BIODIVERSITY BASELINE STUDY –

Final Report

For

NORWICH City Council

By

Norfolk County Council

NBIS Norfolk Biodiversity Information Service

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Acknowledgements

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Report Citation

Norfolk Biodiversity Information Service/Norfolk County Council (2024) Norwich Biodiversity Baseline Study.

Executive Summary

Section 1: Introduction

This report has been commissioned by Norwich City Council (Norwich CC) to provide a baseline assessment of biodiversity in the city. Its purpose is to identify the factors threatening it and to present prioritised opportunities for enhancement. The Norwich Biodiversity Baseline Study (BBS) has also provided an evidence base to produce a framework for ongoing biodiversity survey and monitoring and presents information that can be used to inform Biodiversity Net Gain (BNG) guidance and Supplementary Planning Documents (SPD).

Section 2: Results from Data Gathering and Gaps Identification

In this section, gaps in species, sites, and habitat data in Norwich have been identified. While the BBS provides a valid baseline assessment for the city, there is a limited to moderate impact from gaps in data currency and resolution. The Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework provides methods to address these gaps going forward. Much of the species' data held consists of ad hoc records rather than structured long-term surveillance and monitoring. This has resulted in a disparity in recorder effort across the study area, which in turn can lead to difficulties in calculating species richness, due to differences in how well each area is recorded. Site data, whilst spatially comprehensive, is often outdated. Additionally, whilst two main habitat datasets are available, these suffer from a lack of ground truthing. Mapping indicative of recorder effort across Norwich reveals many areas have no recording, whilst there are medium -high concentrations of records in a small number of locations, associated with areas of semi-natural habitat renowned for their wildlife. This said, these gaps are consistent with most other local authority areas in England and so provide an acceptable level of information to make informed decisions within the rest of the BBS.

Section 3: Natural Assets

Norwich contains a wealth of species (including protected and priority species), statutory and non-statutory designated sites and a variety of different habitats. Three out of five SSSIs in Norwich are in 'favourable' or 'unfavourable recovering' condition. 83% of County Wildlife Sites (CWS) and County Geodiversity Sites (CGS) are in positive conservation management, and 41% of CWS are in 'favourable' or 'recovering' condition.
Norwich contains areas of 'irreplaceable habitat' – that is, habitat that if lost can never be replaced with habitat of the same value. These are the areas of Ancient Woodland, Ancient and Veteran Trees, and Lowland Fen.

Section 4: Biodiversity Character Areas (BCAs)

BCAs have been identified to enable a more strategic approach to identifying opportunities, by considering them in context to the wider environment.
There are four key BCAs within Norwich that hold strategic importance at a county scale, which can be summarised as follows:

- The **River Corridors BCA** is defined by the wider floodplain/river valley boundaries around the Yare and Wensum, encompassing a diverse range of wetland habitats in addition to the rivers themselves.

- The **Heathland BCA** identifies significant remnants of heathland and acid-grassland across the city, along with wider historic extents.
- The **Wooded Ridge BCA** shows two distinct areas of broadleaved woodland on chalk escarpments which cover large areas of the south and east of the city.
- The **Historic Habitats BCA** underscores the importance of historic parks and churchyards to biodiversity within the city centre, characterised by fragments of ancient meadows or parkland.

There are two additional BCAs identified as locally important that represent thematic areas which are most relevant to an urban environment like Norwich:

- The **Green Streets BCA** divides the residential and commercial gardens and street trees within the city into three characteristic zones (commercial, detached/semi-detached housing, terraced/communal flats), each with differing biodiversity value and opportunities.
- The **Community and Active Spaces BCA** recognises the importance of other amenity sites within Norwich, which may offer both biodiversity value and wellbeing benefits to residents.

In many places the BCAs inevitably overlap, highlighting the competing priorities in many parts of the city, where areas may hold significance for multiple habitats. Defined boundaries can also extend beyond Norwich City, representing broader connectivity with the surrounding districts.

Section 5: Biodiversity Hotspots

Biodiversity hotspots integrate species, sites, and habitat data into a heatmap, revealing areas within Norwich with the highest biodiversity value.

