dataset is suitable, for example age of the data and whether the data is in a format which can easily and readily be interrogated are crucial in deciding which datasets should be used.

Following a data review the combined habitat map produced during the earlier stages of this assessment was used as a primary baseline as this represented the most complete habitat dataset for the area and would easily work with the preferred methodologies to generate the desired technical outputs detailed in sections 5-7.

Several datasets were used in the production of the Nature Recovery Network mapping, justification on their use and relevant limitations can be found in Appendix B.

A full inventory of available datasets has been collated (Appendix C) where each dataset was allocated a ‘confidence’ rating based on that particular datasets desirability and reliability which helps to justify a hierarchy of use i.e. where there is commonly high desirability and reliability there is a higher ‘confidence’ in that dataset and it is placed higher in the hierarchy than a dataset which for instance may have a high desirability but a low reliability.

5. Mapping the opportunities to enhance habitats for biodiversity

The first step in analysis to establish opportunities for nature's recovery is to take the data evidence base established previously and carry out a variety of habitat analyses to determine distinctiveness /character for use within other recognised methods (for example, DEFRA biodiversity metric 2.0* etc…). Furthermore, using the evidence base to apply methods to identify strategic habitat areas and habitat connectivity opportunity areas in relation to creating a robust nature recovery network for the District.

By utilising the knowledge of the county's habitats and species, experience of technical GIS systems and data management, coupled with the available datasets identified in the evidence base, it was possible to produce a number of outputs which are robust, challengeable and can deliver the Districts nature recovery network.

5.1 Habitat distinctiveness mapping

Habitat distinctiveness mapping is one of several elements included within the biodiversity metric 2.0 (Crosher et al. 2019) by using habitat as a proxy for wider biodiversity value via associating and scoring different habitat types according to their relative biodiversity value. An example of this would be irreplaceable ancient woodlands scoring very highly (higher biodiversity value) whereas intensively managed amenity grassland or highly improved agricultural arable land score lower (lower relative biodiversity value).

The criteria used for the creation of the habitat distinctiveness map was based on the Biodiversity Metric 2.0 Beta test (Crosher et al., 2019) which loosely defines what habitats are included within each distinctiveness band. These metrics are currently emerging and form the basis of the Environment Bill (House of Commons 2019), but represent the most comprehensive set of standards for which to base the distinctiveness mapping on.
The distinctiveness map (map 1) was produced using Phase 1 habitat data by associating a distinctiveness value to each specific habitat type (e.g. arable land) in a GIS package based on guidance provided in Crosher et al. 2019, selecting and isolating the habitats spatially into the 5 respective distinctiveness bands. Further ratification to the irreplaceable habitats in the very high distinctiveness band was completed by use of priority habitat inventory (Ancient Woodland Inventory) boundaries. A spatial GIS file was produced for each distinctiveness band.

Further detail of the habitat distinctiveness mapping and the breakdown of habitats included within each distinctiveness band can be found in Appendix D.

Habitat distinctiveness mapping provides multiple uses outside of the biodiversity metric 2.0, including:

* http://publications.naturalengland.org.uk/publication/6020204538888192 , http://publications.naturalengland.org.uk/publication/5850908674228224

1. Identifying areas of high biodiversity value that are a priority for protection and expansion within a local plan whilst working in line with biodiversity mitigation hierarchy (avoid, minimise, remediate, compensate).

2. Flagging areas that may contain medium value (semi-natural) habitat. These could be highlighted in policy as requiring a comprehensive biodiversity evaluation if they are put forward for planning purposes (based on mitigation hierarchy). Biodiversity offsetting/compensation may be required in these areas if they are developed.

3. Identifying possible wildlife corridors which can be highlighted and designated as part of a local plan/Green Infrastructure Strategy. These areas could be the target of restoration projects/funding/aspirational opportunity areas funded through development compensation (obviously the allocation of funds is based on broad scale spatial analysis as opposed to the methods of calculating the offsetting requirement of a specific site).

Planning policy supports application of the mitigation hierarchy which determines a hierarchy of actions when using the biodiversity metric 2.0, as well as a consideration within paragraph 171 of the National Planning Policy Framework[*]. This may mean retaining habitats in situ or avoiding habitat damage. It is easier to achieve biodiversity net gains where habitat impacts are avoided due to the way that habitat creation and enhancement risks are accounted for. The mitigation hierarchy is in the desirability order as follows:

- **Avoid** – Where possible habitat damage should be avoided
- **Minimise** – Where possible habitat damage and loss should be minimised
- **Remediate** – Where possible any damaged or lost habitat should be restored
- **Compensate** – As a last resort, damaged or lost habitat should be compensated for

The mitigation hierarchy corresponds with the habitat distinctiveness mapping, e.g. very high distinctiveness habitats such as irreplaceable ancient woodlands should be avoided from development and 'low' value habitats should be compensated.

The habitat distinctiveness mapping is based on available habitat data and the designated nature conservation site boundaries for the District, including UK Biodiversity Action Plan (UKBAP) and priority habitat areas.

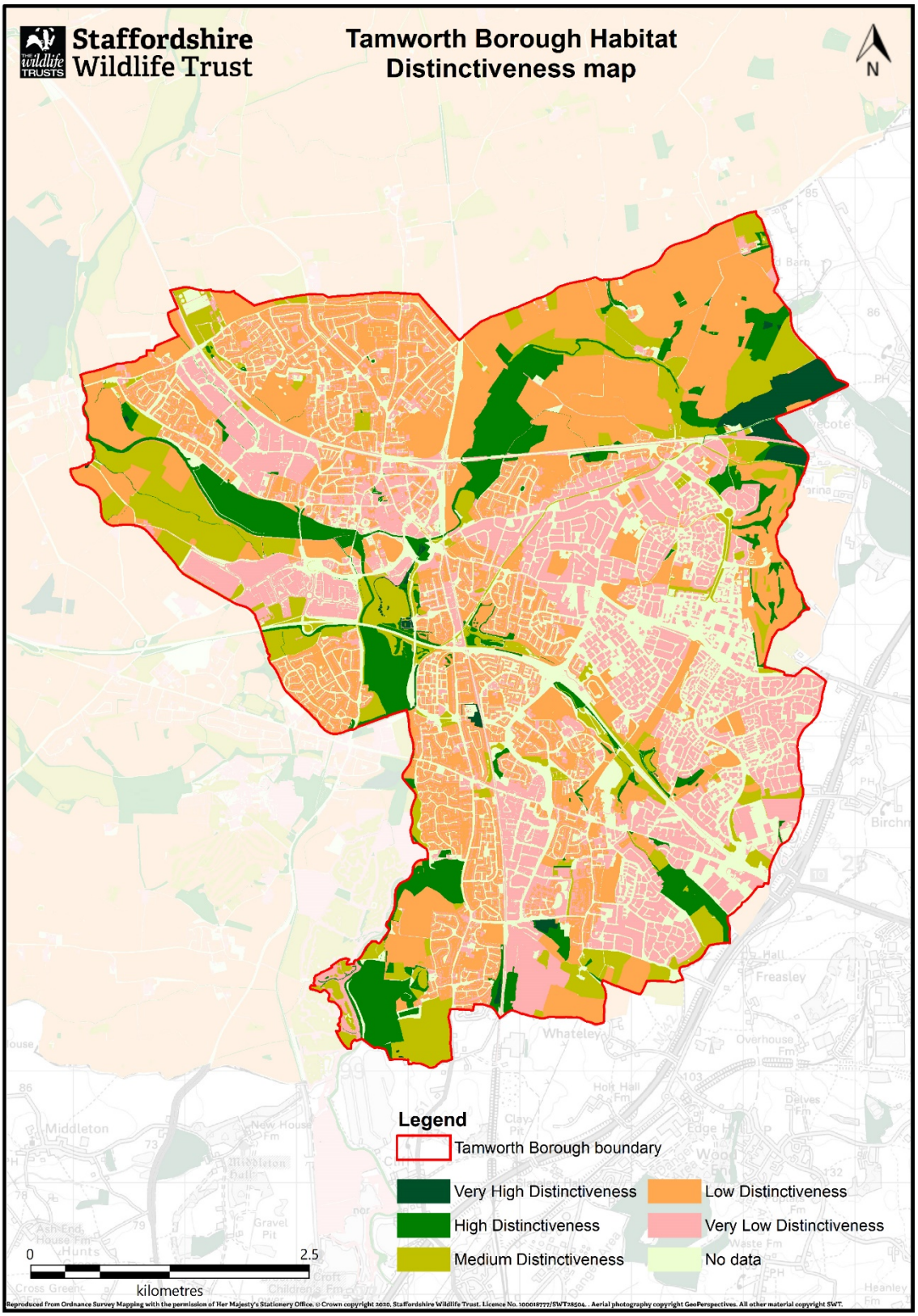
Habitat distinctiveness mapping does not include species explicitly. Instead, it uses broad habitat categories as a proxy for the biodiversity 'value' of the species communities that make up different habitats. The metric does not change existing levels of species protection and the processes linked to protection regimes are outside the scope of the metric.

Habitats are assigned to distinctiveness bands based on an assessment of their distinguishing features including for example rarity (at local, regional, national and international scales), and the degree to which a habitat supports species rarely found in other habitats. It must also be noted that this mapping is at a broad district-wide scale for

[*] https://www.gov.uk/guidance/national-planning-policy-framework/15-conserving-and-enhancing-the-natural-environment

identifying risk where there may potentially be losses to important habitat. Full ecological surveys and Preliminary Ecological Appraisals (PEA) or Environmental Impact Assessmesnt (EIA) should be carried out at a site specific level to determine the ecological value and amount of ‘biodiversity units’[*] a site level.

[*] https://www.biodiversityinplanning.org/news/bd-net-gain/



Map 1 Habitat distinctiveness map for Tamworth Borough (2021)

5.2 Habitat distinctiveness mapping limitations

The distinctiveness mapping has been carried out using a desk-based methodology utilising available habitat datasets at a landscape scale with a view of being able to quickly determine on a wider scale the likely impacts of a development. As such the landscape level distinctiveness map in some cases may not provide an accurate account of a sites full habitat distinctiveness at a finer scale (for example at site level). Due to this, developments requiring distinctiveness mapping as part of biodiversity net gain analysis should be subject to a thorough Preliminary Ecological Assessment (PEA) to determine the full extent of in situ habitats and the expected biodiversity impact of any potential habitat loss or damage.

5.3 Biodiversity metric 2.0* and Biodiversity Net Gain

The DEFRA Biodiversity metric 2.0 is designed to quantify biodiversity to inform and improve planning, design, land management and decision-making.

The metric can be used to both:

- Assess or audit **the biodiversity unit value** of an area of land and
- **Calculate the losses and gains** in biodiversity unit value from changes or actions which affect biodiversity, for example building houses or a change of use in a land holding.

The biodiversity metric 2.0 has 4 ‘quality components’ namely:

- **Distinctiveness** – based on the type of habitat present. For example, modified/amenity grassland is given a score of “2”.
    - Distinctiveness is determined by the habitat distinctiveness mapping (see section 5.2).
- **Condition** – based on the quality of the habitat. This is determined by condition criteria set out in the technical supplement.
    - This cannot be achieved as part of this exercise due to the difficulty of determining condition from a desk based methodology.
- **Strategic Significance** – based on whether the location of the development and or off-site work has been identified locally as significant for nature.
    - Strategic significance is determined by the individual habitat strategic areas and the combined strategic areas map (see section 5.4).
- **Connectivity** – based on the proximity of the habitat patch to similar or related habitats.
    - Connectivity is determined by combined strategic areas map & habitat connectivity opportunity maps (see sections 5.4 & 6).

* The DEFRA Biodiversity metric 2.0 is currently in a beta testing period, the final metric may be different to the metric used in this report.
http://publications.naturalengland.org.uk/publication/5850908674228224

Through the current study 3 of the 4 quality components have been assessed and defined at a District scale, the only exception being habitat condition which cannot realistically be assessed through a desk based methodology on such a scale and would require further ground-truthing to determine actual unit values (for example through a Preliminary Ecological Appraisal (PEA) or Environmental Impact Assessment (EIA)).

Potential delivery mechanisms of future Biodiversity Net Gain offsetting were considered as part of this study and how these may be applied in the District in the future (Appendix K (Separate document)). This includes the prioritisation and suitability of site selection in the case of off-site net gain mitigation and the creation of an initial District-wide live representation of potential receptor sites. As this map is a live representation it is subject to change and further refinement.

5.4 Strategic Habitat Areas

The Strategic habitat area methodology we have applied was developed and is currently being implemented by Warwickshire County Council (WCC) and was developed in partnership with Warwickshire Habitat Biodiversity Audit (WHBA), The University of York and Warwickshire Wildlife Trust. The methodology forms part of WCCs Sub Regional Green Infrastructure Strategy* and is used in targeting areas for habitat enhancement through biodiversity offsetting compensation.

This model was chosen for this assessment because it can be relatively easily applied with the habitat data available; it is robust having been peer reviewed during development, it is already in use by an adjacent local authority and it is based on the fundamental principles of habitat connectivity identified in Lawton et al. (2010).

The model assesses the proportion of broad habitats e.g. woodland, grassland, heathland etc. within an area to determine whether these are ‘strategic’, ‘semi-strategic’ or ‘non-strategic’ for the creation or restoration of further habitat based on the proportion of habitat already present in the area.

The strategic habitat areas were produced using the composite habitat dataset identified in the evidence base review. Firstly, specific higher quality habitats were selected and isolated from the composite habitat map (e.g. heathlands or species-rich grassland etc). The proportion of the selected habitats that overlap individual Ordnance Survey 1km grid squares was then calculated in a GIS package and each square subsequently classified into one of the area bands below, based on the area of habitat overlapping the 1km square.

In the case of Tamworth it was obvious that a 1x1km grid resolution was going to be far too coarse for use in identifying strategic areas owing to the largely urban and built up nature of the borough. The same methodology of semi-natural habitat selection etc. was used but the 1x1km resolution grid was replaced by a 100x100metre resolution grid to provide a finer scale assessment which is able to pick up the smaller areas of semi-natural habitat in the borough.

* https://www.warwickshire.gov.uk/directory-record/2160/sub-regional-green-infrastructure-strategy

Specific details on the strategic areas are listed in Appendix E.

The strategic habitat areas can be viewed as a hierarchy when it comes to the creation of a particular type of habitat:

1. **Strategic areas** are key areas to focus habitat creation or restoration. There is some high quality semi-natural habitat but additional high quality semi-natural habitat would improve the function of the network.

2. **Semi- strategic areas** are the next preferred areas in terms of habitat creation – These areas already have a relatively large area of high quality semi-natural habitat but more would still be of benefit.

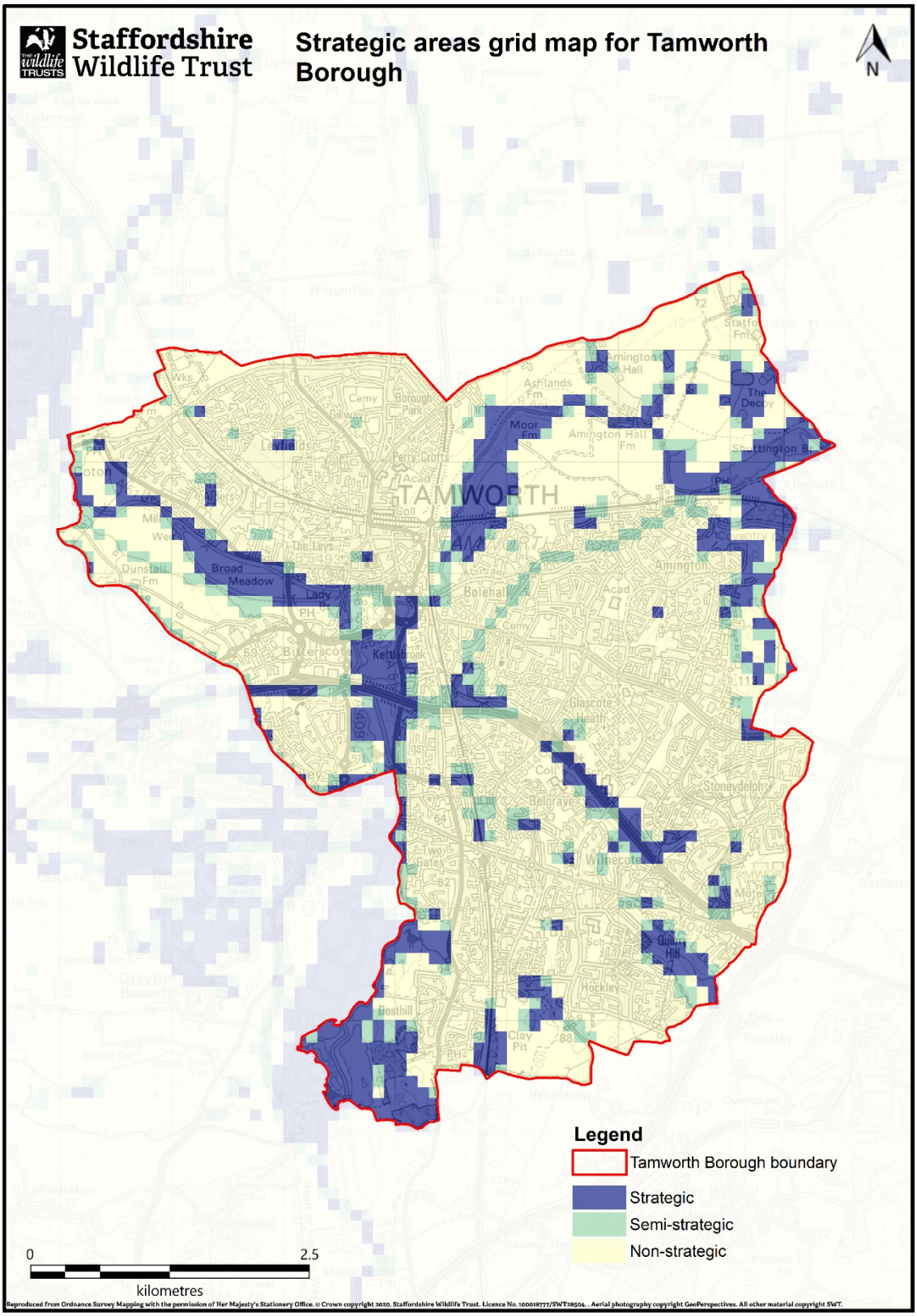
3. **Non-strategic areas** are where there is very little or no high quality semi-natural habitat where it would be difficult to create enough high quality semi-natural habitat for it to be functional. (This is not to say that semi-natural habitats should not be created in this area but that it is lower in the overall hierarchy).

The strategic area mapping described will be crucial in delivering the fundamental principles in Lawton et al. (2010).

An overall strategic areas map was produced based on the combination of all the habitats analysed as part of the strategic mapping exercise (map 2). For this map, the criteria for strategic and semi-strategic areas have been swapped so that strategic areas are those with the highest amount of overall habitat. By altering the methodology in this way it is possible to create a coarse overall ‘connectivity map’ by highlighting the areas with highest combined overall habitat availability and connectivity as opposed to those areas where it is best to create habitats.

The strategic areas are not static and are merely a snapshot in time, changes are an inevitable part of the mapping as available habitat data changes. To an extent the strategic areas mapping is self-fulfilling, as opportunities to enhance habitats described by the map are practically implemented on the ground, mapped through subsequent monitoring and the new habitat data being incorporated into future maps will influence future changes in the areas on the map (described in more detail in section 10.2).

All strategic areas for each of the habitat types assessed are supplied as digital GIS appendices to this report.



Map 2 Combined strategic areas map for Tamworth Borough (2021)

6. Establishing the Habitat Connectivity Opportunity Areas (HCO) for Tamworth Borough

The strategic areas mapping described previously still leaves gaps between areas deemed to be strategic or semi-strategic for a particular habitat type, therefore the creation of habitats solely within these areas may still end up leaving isolated habitat patches which potentially do not link to one another within a landscape. In the interests of driving habitat creation in the direction of connecting these isolated spaces it is important to map an aspirational 'ideal' connected habitat network to work toward: A Nature Recovery Network.

Using local knowledge coupled with additional datasets including soils, nature conservation site boundaries, Staffordshire Biodiversity Action Plan (SBAP) Ecosystem Action Plan Areas (EAPs (Appendix I) and priority habitat inventories along with a piece of ecological modelling software called Condatis (Wallis & Hodgson, 2012), it was possible to further scrutinise and refine the strategic areas map to define comprehensive Habitat Connectivity Opportunity (HCO) areas map for the District based on individual habitats.

The HCO areas add another dimension to the strategic areas modelling detailed previously to define where habitats are both already well connected and equally as crucially broadly identify where to direct the delivery of habitat creation or restoration to create a connected habitat network.

6.1 Habitat Connectivity Opportunity Areas Rationale

The decision to use Condatis to build upon the strategic mapping was in part due to the fact the software has previously been used to identify habitat connectivity in other areas of the county (Churnet Valley Landscape Ecology Pilot Partnership, 2014), where it worked well at identifying rough habitat corridors. Condatis also works on a per habitat basis it is therefore possible to analyse habitat connectivity on an individual habitat basis (A full technical explanation of the Condatis software can be found in Appendix F). Condatis has some limitations in that it only takes into account a single habitat at a time and does not account for other potential connectivity barriers, for example urban areas. It is therefore crucial that these outputs were vetted against other relevant datasets such as soils data; ensuring that identified connectivity opportunities fall in line with the SBAP EAPs areas and that crucially the connectivity opportunity areas correspond with how local expert knowledge would expect the habitat connectivity areas to look in the District, to sense check what is produced by the models.

7. Results

7.1 Habitat Connectivity Opportunity Areas identified

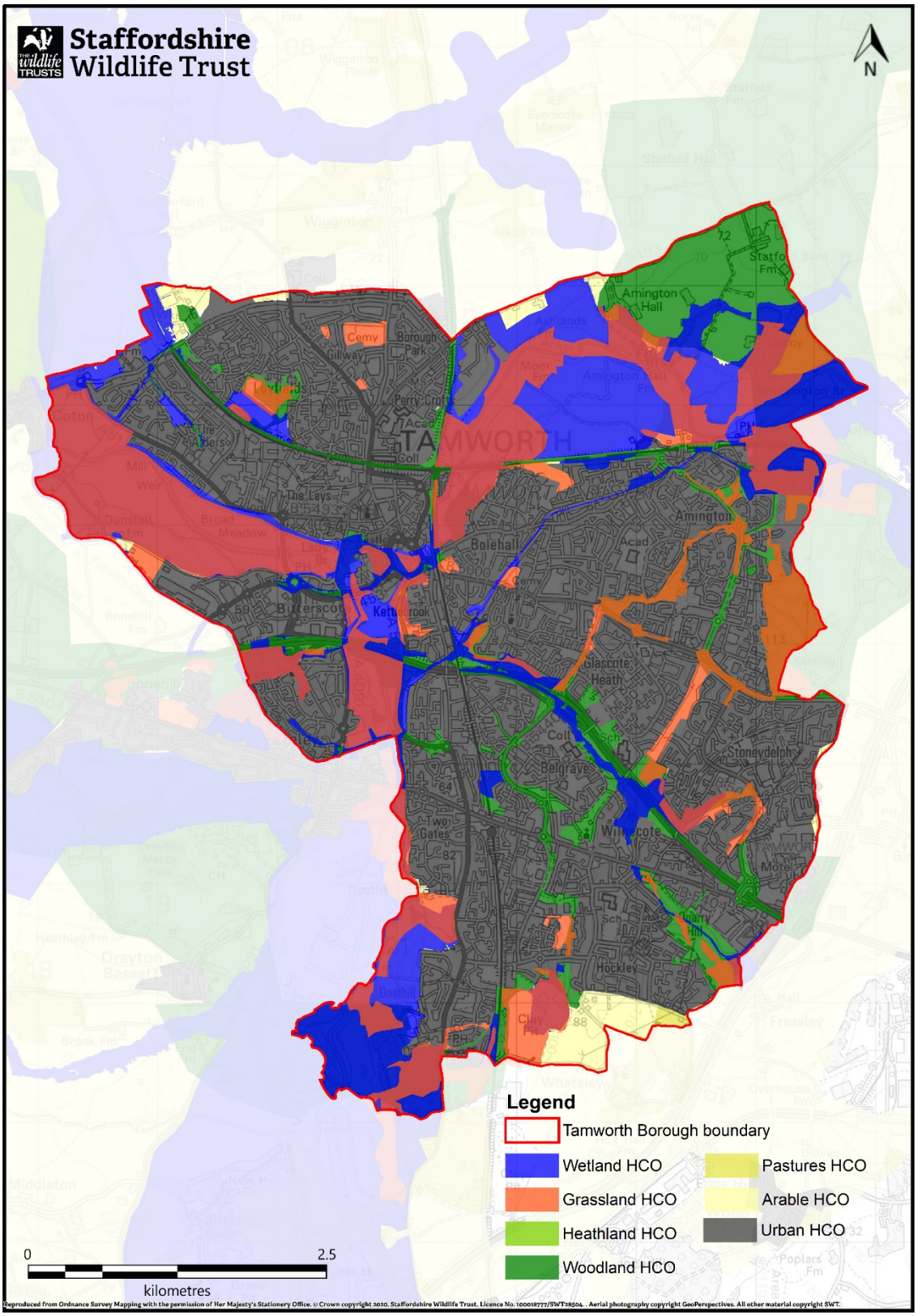
A total of 6 separate Habitat Connectivity Opportunity area types have been identified and mapped covering the entirety of Tamworth Borough:

1. Heathland
2. Woodland
3. Grassland
4. Wetland
5. Pasture and arable land
6. Urban

Each opportunity area is described in terms of its key habitat or habitats. This should not be taken to mean that other habitats are absent from the opportunity area, or that habitats identified as a priority in the opportunity areas should replace existing non-target high quality habitats of a different type.

The Habitat Connectivity Opportunity areas were brought together to produce a combined HCO map for the District (map 3).

Each opportunity area is described in more detail in the following sections, along with relevant associated land uses, environmental issues, and the overarching objectives and opportunities for each zone.



Map 3 Combined habitat connectivity opportunity areas map for Tamworth Borough (2021) NB: some of the HCO areas overlap one another which can lead to the colouring of the map being distorted.

7.2 Woodland Opportunity Area

Woodlands in the borough are generally narrow and confined to roadsides and on the periphery of other linear features such as railway lines, watercourses and canals. There are some larger areas of woodland in the less urban areas in the North and South of the borough, mainly around Dosthill and Amington and Alvecote.

There are no designated Ancient Woodland Inventory (AWI) or (Re)Planted Ancient Woodland Inventory sites (PAWS) and there is no predominant type of woodland in the borough, the woodlands the urban areas mostly consist of plantation deciduous and mixed deciduous woodlands, the larger homogenous blocks of woodland are made up of a mixture of semi-natural and plantation deciduous woodlands.

The A5 which runs through the centre of the borough has almost a continuous band of woodland either side which provides screening to the nearby housing, but also is likely to act as a good ecological pathway.