The River Yare Corridor exhibits the highest biodiversity values and highest number of axiophytes, thanks to its considerable extent of priority habitats. The Wensum corridor in contrast has a comparatively lower biodiversity value; although it is rich in axiophyte species in the upper reaches, the urban floodplain within the city centre exhibits lower biodiversity. This highlights the importance of ecological actions in these urban sections of the corridor.

The Wooded Ridge also has a high biodiversity value, as does the Heathland BCA, though this is primarily due to the ecological significance of Mousehold Heath, as the wider historic heathland extent has been found to score relatively lower in many areas.

Regions with greater historical continuity (e.g., parts of the wooded ridge containing Lion Wood, historic parklands and churchyards) displayed higher biodiversity values than even some present-day designated sites, highlighting the ecological value inherent to minimally disturbed legacy ecosystems.

Section 6: Strategic Significance

This section outlines the application of the BCAs devised in this study, to identify areas of strategic significance for uplift under mandatory Biodiversity Net Gain (BNG). It supports the interpretation of BNG guidance and the development of Supplementary Planning Guidance, through the provision of three resources to aid decision making: a decision tree to identify strategic significance scores; definitions of strategic significance levels within the Norwich context; and a table of habitats and habitat features eligible for uplift.

Section 7: Threats

Threats are widespread across all BCAs and decision-making must balance diverse interests, not just biodiversity. There are also data gaps in the evidence base that could limit the proactive decision-making in the development of conservation actions. The overarching impact of climate change also brings intensifying threats by altering habitats, conditions, and ecosystem balances across all BCA types. Each area additionally faces localised threats:

- **River corridors** must contend with risks such as water pollution, water abstraction and agricultural runoff. Siltation and channelisation alter natural waterway habitats and structure while invasive species (e.g. American Signal Crayfish) displace native species.
- **Heathlands** face shrinking habitat areas leading to aggravated ecological isolation and fragmentation. Air pollution from surrounding regions can cause damage to fragile lichen communities whilst light pollution disrupts the natural nocturnal and breeding behaviours in bat species.
- **Wooded habitats** experience loss of habitat features including dead, aged, mature trees that are good nesting sites for a range of species. Management currently focuses on health, safety, and fire risks but is presently under-resourced for ecologically sensitive management. This leads to regeneration and domination of invasive tree species, and larger trees, leading to a single-age structure which is more vulnerable to damage and disease. Management decisions can also lead to a loss of transitional woodland edge habitat and diverse glades which are important for species richness.
- **Historic habitats** are impacted by the effects of modernisation, including changes in management practices shifting from grazing to mowing. The loss of old structures diminishes niches for wildlife, and urbanisation in the surrounding city leads to increased air pollution. Vulnerability to tree diseases and pests and climate change is also heightened given the recovery time for mature trees.
- **Community sites** face conflicting choices between maintaining vegetation for safety versus biodiversity. Anti-social behaviours such as littering, off-trail use, and vandalism also pose direct threats by degrading habitats and disrupting wildlife.
- **Green city streets** contain limited green space as artificial surfaces and private land are prevalent. This can make it difficult to identify areas to enhance connectivity between isolated green spaces.

This report shows there is a strong relationship between threats and how they can be re-framed to provide opportunities for biodiversity enhancement.

Section 8: Opportunities

City-wide opportunities include encouraging actions and behaviour changes that benefit biodiversity through engagement; using planning design principles for biodiversity, and considering actions through BNG, DLL, implementing SuDS and creating B-Lines to support pollinators. The opportunities presented here are for all stakeholders and partners and subject to feasibility assessment and review.

- For the **River Corridors BCA**, specific opportunities lie in fully coordinating management between marshland sites to restore and create wetlands and floodplains along the rivers Wensum and Yare. This includes opening up canopies,

maintaining water levels, creating/restoring ditches/ponds/drains, and, where possible, reverting agricultural land to semi-natural wetland habitat.

- The **Wooded Ridge BCA** presents chances to improve habitat quality and address the threats that arise from a lack of diverse age structure and the loss of glades and transitional edge habitats. These can be avoided through management practices that mimic natural processes, such as opening the canopy, coppicing, haloing, and selective thinning of vegetation. Aside from improving woodland, there is scope to expand woodland, and council-owned land in proximity to woodland sites should be investigated for expanding tree canopy cover.
- For the **Heathland BCA**, priority should be to maintain the favourable condition of Mousehold Heath while identifying potential areas to connect/extend heathland long-term via restored or created acid grasslands on suitable acidic soils. There is also a strong possibility that plant species of the past, many of which are rare and protected today, could be restored by re-excavating ghost ponds and exposing the historic seedbank.
- For **Historic Habitats BCA**, the priority is to maintain important historic sites, habitats, and species niches. Grassland should be managed, where possible with a shift to a 'conservation cut' and focus should be protecting mature and veteran trees, and the species that depend on them (e.g., bats). Installing bat-friendly lighting across the city would reduce wildlife disturbances and mortality.
- In both **Historic Habitats and Community and Active Spaces BCAs** there are opportunities to expand these wildlife refuges, looking into the feasibility of allocating 10% of green spaces as biodiversity assets, where appropriate, creating wildlife ponds, tiny forests, pollinator areas, orchards, and community gardens. This includes historic sites such as churchyards and gardens but more specifically the larger parks, golf courses, and school playing fields.
- For the **Green Streets BCA**, opportunities lie in adjusting road verge maintenance regimes to help connectivity. Green and brown roofs on buildings present an opportunity to integrate nature into urban infrastructure, benefiting pollinators and bird life. Engaging residents in wildlife-friendly practices would also be beneficial.

Section 9: Survey and Monitoring Framework

This section describes the rationale behind the creation of a Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework), including details of the framework's purpose, structure and intended use. The Framework outlines approaches to address local gaps in biodiversity data, monitor biodiversity change and measure conservation success through the creation and delivery of a Survey and Monitoring Programme across Norwich. It has been written so that it can be used as a standalone document for relevant practitioners or appraised at the relevant points when reading the BBS, and when putting together feasibility studies or a review of next steps for integrating these outputs into the Biodiversity Strategy and wider policies and plans.

A variety of surveys are suggested, based on the identified needs from gaps analysis, a review of existing survey and monitoring methods, and the survey and monitoring required to support the delivery of opportunities and recommendations outlined in the BBS.

Section 10: Recommendations

This section makes detailed recommendations for Norwich CC, and its relevant partners and associated stakeholders, to take forward regarding opportunities identified. Recommendations resulting from the BBS are grouped in themes and summarised as:

- **Governance:** Update relevant Norwich CC strategies in their next reviews to align with the actions and priorities outlined in this report. Consider recruiting staff to coordinate the implementation of the report's findings and review data/opportunities during the 5-year reporting periods.
- **Planning:** Conduct training sessions on the outcomes of this study and include biodiversity actions in planning processes that dovetail with the Green Infrastructure Strategy and explore the possibility of a green living roofs strategy. Use the BCA details as evidence for BNG guidance and strategic uplift considerations and look into supporting the development of a Supplementary Planning Document (SPD) for biodiversity.
- **Land Management:** Maximise the use of conservation cut regimes when managing areas, and balance biodiversity and safety needs by opening canopies, managing scrub, etc. Review areas in BCAs such as parks and open spaces for natural assets like tree planting, wildflower meadows and ponds, aiming for 10% of the communal area to be managed for wildlife (where appropriate and possible). Protect priority species and habitats as a minimum requirement, by, for example, creating a bat protection strategy with focus on underground and old building (churches etc) roosts. Focus on opportunities that restore habitats that have been lost and reconnect up ecological networks, particularly along the river corridors, heathland/acid grassland and parklands.
- **Wider Engagement:** Investigate establishing a full engagement programme of key messages and targeted activities. Continue engagement started within the development of the BBS, with a view to fostering community buy-in and a sense of ownership towards the opportunities identified and recommendations made.