The areas of woodlands at Wiggington Park reflect a more traditional parkland landscape with associated with mature and veteran trees important for a range of species.

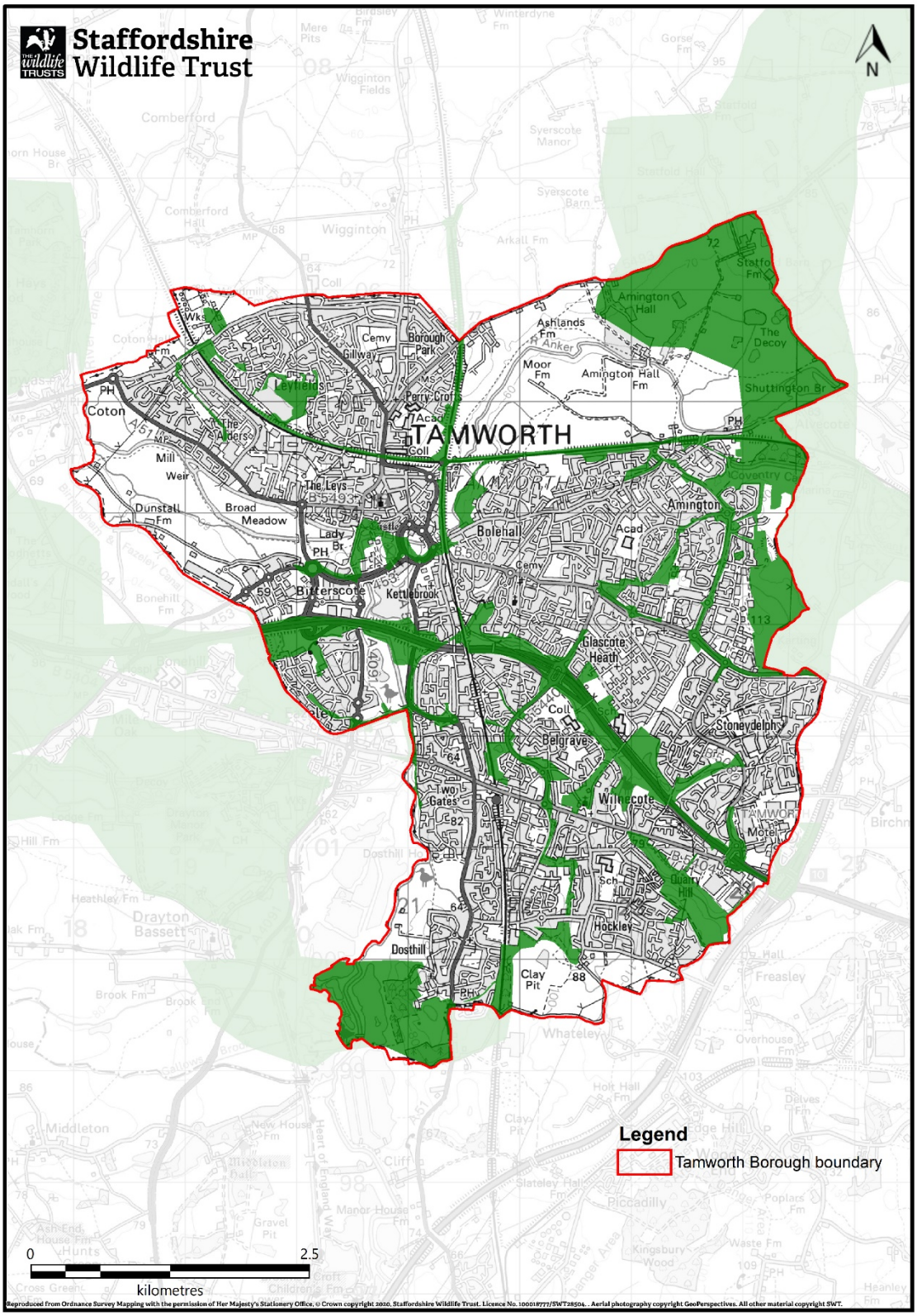
7.2.1 Key Habitats	7.2.2 Key species
• Woodlands (e.g. semi-natural ancient woodlands, coniferous plantation) • Wood Pasture and Parkland are of particular importance in the District. • Dense Continuous and Scattered Scrub • Lowland Heathland • Traditional Orchards • Lowland Meadows and floodplain meadows	• Butterflies • Cuckoo • Owl Species • Bluebell • Amphibian species (Great Crested Newt, Common Frog, Common Toad), specifically as terrestrial refuge sites. • Native Black Poplar
7.2. 3 Threats	**7.2.4 Opportunities**
• Loss and fragmentation of irreplaceable woodland habitats (ancient woodland inventory sites). • Both residential and industrial development. • Inappropriate management of species-rich and/or ancient woodland sites either directly within or surrounding these sites leading to deterioration and lowering overall diversity. • Loss or deterioration of hedgerows and other associated habitats severing connectivity between woodlands and to other habitats.	• Protection of existing sites, particularly ancient woodland inventory sites and woodlands which are designated as Local Wildlife Sites. Planting of further future woodlands on sites which do not already support a priority habitat to improve connections of existing areas of high quality woodland and increase the area of woodlands which are ecologically functional for the species that they support. • Encourage relaxed management on the fringes of woodlands to provide a softer edge (e.g. scrub formation) habitat which is able to support both more and a wider diversity of species, particularly birds and butterflies.

• Unsympathetic or poorly thought out woodland planting and creation on sites which already support another important habitat of conservation concern, e.g. species rich lowland meadows, causing irreversible loss. • Replanting of ancient woodland sites with species which are not characteristic or native to the area. • Scrub removal either through intensive management regimes or development.	• Expand the area of existing woodlands. Create new areas of woodland that are in strategic locations and are of suitable size to act as stepping stones between existing woodlands. Woodland expansion and creation must not be detrimental to other high quality habitats for instance diverse grassland habitats. • Use historical maps and data to determine the past extent of woodland areas, particularly where there may still be a rich ground flora in the seedbank for the restoration and expansion of ancient woodland sites. • Planting new and maintaining existing hedgerows to better connect smaller isolated woodlands benefiting species migration and chances of breeding. • Avoidance from or incorporating key woodlands into development sites, this is achievable through mitigation hierarchy within the National Planning Policy Framework. • Restoration of Planted Ancient Woodland sites (PAWS) to native broadleaf or diversification of coniferous woodlands to include more native planting. • Ensure that there is no loss or damage to known wood-pasture or parkland sites or sites which may have similar habitats. • Identification of, and promotion of the importance of veteran trees, both in woodland and in the wider landscape.

7.2.5 Opportunities to enhance other benefits

- Flood risk mitigation
- Urban Cooling
- Carbon storage
- Recreation and aesthetic
- Cultural heritage
- Wood fuel, timber and fibre
- Foraging / wild food

7.2.6 Map of Woodland Opportunity Area



7.3 Grassland Opportunity Area

Grasslands are an important feature throughout the district ranging from small discreet areas of public amenity space to large expanses of species rich floodplain pastures and meadows. Many of the important grassland areas within the district are already designated as Local Nature Reserves (LNR) and are mostly publicly accessible, allowing people to get closer to nature.

Species-rich grasslands occur in high concentration for such a small and urban borough. For the most part the species-rich grasslands are closely associated with watercourses in the borough; the corridors of both the River Tame and the River Anker support a number of important grassland sites, in addition to the many other smaller watercourses such as the Kettle, Mill and Bourne Brooks all of which support some species-rich grassland areas.

Notable grasslands include Broad meadow which supports one of the only remaining native populations of Snake-head Fritillary in the county, the only other sites with populations as significant as these in the county are internationally designated for their conservation importance.

Another area of importance is the Kettle Brook LNR which also possesses some species rich grasslands which are publicly accessible.

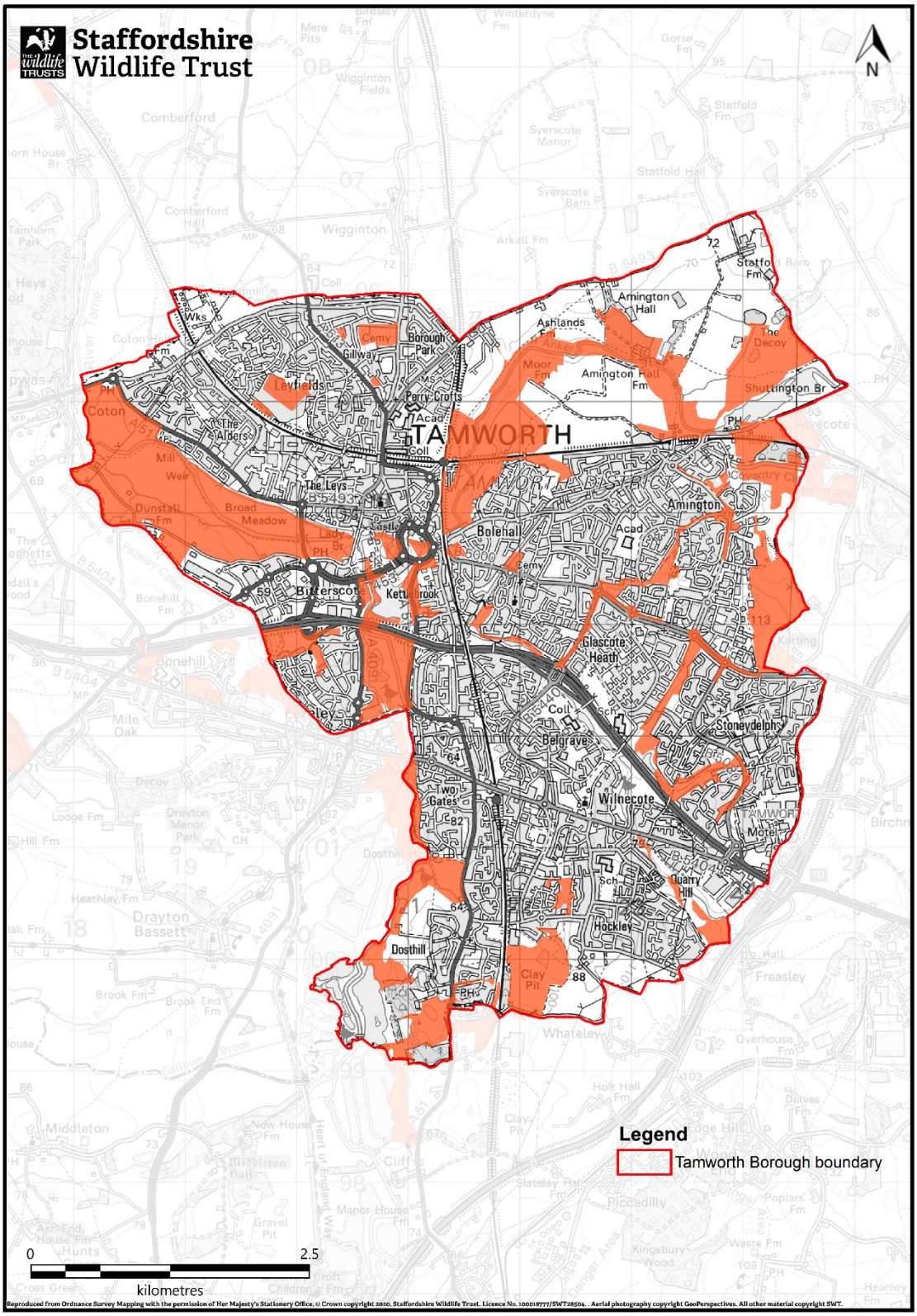
Even in the very centre of the urban areas species-rich grasslands are still present in and around 'Egg Meadow' the area in the centre of Bole bridge and Anker Bridge close to the town centre.

Whilst not strictly just grassland habitat, Open Mosaic Habitats on Previously Developed Land (OMHPDL) also known as 'brownfield habitats of high environmental value' are also of importance in the borough, but generally do not fit into a single habitat categorisation. OMHPDL habitats are generally made up of a mosaic of 2 or more specific habitats such as short ephemeral vegetation, grasslands and scrub. As the name suggests occur on land which has previously been developed e.g. from mineral extraction, building development etc. and provide conditions capable of supporting very specific groups of plants and animals which often aren't found elsewhere.

7.2.1 Key Habitats	7.3.2 Key Species
• Lowland meadows • Semi-improved Pastures • Hedgerows • Arable land • Open mosaic habitat on previously developed land • Ponds • Traditional Orchards • Coastal Floodplain Grazing Marsh • Purple Moor Grass and Rush Pastures	• Skylark • Farmland birds • Bats (specifically Brown Long-eared, Noctule and Pipistrelle species) • Butterfly species such as Dingy Skipper and Small Pearl-bordered Fritillary. • Reptiles, specifically Common Lizard and Adder • Snakes-head Fritillary
7.3.3 Threats	**7.3.4 Opportunities**
• Development pressure • Poor management of key diverse sites including:	• Ensure that all high quality grassland sites remain in positive conservation management, securing vital areas which

○ Over-grazing ○ Poaching ○ Neglect of Hedgerows ○ Over-cutting of Hedgerows ● Nutrient intensification both from agricultural practices as well as diffuse pollution sources - nitrogen deposition. ● Agricultural intensification ● Neglect of sites and lack of appropriate conservation management. This is a major threat to diverse grassland sites not only in the District but in the county as a whole. ● Global and local climate change. ● Habitat loss and fragmentation	can be used as sources of biodiversity into the future. ● Protection of existing high quality grasslands and buffering these from potentially detrimental neighbouring land uses such as intensive farming practices. This could be achieved through encouraged uptake of agri-environment schemes, landowner liaison/education ● Enhancement of any existing grassland sites or restoration of degraded sites so that they may achieve Local Wildlife Site Status and ensure that the management of these sites persists to ensure that they remain diverse. ● Reversion of arable land to diverse grassland where soils dictate. This is usually only carried out in certain circumstances due to the difficulty and cost associated however there are examples of this being successfully carried out in the District. ● It is critical that areas of high quality grassland are linked with mosaics of other high quality grassland to ensure that species reliant upon these habitats are able to move freely between them. ● Use of Light Detection And Ranging (LiDAR) imagery to identify historical field patterns and features i.e. ridge and furrow to indicate where grassland restoration may be most successful as these areas have not or are unlikely to have undergone any serious agricultural improvement in the past.
7.3.5 Opportunities to enhance other benefits	
● Pollination ● Recreation and aesthetic ● Cultural heritage	

7.3.6 Map of Grassland Opportunity Area



7.4 Wetland Opportunity Area

Watercourses and wetlands are undoubtedly the most significant features of the borough. The confluence of two large watercourses the Rivers Tame and Anker occurs within the centre of the town, along with a number of additional smaller watercourses such as the Kettle, Bourne and Mill Brooks also running through the district along with dozens of drains and ditches.