Further recommendations related to Survey and Monitoring consist of:

- **Survey & Monitoring:** Conduct feasibility studies on the identified survey and monitoring priorities, assigning goals connected to biodiversity indicators and utilising groups for site input while budgeting for actions.
- **Species:** Target recording improvements for rare species and under-recorded groups across sites with low current effort. Encourage long-term monitoring and utilise improved indicator lists over time and ensure this data is captured by boosting guidance on data submission to NBIS.
- **Sites & Habitats:** Incorporate forthcoming Ancient Woodland Inventory updates into an updated baseline, extract relevant site details from management plans, use historic habitat mapping datasets, and ground truth new LNRS habitat maps with targeted field surveys to provide more detail.

Recommendations identified for NBIS:

- **NBIS:** Source and collate records not currently in the NBIS database. Coordinate records data flow, and work with species experts where possible.

Section 11: Further Developments of the Study

The section suggests **next steps or further developments** under each stage of the production of this study, including:

- **Baseline data collection and presentation:** Including conducting periodic updates to address data gaps incorporating any new datasets (e.g., NBN Atlas, Ancient Woodland Inventory) and make updates according to changes in legislative definitions and designations.
- **Further analysis and interpretation of data:** Including engaging with the LNRS process where there are opportunities to incorporate more detailed mapping, considering statistical methods to remove the influence of recording effort on species mapping, and considering detailed analysis of other threats to biodiversity such as climate change.
- **Prioritisation scoring of opportunities:** Including conducting a periodic review of priorities within the context of Norwich CC's and partners resource availability and priorities.
- **Feasibility assessments and creating an action plan:** Including conducting feasibility studies and cost-benefit analyses to narrow down biodiversity conservation actions based on funding and timescales, and piloting actions before wider rollout. Refining prioritisations could also involve examining relationships between biodiversity value and socioeconomic factors across the city.

Section 12: Conclusions

This study demonstrates that Norwich City has important natural assets, supporting a wide range of species including those identified as priority and protected. The city also supports a number of priority habitats including, heathland, woodland, rivers and ponds and has 44 designated sites with a biodiversity focus.

The priority is that existing natural assets are protected first and foremost, bringing as many into favourable condition by 2030 as possible. In addition to this, focus should also be on expanding and connecting these sites before creating new isolated sites. This essentially follows Lawton, 2010's suggestion of how to implement the Lawton Principles via a hierarchy in order of priority: Better; Bigger; More; enhance connectivity; create new corridors.

Through assessing the existing data and information, it has been concluded that there are gaps in the evidence base that impact the baseline. The survey and monitoring report produced as part of this study includes recommendations on how these gaps can be addressed, and how a programme of survey and monitoring can be established to assess changes in biodiversity and monitor conservation success.

General and specific threats to biodiversity across the city have been identified along with many opportunities to address these threats and to enhance the city's natural assets. This has been done through the development of Biodiversity Character Areas which enable strategic planning and resource allocation and work alongside the prioritised lists of opportunities and threats identified.
This study is a baseline and so does not have an action plan as one of the outputs. As such, delivery requires further decisions to be made by Norwich CC and other

stakeholders to review these opportunities, through the appropriate consideration of, for example, feasibility studies, cost-benefit analyses, policy prioritisation and resourcing implications.