Many of the watercourses in the borough have large areas of associated floodplain, in particular the River Tame and Anker, but also to a lesser degree some of the smaller watercourses such as the Kettle Brook. The floodplains of the River Tame support a number of different wetland habitats, to the south of the borough in the former mineral workings now supports a range of wetland habitats which are of high importance to a huge diversity of species.

Both the floodplains of the River Tame and Anker support a wet grassland habits as a result of the periodic flooding and inundation, these are important both locally and within the county. Key sites are Broad Meadow, Tameside Nature Reserve on the River Tame and Warwickshire Moor on the River Anker.

The Kettle Brook also supports a good linear pathway of wetland habitats but in addition also supports areas of grassland and wet woodland habitat at Stonydelph which are also of a high biodiversity value.

In addition to the rivers and their associated wetland habitats Coventry and Birmingham and Fazeley Canals run through the borough, providing additional linear wetland habitat and increased habitat connectivity, in the case of the Coventry Canal through dense urban areas.

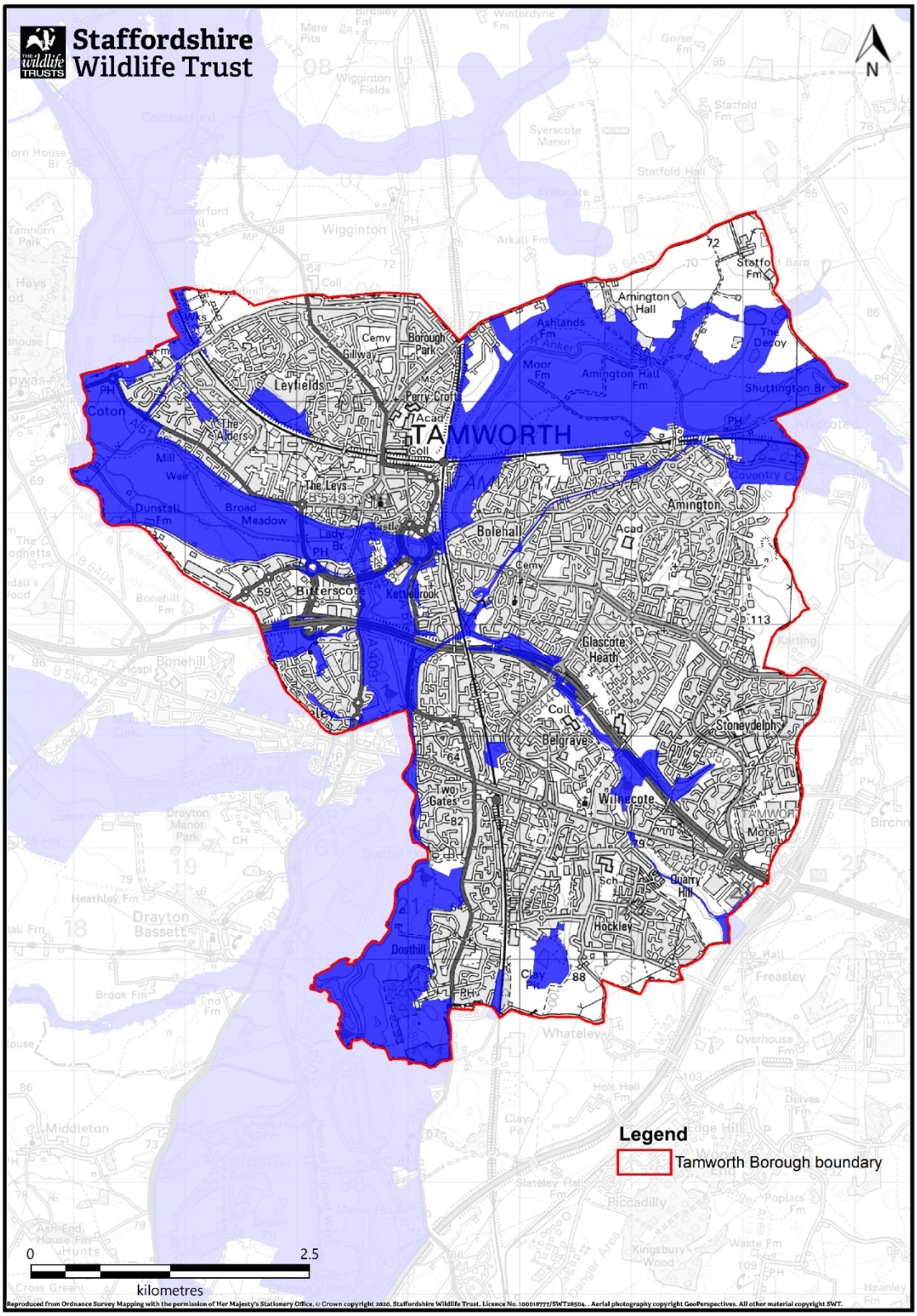
The area around Hockley Clay pit also supports some diverse wetland and grassland habitats which are important locally.

7.4.1 Key Habitats	7.4.2 Key Species
• Woodland • Grassland • Pasture • Arable • Urban fabric/mosaic habitats	• Otter • Great Crested Newt • Freshwater White-clawed Crayfish • European Water Vole • Harvest Mouse • Various Reptiles and Amphibians • Waders and wintering wildfowl • Brown Trout
7.4.3 Threats	**7.4.4 Opportunities**
• Mineral extraction. • Pollution from acute and diffuse sources. • Poor land management, livestock in and near watercourses and waterbodies, soil erosion leading to	• Protection of existing high quality wetland sites particularly those with a nature conservation designation. This will be achieved through the identification of environmental issues for example pollution from agricultural run-off and subsequent remediation for instance through Rural SuDS. These

eutrophication of water bodies and loss of habitat in watercourses. ● Historic deepening and straightening of watercourses, meaning that rivers and streams lack natural features such as gravel beds. Water is disconnected from floodplains. ● In some areas removal of tree cover and grazing leading to habitat degradation. ● Lack of understanding of the need to protect water throughout the catchment including areas where there are no obvious watercourses. ● Global and local climate change. ● Loss of 'coarse' habitat to development or agricultural intensification which would otherwise impede the flow of water leading to: ○ Increased flood risk. ● Invasive Non Native Species (Himalayan Balsam (*Impatiens glandulifera*), Parrot's-feather (*Myriophyllum aquaticum*), *Azolla* sp, *Crassula helmsii* etc.). ● Plant and animal disease, transmission and biosecurity.	sites should be buffered from any potential sources of damage both through creation of habitat around key sites to provide a 'soft edge' habitat and landowner liaison to address issues. ● Identification of the most suitable locations for the targeting and prioritisation of further wetland creation and enhancements. ● Seek opportunities to deliver Natural Flood Management in the headwaters of rivers and streams to address flood risk and provide additional areas for habitat provision. ● Look for opportunities to carry out river reprofiling/naturalisation, improve flood storage and provide additional habitats suitable for a range of species particularly breeding waders and wintering wildfowl. ● Use historical maps and LiDAR information to identify historical wetland and river features, sluices, water meadows etc. which could potentially be restored to deliver both flood risk mitigation and habitat improvements. ● Use flood models to dictate where work can be targeted to both deliver improved flood mitigation as well as deliver further habitat works ● Ensure that sand and gravel quarry extraction sites are effectively restored and provide additional benefits for wildlife. There is a huge opportunity here to deliver biodiversity and flood mitigation objectives. ● Effective mitigation for the loss of Great Crested Newt (GCN) habitat as a result of development. (Priority areas for the creation of compensatory pond clusters would need to be addressed at a finer scale using Great Crested Newt (GCN) metapopulation data and modelling).
7.4.5 Opportunities to enhance other benefits	

- Flood risk mitigation
- Water quality
- Recreation and aesthetic
- Cultural Heritage

7.4.7 Map of Wetland Opportunity Area



7.5 Pasture and Arable Opportunity Area

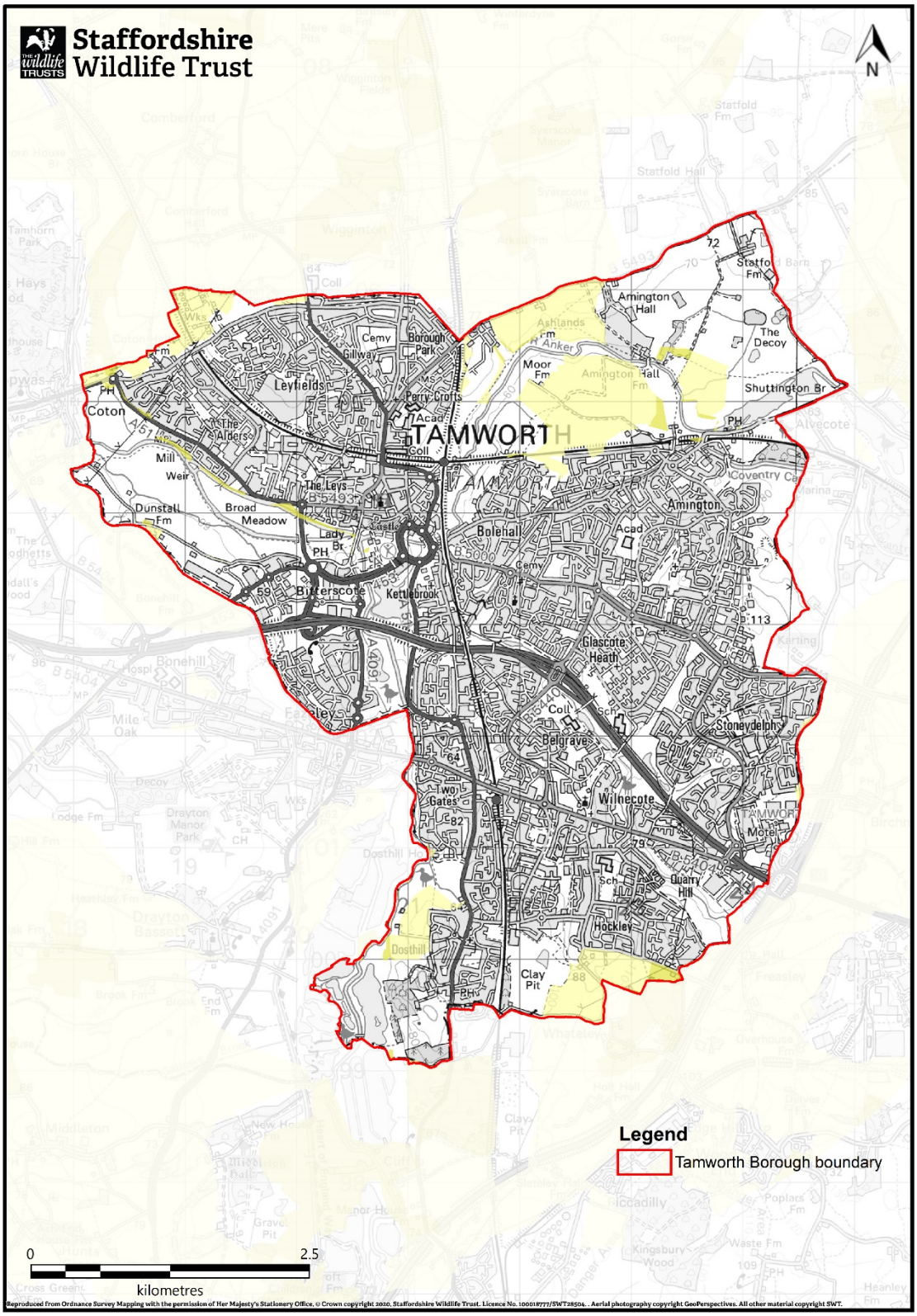
Only a very small amount of the pasture and arable opportunity area is present in the borough owing to the largely urban nature, this is mostly confined to the North alongside the River Anker and a small area of farmland to the south around Dosthill and Hockley.

7.5.1 Key Habitats	7.5.2 Key Species
• Grassland • Woodland • Hedgerows • Mature and veteran trees	• Barn Owl • Brown Hare • Harvest Mouse • Polecat • Grey Partridge • Wall Brown butterfly • Arable 'weeds' and cornfield annuals rare to the county found in set-aside ground, headlands and field margins.
7.5.3 Threats	**7.5.4 Opportunities**

• Habitat fragmentation.
• Agricultural intensification.
• Urban encroachment.
• Pollution of waterways.
• Loss and deterioration of ponds for example through changes in water management or nutrient intensification.
• Improper management e.g.
  ○ Over-grazing
  ○ Poaching
  ○ Neglect of hedgerows
  ○ Over-cutting of hedgerows
	• There are a wide range of opportunities for more intensively farmed agricultural land ranging from very small interventions such as leaving one corner of an arable field as set aside to provide feeding opportunity for farmland seed eating birds to large whole farm scale interventions for example reversion of large areas of arable land into diverse grassland. Obviously the scale of the intervention is down to what is practical and ultimately what is desirable, cost effective and sustainable in the eyes of landowners and land managers.
	• Link up existing semi-natural habitats through the creation of habitat corridors and networks using hedgerows, arable field margins and watercourses where possible.
	• Reversion of arable to other habitats with a higher biodiversity value for example species rich grassland.
	• Encourage uptake or movement toward organic production methods or holistic grazing management over reliance on supplementary feeding or indoor systems for example.

	• Where developments are likely to impact on large areas of intensive farmland, ensure that as a result some of the developed area is dedicated to the provision of high quality semi-natural habitats which may greatly improve habitat availability and connectivity within the landscape.
7.5.5 Opportunities to enhance other benefits	
• Water quality • Cultural heritage • Food production	

7.5.7 Map of Pasture and Arable Opportunity Area



7.6 Urban Fabric Opportunity Area

Urban fabric constitutes the largest proportion of the borough aside from small areas to the far north and south.

In terms of green space capable of supporting biodiversity Gardens probably make up the biggest component within the urban areas, however they are generally fairly small. There are a number of areas with street trees and landscaped planting which are of value to wildlife but possibly just as importantly also provide additional ecosystem service benefits for example through urban cooling.

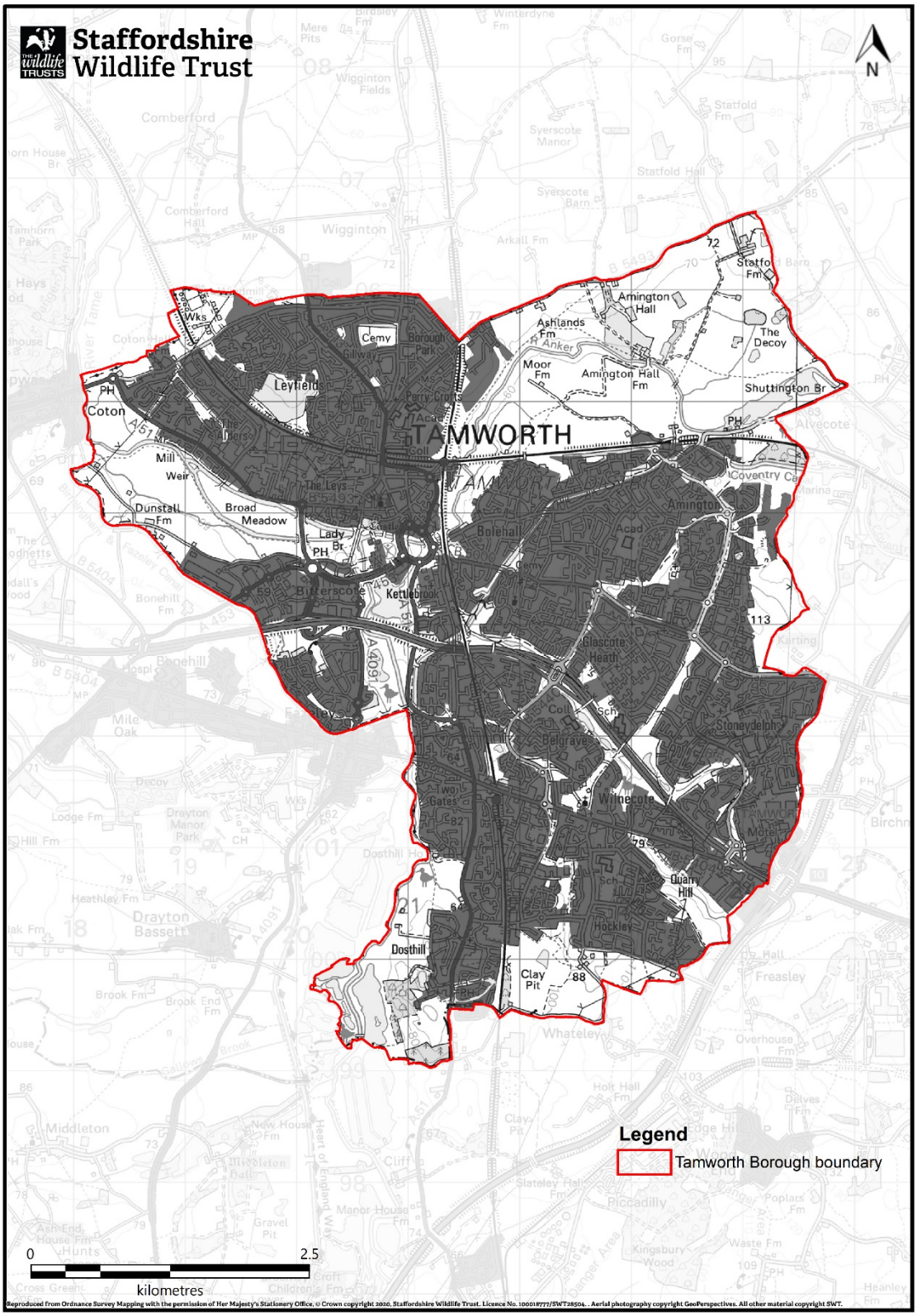
7.6.1 Key Habitats	7.6.2 Key Species
• Grassland • Woodland • Open Mosaic Habitat on Previously Developed Land (brownfield habitats) • Wetland • Rivers and streams • Street trees (particularly those in environments where other green space is lacking)	• Hedgehog • Great Crested Newt • Slow Worm • Invertebrates and pollinators • House Sparrow • Toads and other amphibians • Finch species.
7.6.3 Threats	**7.6.4 Opportunities**
• Habitat fragmentation through the loss of both sources of biodiversity as well as habitat 'stepping stones' and linear pathways which species require to be able to disperse. • Pollution both from acute and diffuse sources leading to the loss of diversity in waterways etc. • Urban expansion • Redevelopment of Open Mosaic Habitats on Previously Developed Land (OMPDL) which are often important sites for a number of species in urban areas. • Intensive management of urban green spaces leading to: • Invasive species • Increased flood risk due to increased area of hard impermeable surfaces.	• The key objectives in these areas is not to connect urban areas together but to enable permeability between rural and urban landscapes, especially where high quality semi-natural habitats exist in close proximity to or within these areas. In doing this it is possible to benefit habitat connectivity but also bring wildlife closer to people. • Urban spaces are often important for the Open Mosaic on Previously Developed Land (OMPDL Biodiversity Action Plan (BAP) habitat due to the relatively high levels of (re)development. These habitats are often vitally important for a number of rare and unusual invertebrate species relying on bare ground. OMPDL habitats are often transitory habitats, both in terms of natural succession and likelihood of development, ensuring that there is always provision of some of this habitat type at any one point in urban areas will help to prevent the complete loss of species relying on this habitat from an area.

	● Ecological enhancement of existing urban green spaces, for example through improving the diversity of amenity grassland in parks by seed sowing and green hay strewing, enhancement or creation of wetlands in Sustainable Drainage Systems (SuDS). ● Creation of new habitats when planning new urban developments, make new developments as green as possible to bring high quality habitats and improve habitat connections in the urban environment. This may include for example green roofs/green walls, wildlife friendly SuDS which can be planted with native wetland species, rain gardens to slow the flow of water. ● Ensure that urban green spaces are managed appropriately to provide the best benefits for wildlife and people - this may include relaxing mowing regimes to create and maintain more diverse grasslands, thinning of plantation woodlands to improve structural diversity or invasive species control. ● Ensure that linear features such as canals, old railway lines, road verges, hedgerows are managed for the good of wildlife as these are often critical pathways for biodiversity in and out of the urban environment. ● Provide suitable opportunities in existing and new developments for protected and Biodiversity Action Plan (BAP) species for example bats, hedgehogs and pollinators.
7.6.5 Opportunities to enhance other benefits	
● Recreation and aesthetic - improved access to and increased number of natural resources. ● Health and wellbeing - improved access to an increased number of natural resources. ● Flood risk mitigation - More green areas lead to increased habitat coarseness which slows the flow of water, Sustainable Drainage Systems (SuDS) schemes increase habitat and hold water away from vulnerable areas. ● 'Pocket Parks' encouraging local people to take up management of small urban green spaces to benefit both wildlife and those which live nearby. By adopting multiple	

pocket parks it is possible to create a stepping stone network throughout the urban environment.

- Urban cooling – suitable tree planting, increased green space and green developments, green walls, green roofs etc.
- Cultural heritage - access to nature and traditional landscapes.
- Public engagement - opportunity to educate people on ecology and the natural world and what people can do to provide space for wildlife in gardens, allotments, local parks etc.

7.6.7 Map of Urban Fabric Opportunity Area

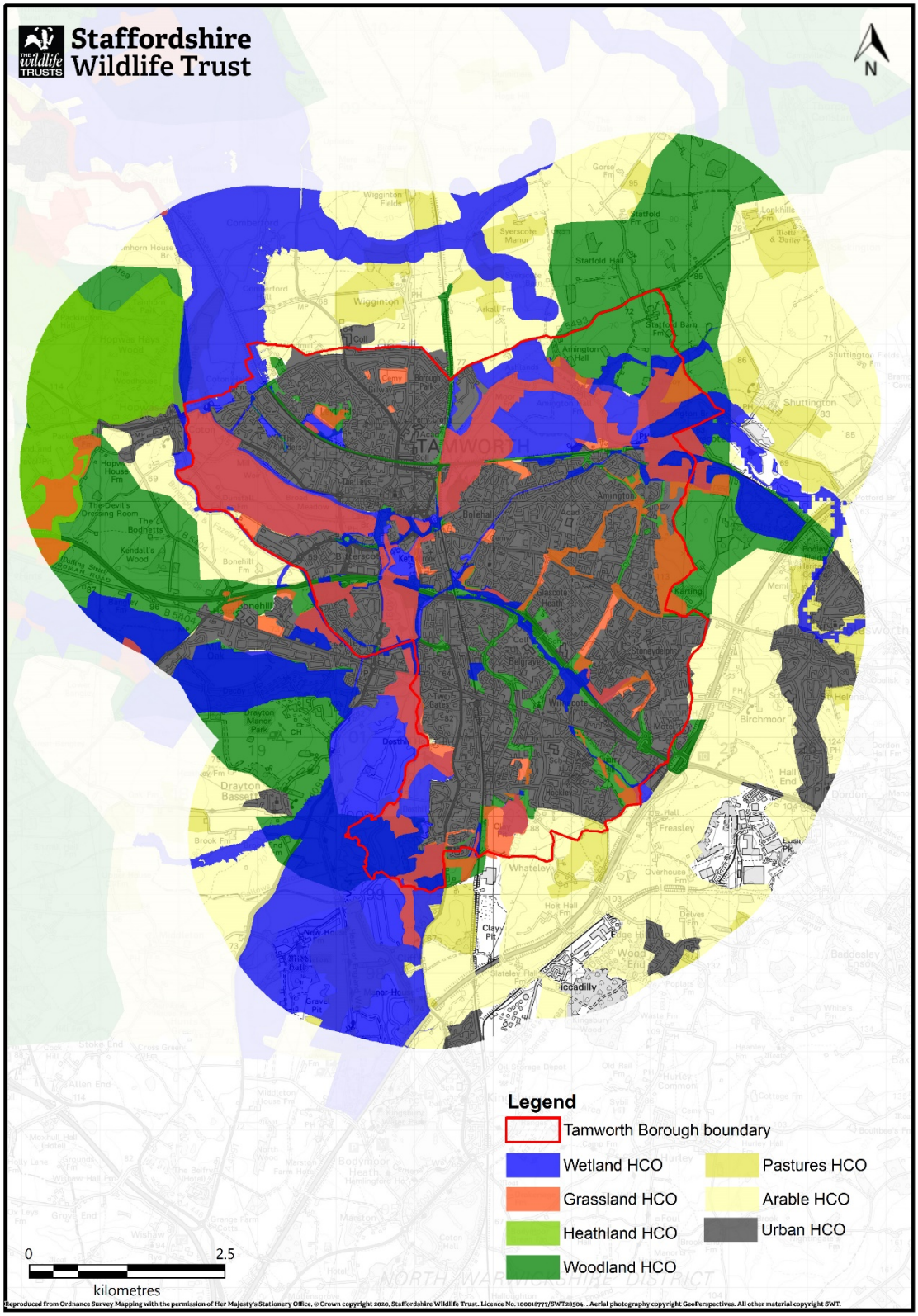


8. Cross boundary habitat connectivity

As habitats and wildlife do not adhere to political boundaries it is important to take into account habitats which exist on the other side of political boundaries to ensure that there is no ‘hard edge’ where for example a Habitat Connectivity Opportunity area ceases to exist at the edge of a county or District boundary despite there being suitable habitat

Map 4 illustrates this, showing the Habitat Connectivity Opportunity areas combined map including a 2km radius buffer around the District boundary. Despite the buffered radius falling outside of the District and county boundaries habitat connectivity into these areas has been considered as part of the mapping to ensure this ‘hard edge’ has been avoided. It must be noted however that the HCO areas do not extend large distances into neighbouring authority areas with the ultimate goal that all authority areas will have a mapped Nature Recovery Network which dovetails with this NRN mapping.