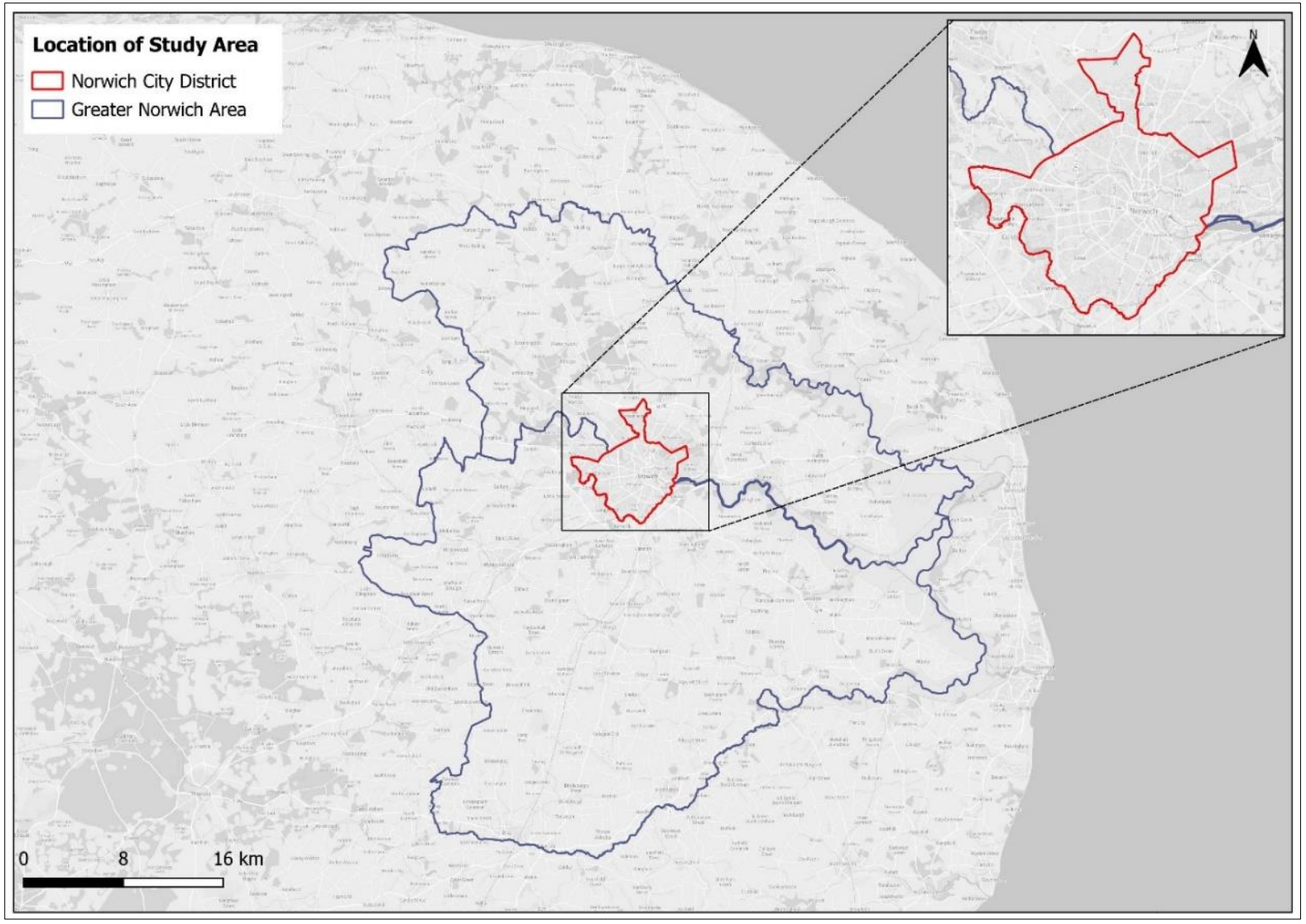
Section 1: Introduction

1. Norwich is a beautiful, unique, and biodiverse city with many green spaces, heathland, parks, woodlands, allotments, and waterways. Its tree canopy cover is higher than the national average (Doick et. al, 2017). The city has many open spaces, two river valleys, extensive undeveloped flood meadows and marshes and other significant habitats and species. Norwich CC already makes a difference for biodiversity, with much work dedicated to protecting and enhancing natural areas, and ambitious expectations of housing developers.

2. This report has been commissioned by Norwich CC to provide a baseline assessment of biodiversity in the city, to identify what threatens it, and present opportunities for enhancement (see the more detailed list of project aims in paragraph 4 below).

1.1 The Study Area

3. The study area for the BBS is the Norwich CC administrative boundary (Map 1)



Map 1: Location of the Norwich City study area within Greater Norwich Area.

1.2 Aims of the Study

4. This BBS provides a valuable assessment of the location and diversity of wildlife and habitats in Norwich. It identifies areas for creating and improving habitats for nature and wider environmental goals. Professor John Lawton outlined these principles in describing the concept of a healthy nature network, with core areas, corridors and stepping-stones, restoration areas, buffer zones and sustainable use areas (Lawton, 2010). The Lawton Principles form a core component of Norwich CC's Biodiversity Strategy and will underpin efforts to improve and enhance biodiversity in the city. The key aims of this project are to:
    - Help Norwich CC meet its obligations under new and forthcoming legislation, to protect and enhance nature in the city.
    - Provide a single, accessible, evidence base for biodiversity which includes species, sites, and habitat/land use information.
    - Make recommendations for ongoing biodiversity reporting.
    - Determine the main threats to, and opportunities for, biodiversity in Norwich.
    - Identify what habitats and species are currently succeeding and which are in decline and what information is needed to assess this.
    - Provide information that can be used to inform Biodiversity Net Gain (BNG) guidance and Supplementary Planning Documents (SPD).
    - Provide resources to aid decision-making for nature recovery in the determination of planning applications and asset management in Norwich.
    - Provide a prioritised list of actions for biodiversity which can be integrated into Norwich CC policies such as the Biodiversity Strategy and Climate and Environmental Emergency Plan.
    - Make recommendations for delivery of the prioritised opportunities and for governance at Norwich CC.

1.3 Study Outputs

5. The study outputs comprise:
    - A **final report** which includes:
        - A district-scale biodiversity baseline of natural assets, taking account of the land use context, that need to be conserved and protected. This includes current species, sites and habitat/land use data, results from stakeholder engagement and expert interpretation of biodiversity data for Norwich.
        - Locally distinctive Biodiversity Character Areas (BCAs) to enable targeting for nature recovery, mirroring an approach used for National Character Areas (NCAs).
        - A table identifying opportunities and threats to Norwich's biodiversity.
        - Identification of a set of prioritised opportunities for conserving and enhancing biodiversity (nature recovery) which are presented under the

Lawton principles (bigger, better, more, joined). This is a strategic assessment, highlighting key site-specific opportunities where identified.

- Recommendations for enhancing biodiversity in Norwich. Recommendations generally fit into one of the following broad themes for action: a) on governance b) for planners; c) for land managers; d) for wider public engagement e) for survey and monitoring and f) for NBIS.

- A **Survey and Monitoring Framework** (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework) which sets out how to address local gaps in biodiversity data, monitor biodiversity change and measure conservation success. The framework also identifies opportunities to engage citizens and encourage a sense of ownership of positive change.
- Additional appendices, which contain supplementary materials from the final report, such as maps and tables, to provide supporting evidence that is too extensive or specialised to be included in the main body of the report. This includes Norwich BBS Appendix BBS1 – Study Approach and Methodology where the methodology of the report is discussed.

6. Key outputs not contained in this final report, are the methodology and study approach (Norwich BBS Appendix BBS1 – Study Approach and Methodology) and a Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework). These two documents should be viewed in conjunction with the information presented in the main body of this report, to fully understand the recommendations being made, and the reasoning and methods behind them. A complied sortable resource of threats and opportunities is provided in Norwich BBS Appendix BBS7 – Threats and Opportunities Table and a list of potential survey and monitoring activities for biodiversity in SMF Appendix SM1 BBS – Survey and Monitoring List in the same format. These latter two outputs are essential to be read in conjunction with Section 7 – Threats and Section 8 – Opportunities and Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework and used when implementing the BBS.

1.4 About this Report and Study

7. This study is based on ecological data and input from stakeholders actively working or volunteering in ecological and conservation fields.

8. This report is a resource to support existing policies and action plans and inform the creation of new ones.

9. The opportunities, recommendations, guidance and advice presented are based on the available data, information and stakeholder engagement.

10. All prioritisations provided are based on available information and the Project Team's expert opinion. These are intended as a tool which identifies early and /or priority

actions. Subsequent reviews should revise these, considering new information and the opinions of relevant officers and decision makers.