The cross boundary HCO areas in neighbouring local authorities may be subject to change based on any future NRN mapping which may be commissioned by the respective local authority in its jurisdiction. At this stage Habitat Connectivity Opportunity areas identified outside of the District should only be considered potential and may be subject to future changes. These areas have been included in this assessment to demonstrate the duty to cooperate across boundaries has been considered in this mapping exercise.



Map 4 Combined habitat connectivity opportunity areas map for Tamworth Borough including a 2 kilometre buffered radius of the District boundary (2021). NB: some of the HCO areas overlap one another which can lead to the colouring of the map being distorted.

9. Practical Application of the maps

The HCO maps detailed are designed to be used in conjunction with the biodiversity metric 2.0, however the habitat connectivity opportunity areas and the bottleneck analysis can be used to both inform the metrics and target the location and application of future ecological enhancements contributing to a functional nature recovery network.

The HCO areas are based around the principle of habitats being ecologically functional and well connected to one another within the landscape. This means that habitats are able to both support a high population and diversity of species, meaning these species have the ability to be able to move freely within the landscape, as a result of good habitat connectivity.

These areas promote the conservation, restoration and enhancement of certain priority habitats, ecological networks and contribute to the protection and recovery of associated priority species within defined geographic areas.

The habitat connectivity opportunity areas mapping has no white space as there are always opportunities for the delivery of habitat creation or enhancement anywhere in the landscape irrespective of whether it has been identified as a connectivity area for a priority habitat or not. Taking this approach ensures that the landscape as a whole can remain permeable for our flora and fauna and resistant to both local and global impacts For full technical details on the principles of HCOs and mechanisms for delivery see Appendix G.

The habitat connectivity opportunity areas identify the key areas where the creation of new habitat is best prioritised to benefit habitat connectivity within the landscape. Targeting additional habitat creation in this way will have the greatest impact on both availability and connectivity of habitat within the landscape as it builds upon areas which already possess some good quality habitats but by increasing their size, quality, coverage and connectivity within the landscape will enable those habitats to become more functional.

The way that the opportunity areas are generated means that habitat opportunities are not mutually exclusive of one another i.e. there can be overlapping areas for multiple habitat types; for instance an area defined as an opportunity for woodland enhancement may also provide a good opportunity for improving grassland and wetland habitat enhancement and connectivity. The on-site prioritisation of what habitat to create where must therefore rely upon both the opportunity areas as well as local ecological expert knowledge so as not to risk either damaging connectivity or destroying existing good quality habitats.

10. Next Steps

10.1 Habitat connectivity bottlenecks

Bottlenecks highlight the areas of habitat which have the highest ‘strain’ in terms of supporting connectivity within the nature recovery network. These areas are where there is a high flow of species through an area with relatively few links and over a long distance (i.e. a very concentrated flow of species movement squeezing through a very small area of habitat and being forced to jump large distances between patches of suitable habitat). Producing detailed guidance in how this can best be addressed will enable informed focused positive impacts that directly reduce strain on the habitat connectivity network.

Bottlenecks can be used to determine the optimal locations to create and restore habitats to benefit connectivity and reduce ‘strain’ on the habitat network. Creating, enhancing and restoring habitat in these locations will not only benefit by reducing strain on the network but also reduces the risk or likelihood of losing what may be an important link in a habitat connectivity network which is already under pressure.

10.2 How the strategic mapping will evolve over time

As discussed previously, the opportunity map is not static and as physical habitats change on the ground and are subsequently mapped and monitored the map itself will evolve with these updates (Appendix J). It must be stressed that the opportunity areas themselves are where work to enhance habitats is focussed as this is where the opportunity to get the greatest benefits lies, the following example purely illustrates how the process of habitat improvement over time can influence changes in the map itself.

11. In Conclusion

The analysis and opportunity areas mapped within the new nature recovery network are much more fine scale and are based around a more robust defensible methodology that can more clearly deliver against NPPF and PPG objectives, as well as those likely to emerge as outlined in the Environment Bill (House of Commons, 2019).

12. Glossary

Term	Definition
Biodiversity Action Plan/ UK Biodiversity Action Plan	A biodiversity action plan (BAP) is an internationally recognized program addressing threatened species and habitats and is designed to protect and restore biological systems. The original impetus for these plans derives from the 1992 Convention on Biological Diversity (CBD). The UK Biodiversity Action Plan (UK BAP) was published in 1994, and was the UK Government's response to the Convention on Biological Diversity (CBD).
Geographic Information System (GIS)	A computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. By relating seemingly unrelated data, GIS can help individuals and organizations better understand spatial patterns and relationships.
Light Detection And Ranging (LiDAR) imagery	Remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth to create a digital topography elevation map.
Local Wildlife Site (LWS)	Local Wildlife Sites are areas with locally significant nature conservation value. They come in all shapes and sizes, from small wildflower meadows and secluded ponds to ancient woodlands. Most are owned by private individuals.
Natural capital	Natural capital can be defined as the world's stocks of natural assets which include geology, soil, air, water and all living things.
Nature conservation site	This is a blanket term is used to describe all sites which have a land use designation relevant to nature conservation or are managed in the interests of nature conservation and wildlife for example, Local Wildlife Sites, SSSI or Nature reserves.
Non-statutory nature conservation site	Non-statutory sites (specifically LWS) receive some protection from development via local planning documents which recognise the need to protect and enhance designated sites and those of interest without a statutory designation.
Site of Special Scientific Interest (SSSI)	Sites of Special Scientific Interest are areas of very high nature conservation value which are legally protected nationally, these sites are normally the best remaining examples of natural habitats and may also have an international designation e.g. Special Area of Conservation (SAC).
Statutory nature conservation site	A site with a designation which is upheld and protected by law e.g. SSSI or SAC
Sustainable Drainage Systems (SuDS)	Sustainable drainage systems (SuDS) are a technical solution to addressing issues that arise with the increasing problem of excess surface water. Originally used in urban areas, they are now used for some roads and towns in rural areas.

	SuDS are always site specific, and require bespoke design that take into account the underlying hydrology, functional purposes of the area, and the present and future needs of people using the area.
White space	Areas of a map which have no information, i.e. gaps in a dataset.

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14. Appendices

Appendix A – Breakdown of Habitat Composite Region (including new habitat data created as part of the brief)

Less than N years old	Data collection method	Cumulative Area (ha)	% of LA area
5 years	Desk based	1016	12.9%
	Ground Truthed Survey	55	0.7%
	Total	**1071**	**13.6%**
10 years	Desk based	1016	12.9%
	Ground Truthed Survey	73	0.9%
	Total	**1089**	**13.8%**
15 years	Desk based	1016	12.9%
	Ground Truthed Survey	2456	31.2%
	Total	**3853**	**49.0%**
20 years	Desk based	2155	27.4%
	Ground Truthed Survey	4848	61.6%
	Total	**7003**	**89.1%**
25 years	Desk based	2155	27.4%
	Ground Truthed Survey	4848	61.6%
	Total	**7003**	**89.1%**
40 years (Upper age limit of available habitat data)	Desk based	2155	27.4%
	Ground Truthed Survey	4960	63.1%
	Total	**7116**	**90.5%**
unknown age	Desk based	0	0.0%
	Ground Truthed Survey	0	0.0%
	Total	**0**	**0.0%**

Appendix B – GIS datasets used in the generation of the NRN mapping for Tamworth Borough

Dataset	Used in	Justification	Limitations
Habitat Composite Region (including newly mapped areas as part of brief)	Strategic areas mapping. Habitat distinctiveness mapping	Provides complete coverage of the District	Wide range of ages and sources (See Appendix 2) which may limit accuracy.
OS MasterMap	Creation of new habitat polygons for Part A of the brief – Phase 1 study.	Spatial information for each field parcel, house garden etc.	No 'habitat' data within the background table data.
Land Classification data	Defining 'Pasture and Arable' and 'Urban' areas in the Habitat Connectivity Opportunity areas.	Quickly and easily define 'habitat' for large areas of land.	Very broad scale areas, covering multiple fields etc.
Functional Ecological Units	Habitat Connectivity Opportunity mapping	Only current dataset which reflects the overall areas of influence for Meres and Mosses in Staffordshire.	
Species Data (Protected Notable BAP etc.) from Staffordshire Ecological Record (SER)	Provide detail of species presence in the Habitat Connectivity Opportunity mapping.	Most complete and up-to-date database of species records in the county.	Not a consistent survey – may be some species present which are missed.
Natural Englands Priority Habitat Inventories	Strategic Areas mapping, Habitat distinctiveness mapping, Habitat Connectivity Opportunity mapping	Identification of key habitat sites within the landscape to be conserved and connected. High value sites within the Habitat distinctiveness mapping.	
Local Wildlife Sites (LWS)	Strategic Areas mapping, Habitat distinctiveness mapping, Habitat Connectivity Opportunity mapping	Identification of key habitat sites within the landscape to be conserved and connected. High value sites within the Habitat distinctiveness mapping.	
Statutory sites maps (SSSI, SAC, RAMSAR etc.)	Strategic Areas mapping, Habitat distinctiveness mapping, Habitat Connectivity Opportunity mapping	Identification of key habitat sites within the landscape to be conserved and connected. High value sites within the Habitat distinctiveness mapping.	

British Geological Survey (BGS) Soil Property Data WMS	Habitat Connectivity Opportunity mapping	Scrutiny of modelling output of Condatis for production of Habitat Connectivity Opportunity Areas ensuring that HCO is within the relevant soil type for that habitat based on the where habitats already exist on that soil type.	
Natural England National Character Areas (NCA)	Strategic Areas mapping, Habitat distinctiveness mapping, Habitat Connectivity Opportunity mapping	To ensure that the identified network aligns with national priorities for species, habitats and landscape.	
Staffordshire Biodiversity Action Plan (SBAP) Ecosystem Action Plan Areas (EAPS)	Habitat Connectivity Opportunity mapping	Ratification that the new Habitat Connectivity Opportunity areas are based on what has been identified as a priority in the SBAP.	

Appendix C – Evidence base confidence review (table supplied as a digital Appendix)

Staffordshire Wildlife Trust (SWT)/Staffordshire Ecological Record (SER) hold and manage a large quantity of the county's primary ecological data which is a key factor in being able to establish a robust evidence base for any strategic environmental work. It is critical that a thorough investigation of the available datasets both in-house and those available either through Open Government Licences, a Creative Commons open licence or via a paid licence subscription to ensure that we are using the best possible datasets in the creation of the NRN.

Desirability and reliability values were scored out of 10, a list of positive and negative indicators were used to define the values for each dataset. The desirability and reliability figures were then multiplied together to give the overall 'confidence' rating which is scored out of 100, the higher the score the higher the 'confidence' of the dataset contributing to a meaningful evidence base. It must however be noted that the dataset confidence ratings are only accurate to the time that they were produced, as new datasets become available and the existing datasets are updated the confidence ratings will alter to reflect any relevant changes. The inventory therefore must be kept up to date and reviewed prior to starting any future large scale projects to ensure that the best evidence base is being used.

Appendix D – Breakdown of habitats and sites included in the habitat distinctiveness mapping bands

Distinctiveness Band	Habitats included within the band	Action (in order of preference)
Very High	● Irreplaceable habitats (e.g. ancient woodland) ● International, national or regional value species populations. ● Priority habitats as defined in Section 41 of the Natural Environment and Rural Communities (NERC) Act that are highly threatened, internationally scarce and require conservation action e.g. blanket bog	Avoid loss, Enhance, Link, Create new habitat adjacent (expand existing habitat)
High	● County and District value ● Habitats known to support county and District value species populations. e.g. all rivers and good quality streams. ● Priority habitats as defined in Section 41 of the NERC Act requiring conservation action e.g. lowland fens	Avoid loss, mitigate loss, last resort compensate loss. Enhance, link and create new habitat.
Medium	● Local Value ● Habitats of Principal Importance and Staffordshire Biodiversity Action Plan (SBAP) habitats that don't meet LSW criteria, semi-natural habitats that act as corridors and stepping stones, arable land which is in a relevant stewardship agreement or organic status. ● Local Value species populations. ● E.g. hedges, ponds, copses and low quality woodland, rough grassland, ruderal vegetation, degraded watercourses/ditches. Habitats known to support priority species. Buildings with protected species presence that aren't high value. ● Semi-natural vegetation not classed as a priority habitat e.g. hazel scrub	Mitigate loss, compensate loss. Enhance, link and create new habitat.
Low	● Site Value ● Intensive arable, improved and amenity grassland, manicured landscaping, isolated poor semi-natural habitat. ● Semi-natural or modified vegetation not classed as a priority habitat and of lower relative value to most wildlife e.g. Temporary grass and clover ley; intensive orchard; rhododendron scrub	Compensate large losses. Enhance, link and create new habitat.
Very Low	● Buildings (unless supporting protected/priority species), hard standing, roads, regularly disturbed bare ground. ● Habitats and land cover or little or no value to wildlife e.g. Developed land sealed surface	Create new habitat where connectivity exists or functional size is achievable.

The mapping works by assessing the proportion of broad habitats e.g. woodland, grassland, heathland etc. within an area to determine whether these are ‘strategic’, ‘semi-strategic’ or ‘non-strategic’

100 x 100 metre grid cells were classified based on the principle that if 20% or more of that square has, for instance woodland habitat within it then it is considered to function ecologically (species associated with that habitat are able to move freely within this square). Based on the above, classification of 100m squares are defined as:

- Strategic: between 5-20% of the 100m cell is covered by a habitat e.g. woodland/grassland. Priority as this requires further habitat to reach the 20% threshold to be considered ‘ecologically functional’ for that specific habitat.
- Semi-strategic: 20% or greater specific habitat in the 100m cell. Already meets the 20% threshold to be considered ‘ecologically functional’ but the creation of further habitat will strengthen ability for species to be able to exist and move through this square.
- Non-strategic: less than 5% of the 100m cell is covered by a specific habitat making it too onerous to bring the amount of habitat to meet the 20% threshold, it is therefore not a priority area to target biodiversity compensation.

Strategic area mapping is carried out on a per habitat basis, e.g. a strategic areas map is produced for each habitat analysed, however an overall strategic areas map has been produced based on the combination of all the habitats analysed as part of the strategic mapping exercise (map 2). In the production of map 2 the parameters have been adjusted to swap the criteria for strategic and semi-strategic areas e.g. anything with over 20% habitat coverage is now considered strategic. By altering the methodology in this way it is possible to create a coarse overall ‘connectivity map’ by highlighting the areas with highest combined overall habitat availability and connectivity as opposed to those areas where it is best to create habitats.

As only higher quality habitats are assessed through this analysis (e.g. species rich grassland) and lower quality habitats are not included (table F1) (e.g. improved grassland or poor semi-improved grassland) as they do not adequately contribute to the network as they cannot support the same level of species diversity as higher quality habitats and therefore would not be able to support this diversity. This is not to say that these habitats do not contribute to the network in some way but are not presently of a high enough biodiversity value to act as a potential source site for biodiversity or to support species typical of that habitat indefinitely.

It is important to note that updating the strategic area maps over time requires up-to-date mapping data which should be sent to the Local Environmental Records Centre (LERC) when available in a suitable format to incorporate into the Nature Recovery Network Mapping.

Table E1 – Habitat types included in the assessment of strategic habitat areas (habitats without an 'X' in a relevant habitat column were not used in the assessment).

Habitat survey type	HABCODE	Habitat description	Woodland	Wetland	Grassland	Heathland
UKBAP	CF1	Coastal floodplain grazing marsh		X	X	
UKBAP	WW	Wet Woodland (Where identified)	X	X		
Phase 1	A111	Broad-leaved semi-natural woodland	X			
Phase 1	A112	Broad-leaved plantation	X			
Phase 1	A121	Coniferous semi-natural woodland	X			
Phase 1	A122	Coniferous plantation	X			
Phase 1	A131	Mixed semi-natural woodland	X			
Phase 1	A132	Mixed plantation	X			
Phase 1	A21	Dense continuous scrub	X			
Phase 1	A22	Scattered scrub	X		X	
Phase 1	A31	Broad-leaved parkland/scattered trees	X		X	
Phase 1	A32	Coniferous parkland/scattered trees	X		X	
Phase 1	A4	Recently felled woodland				
Phase 1	A5	Orchard	X		X	
Phase 1	B11	Unimproved acidic grassland			X	
Phase 1	B12	Semi-improved acidic grassland			X	
Phase 1	B21	Unimproved neutral grassland			X	
Phase 1	B22	Semi-improved neutral grassland			X	
Phase 1	B31	Unimproved calcareous grassland			X	
Phase 1	B32	Semi-improved calcareous grassland			X	
Phase 1	B4	Improved grassland				
Phase 1	B5	Marsh/marshy grassland		X	X	
Phase 1	B6	poor semi-improved grassland				
Phase 1	C11	Continuous bracken				
Phase 1	C31	Tall ruderal			X	
Phase 1	C32	Non-ruderal				
Phase 1	D11	Acid Dry dwarf shrub heath				X
Phase 1	D2	Wet dwarf shrub heath				X
Phase 1	D3	Lichen/bryophyte heath				X
Phase 1	D4	Montane heath/dwarf herb				X
Phase 1	D5	Dry heath/acidic grassland mosiac			X	X
Phase 1	D6	wet heath/acid grassland mosaic				X
Phase 1	E11	Sphagnum Bog		X		
Phase 1	E2 (any)	Flush and Spring		X	X	
Phase 1	E3 (any)	Fen		X	X	
Phase 1	F (any)	Swamp, marginal and innundation		X		
Phase 1	G (any)	Open Water		X		
Phase 1	I21	Quarry				
Phase 1	I22	Spoil				

Phase 1	I24	Refuse tip				
Phase 1	J11	Arable				
Phase 1	J112	Allotments				
Phase 1	J113	Set-aside (field margins)			X	
Phase 1	J12	Amenity grassland				
Phase 1	J13	Ephemeral/short perennial				
NVC	A (Any)	Aquatic Communities		X		
NVC	CG02	Festuca ovina–Avenula pratensisgrassland			X	
NVC	CG03	Bromus erectusgrassland			X	
NVC	CG07	Festuca ovina–Hieracium pilosella–Thymus praecox/pulegioides grassland			X	
NVC	H08	Calluna vulgaris–Ulex galliiheath				X
NVC	H09	Calluna vulgaris–Deschampsia flexuosa heath				X
NVC	H09/MG 10	Calluna vulgaris–Deschampsia flexuosa heath / Holcus lanatus–Juncus effususrush-pasture		X	X	X
NVC	H09/U05	Calluna vulgaris–Deschampsia flexuosa heath / Nardus stricta–Galium saxatilegrassland			X	X
NVC	H09/U2	Calluna vulgaris–Deschampsia flexuosa heath / Deschampsia flexuos agrassland			X	X
NVC	H09a	Calluna vulgaris–Deschampsia flexuosa heath				X
NVC	H09b	Calluna vulgaris–Deschampsia flexuosa heath				X
NVC	H09c	Calluna vulgaris–Deschampsia flexuosa heath				X
NVC	H09e	Calluna vulgaris–Deschampsia flexuosa heath				X
NVC	H12	Calluna vulgaris–Vaccinium myrtillus heath				X
NVC	H12a	Calluna vulgaris–Vaccinium myrtillus heath				X
NVC	H12c	Calluna vulgaris–Vaccinium myrtillus heath				X
NVC	M22	Juncus subnodulosus–Cirsium palustre fen-meadow		X		
NVC	M23	Juncus effusus/acutiflorus–Galium palustrerush-pasture		X		
NVC	M24	Molinia caerulea–Cirsium dissectumfen-meadow		X		
NVC	M25	Molinia caerulea–Potentilla erectamire		X		
NVC	M26	Molinia caerulea–Crepis paludosa mire		X		
NVC	MG04	Alopecurus pratensis–Sanguisorba officinalis grassland			X	
NVC	MG05	Cynosurus cristatus–Centaurea nigragrassland			X	
NVC	MG08	Cynosurus cristatus–Caltha palustris grassland			X	
NVC	MG09	Holcus lanatus–Deschampsia cespitosa grassland			X	
NVC	MG10	Holcus lanatus–Juncus effusus rush-pasture		X	X	
NVC	S (Any)	Salt-marsh communities		X		
NVC	U01	Festuca ovina–Agrostis capillaris–Rumex acetosella grassland			X	
NVC	U02	Deschampsia flexuosa grassland			X	
NVC	U03	Agrostis curtisii grassland			X	
NVC	U04	Festuca ovina–Agrostis capillaris–Galium saxatilegrassland			X	
NVC	W (any)	Woodlands and Scrub	X			

Condatis works by modelling a landscape of habitats as if it were an electrical circuit. A circuit board consists of a number of wires joining up resistors in combinations. When a voltage is applied to the board at one end, the current will pass through the board to the other end but the amount of current passing through each wire will vary according to the resistances it meets through each pathway. Condatis considers a landscape as analogous to a circuit board, with a source population of species being considered the voltage, the links between habitat useable by these species being the resistors, and the flow of species colonising the available habitat across those links being considered the current. Condatis is able to measure the flow of a hypothetical species across a landscape based on the availability of a distinct habitat category e.g. woodland or grassland.

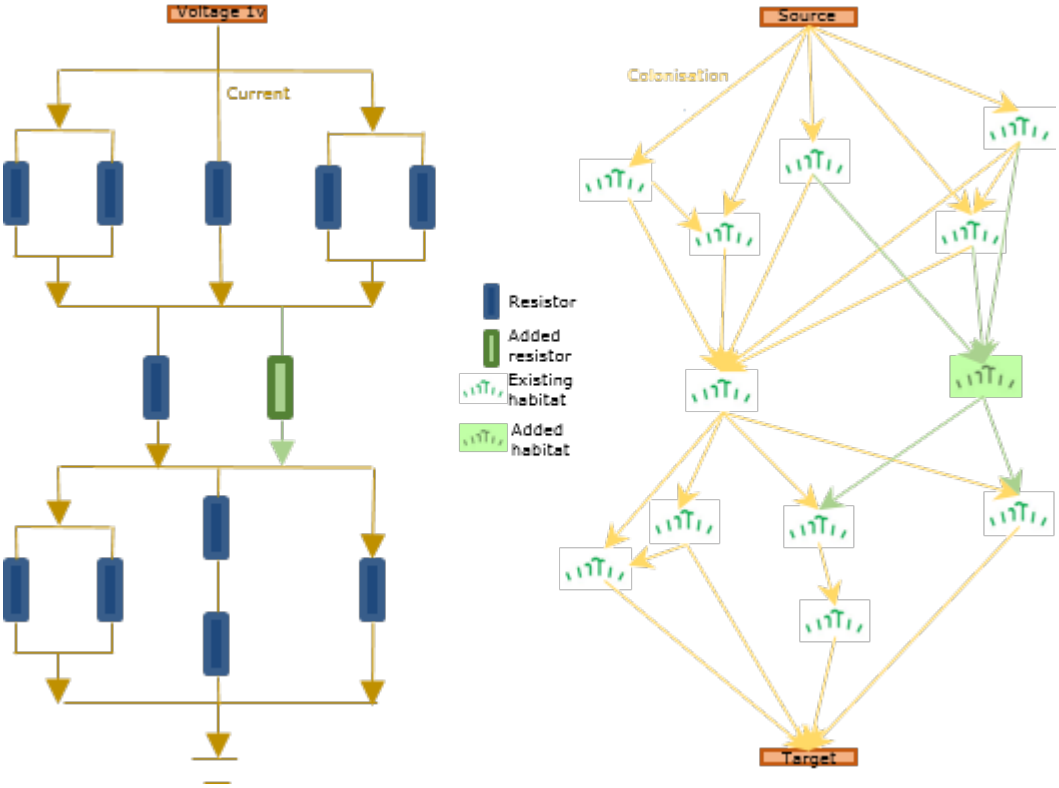


Image 1 Electrical circuit on the left and comparable stylised habitat map on the right. Green represents adding a resistor or additional habitat to each to increase the number of pathways available and therefore improve the flow. Image available at: http://wordpress.condatis.org.uk/

Habitat source and target locations are specified: the source either representing a nominal population of species or an actual population (in this case a nominal population was used), the target representing an area for eventual colonisation. The direction of travel is defined by the placement of source and target and will depend on the purpose of study. For instance, if looking at likely species movement due to climate change, a south to north or lowland to upland direction might be required. A South-north orientation was chosen for the source and target to reflect the likely species movement change in response to climate change. Condatis looks at how the habitat in between the source and target could contribute to the species progress over multiple generations, so it is not designed to look in detail at individual patch-to-patch movements.

By using Condatis to output the relative flow of a species through the landscape for a given habitat type it is possible to more accurately define where wildlife corridors exist and where they could be improved.

- The mapping takes into account existing local wildlife-rich habitats and existing ecological networks as well as local national and internationally designated nature conservation sites.

- The aim of the HCO areas is not to replace large areas of farmed land; we must continue to rely on working with farmers and landowners to manage existing habitats and create areas of new habitat.

- Developments whose primary objective is to conserve or enhance biodiversity particularly those which are aligned with the opportunity areas should be supported, and opportunities to incorporate biodiversity improvements in and around developments should be encouraged especially where this benefits overall biodiversity and habitat connectivity for example the creation of species rich grassland within the grassland opportunity area.

- When delivering against the mapping, care should be taken to ensure that the best possible habitat for that area is being created; it may be tempting for example where an area is both within a connectivity zone for woodland and grassland to plant large tracts of woodlands as this is easiest and most cost effective when in fact this may in some cases result in the loss of important habitats whereas species rich grassland enhancement would be both more beneficial and provides better outcomes for habitat connectivity.

- The main aims are to ensure adequate habitats are large enough to resist harmful effects, and are well-enough connected to ensure that species are able to move around and sustain populations. Harmful effects may be localised, e.g. flooding or be much more far-reaching for example climate change. The need for more, bigger, better and joined up habitats is explained in detail in Lawton et al. (2010).

- The opportunity areas reflect and refine the work of the Staffordshire Biodiversity Action Plan Ecosystem Action Plan areas (Appendix 11) by using finer detail data to pick out more targeted conservation areas.

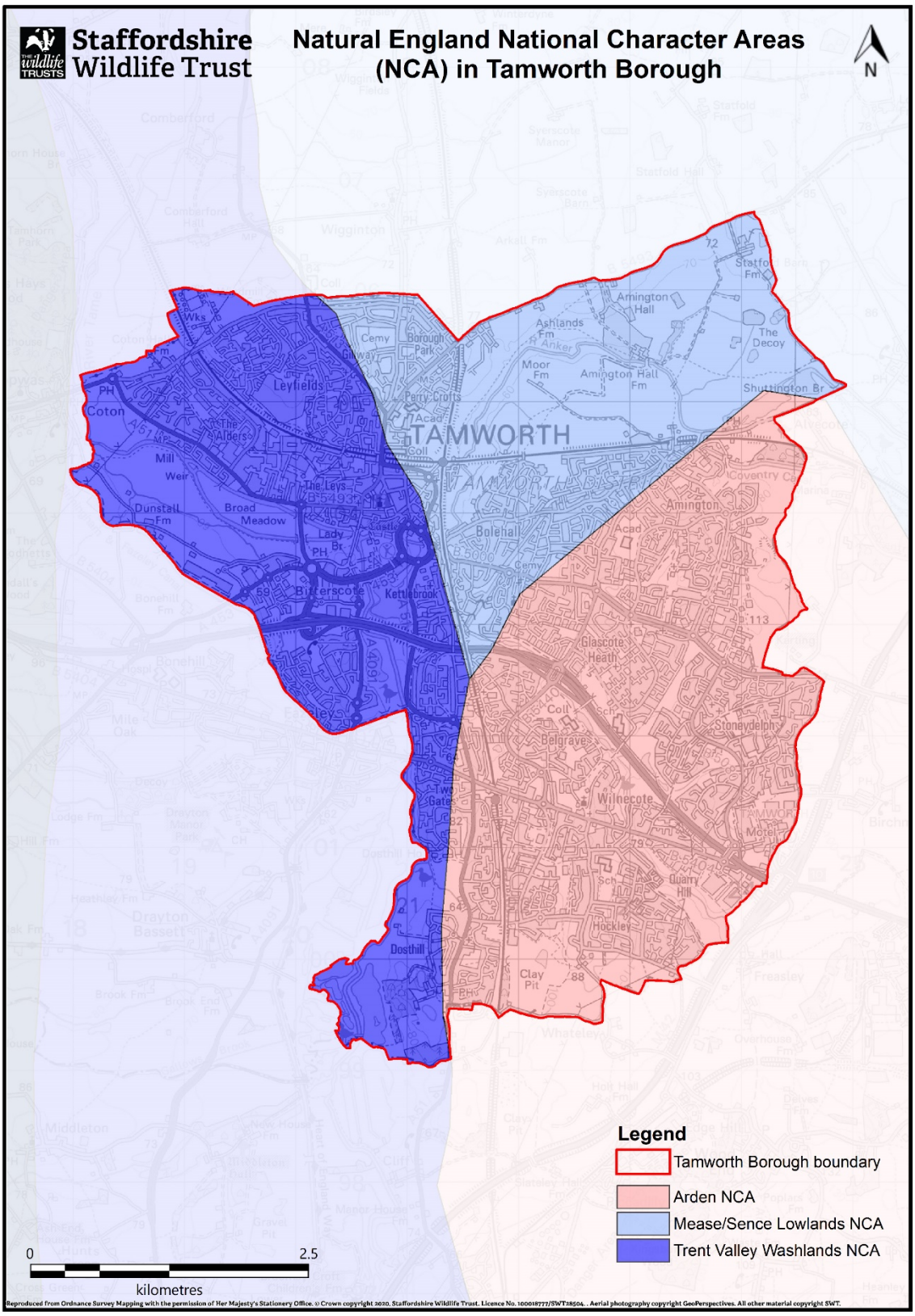
- The habitat connectivity opportunity areas were cross-referenced against previously mapped biodiversity opportunity zones in the District. The habitat connectivity opportunity areas are more refined than the previously mapped opportunity zones but do reflect similarities within the landscape.

- Habitat creation and restoration should take into account landscape considerations, geology and the historic environment. Particular care will be required where intensive methods are required, such as topsoil stripping / deep ploughing, or where the effect, such as woodland planting is likely to be visible from settlements or rights of way.

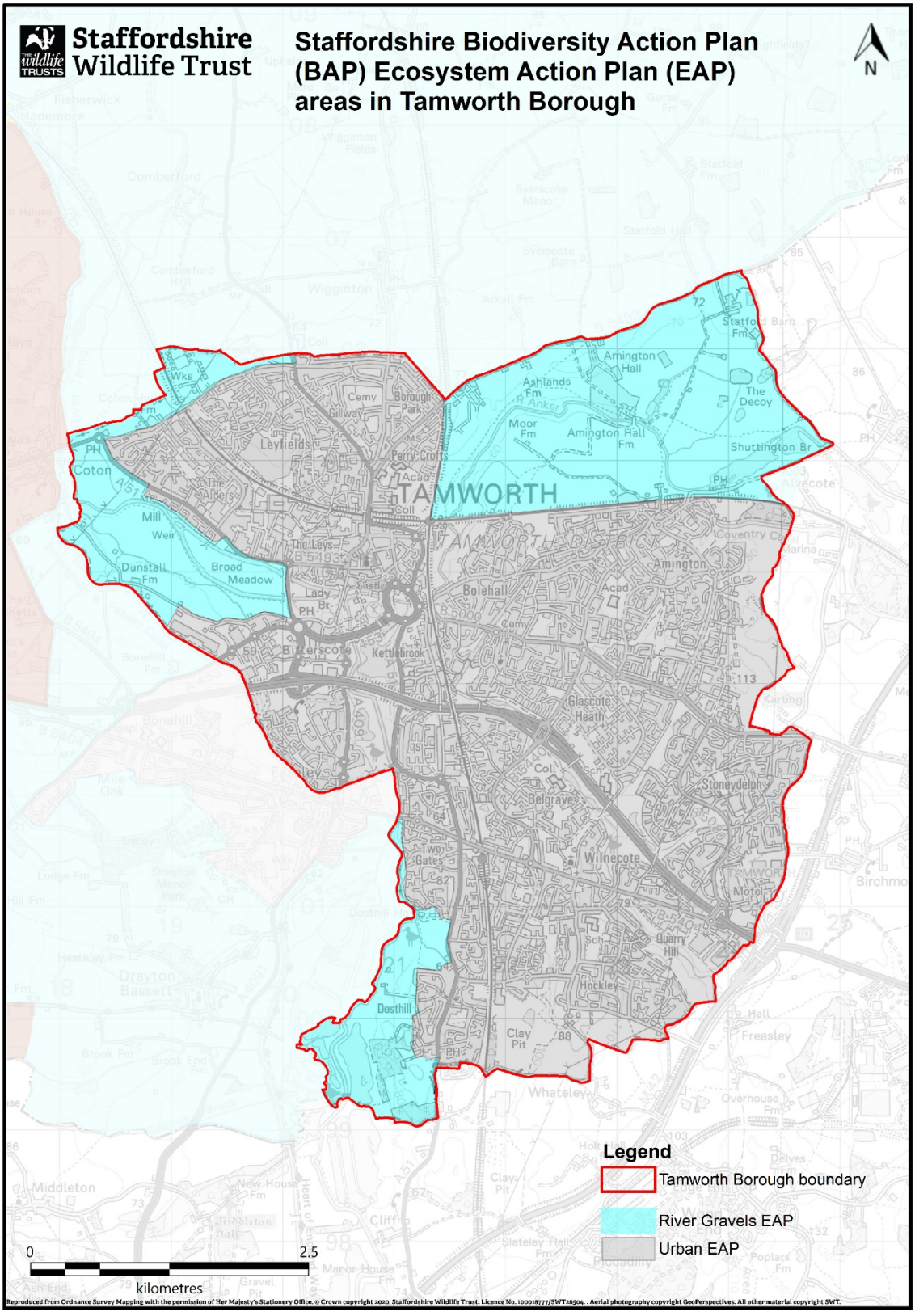
- Habitat creation or restoration may create opportunities too, for example screening unsightly features, creating geological exposures or helping conserve historic features.

- Regular updates of the maps are required to reflect any changes in mapped habitats as a result of physical habitat changes on the ground.

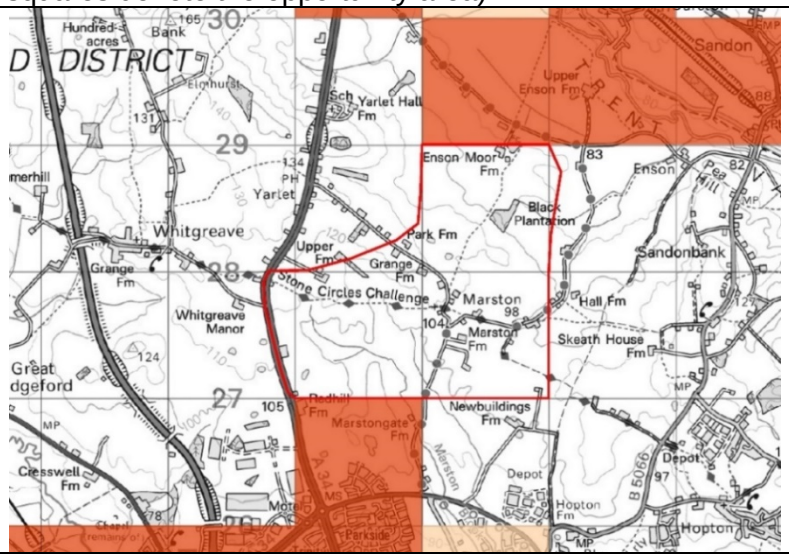
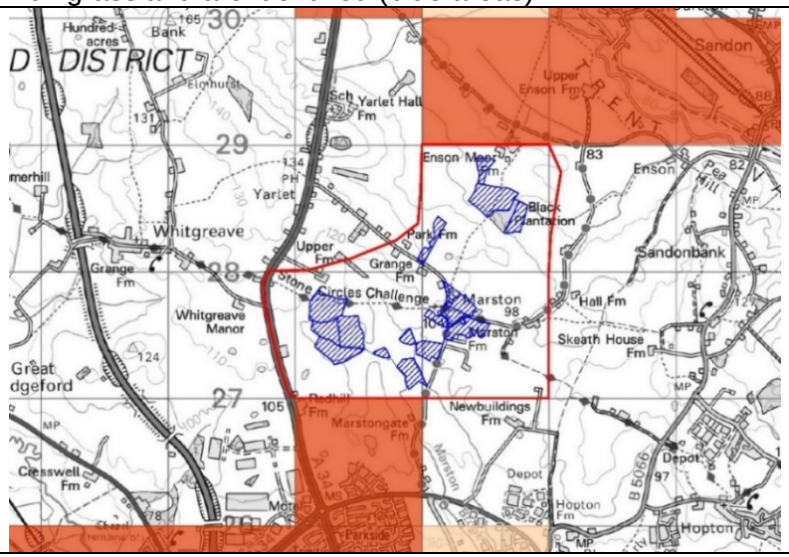
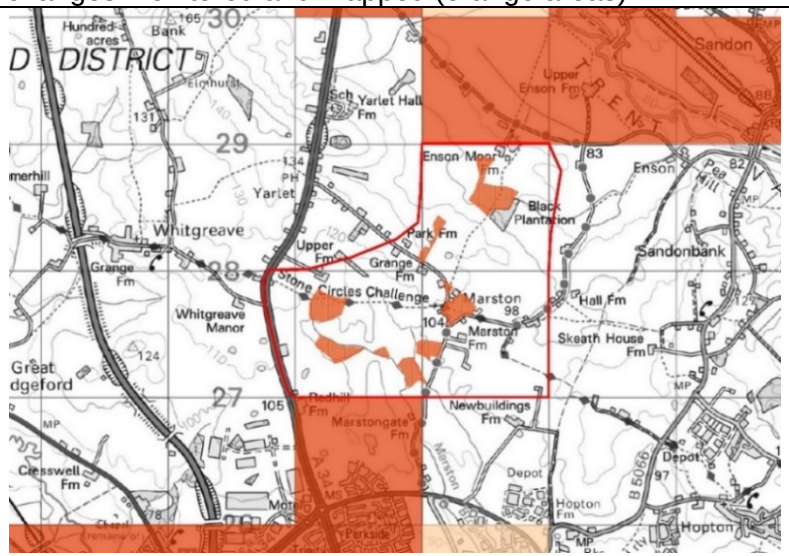
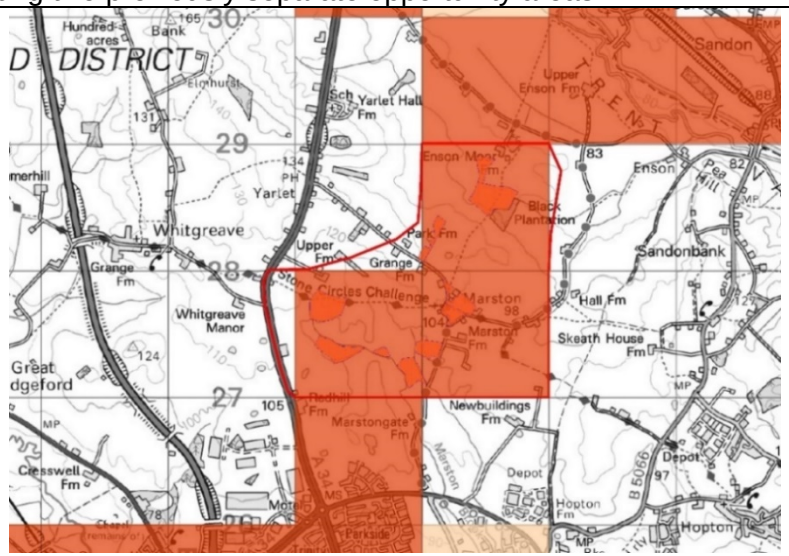
Appendix H – National Character Areas (NCA) in Tamworth Borough (NCA boundaries © Natural England) (2021)



Appendix I – Staffordshire Biodiversity Action Plan (SBAP) Ecosystem Action Plan Areas (EAPs) within Tamworth Borough (2021)



Appendix J – Example of how the strategic habitat areas map will evolve over time.

1: A small gap is identified between opportunity areas for grassland (Orange shaded squares denote the opportunity area).	**2:** Broad scale aspirations for the creation, restoration or enhancement of species-rich grassland are identified (blue areas).
	
3: In time some of the aspirations are realised, leading to enhanced grassland habitat, changes monitored and mapped (orange areas).	**4:** The newly mapped habitat data has now influenced the opportunity area connecting two previously separate opportunity areas.
	

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