11. This report makes no suggestion that Norwich CC is responsible for the implementation of the opportunities and recommendations outlined. Nor should it be inferred that they are responsible for funding or finding the funding to implement them.

12. This report identifies where Norwich CC has responsibilities or where there are legal requirements that it must follow. Additionally, the report provides guidance on prioritisation, implementation, funding and resourcing where applicable.

13. This report recommends that Norwich CC should review and decide which suggested actions and recommendations to integrate with existing workstreams and policies including, but not limited to, those detailed in the wider policy context section.

1.5 Topics Outside the Scope of this Project

14. This study provides a district level assessment of the biodiversity baseline, identifying key threats and opportunities for biodiversity and making recommendations to improve Norwich's natural assets. It should not however be considered a Biodiversity Audit which involves more detailed species surveys and data collection to comprehensively identify and recommend specific habitat and species management actions for maximum ecosystem benefits.

15. This report does not assess the feasibility of any of the suggested actions or recommendations made. A feasibility study should be undertaken to do this.

16. This study acknowledges the general effects but does not provide detailed assessment of climate change, wider catchment issues, ecosystem services or natural capital. These could be undertaken as separate studies, due to the level of detail required, or investigated as part of specific project proposals/feasibility studies.

17. Whilst BNG is an important tool for the delivery of nature recovery, no advice is provided on its implementation in this report. However, section 6 provides information to support planning and decision making.

1.6 The Wider Policy Context

18. This Biodiversity Baseline Study (BBS) is timely, coinciding with the development of several national and local policies as described below. In mapping the most valuable existing areas for nature and proposing areas for creating or improving habitats for nature and wider environmental goals in Norwich, the BBS will provide a useful evidence base to underpin many of the wider policies. This work aligns with the Lawton Principles (Lawton, 2010) of more, bigger, better and joined habitat, through a healthy ecological network consisting of core areas, corridors and stepping-stones, restoration areas, buffer zones and sustainable use areas. Key areas of legislation which reference actions for nature recovery are described below.

1.6.1 The Environment Act 2021

19. National policy is placing ever-greater importance on the natural environment, as outlined in the government's 25-year Environment Plan, which is to be implemented through the Environment Act.

20. Under the Environment Act 2021 there are several key mechanisms for nature recovery:
    - The development of a Local Nature Recovery Strategy (LNRS) for Norfolk (including any species conservation strategies or protected site strategies) by March 2025.
    - The development within the strategy of Nature Recovery Networks.
    - Mandatory Biodiversity Net Gain (BNG), to be introduced in February 2024.
    - Halting the decline in species abundance and protecting 30% of UK land by 2030.
    - Strengthened Biodiversity Duty - the requirement for all local authorities to consider what they can do to conserve and enhance biodiversity in England.

1.6.2 Norfolk Local Nature Recovery Strategy (LNRS)

21. Developing Norfolk's LNRS will require defining areas of particular importance for biodiversity. The BBS has developed an evidence base of existing natural assets (Section 3: Norwich City Natural Assets), brought together as a natural asset map (Map 13) and map of biodiversity hotspots (Map 16). This assessment identifies species, sites and habitats of international, national and local importance, including irreplaceable habitats, as defined by new LNRS guidance (DEFRA, 2023a). This study aims to support the LNRS process by contributing valuable data at a high level of detail, to enhance the evidence base for the Norwich area.

22. The development of Biodiversity Character Areas (BCAs) (Section 4: Biodiversity Character Areas in Norwich City) meets the LNRS requirement to identify areas where nature recovery should be focused. BCAs have been created to contextualise the natural assets and ecosystem services within the study area. Grouping similar assets together means that a more strategic approach can be taken within the planning system, particularly with the advent of BNG.

23. Section 7: Potential Threats to Biodiversity in Norwich City identifies the key threats to biodiversity in Norwich and Section 8: Opportunities for Biodiversity Enhancement in Norwich City the key opportunities for biodiversity. Section 10: Recommendations makes a series of recommendations to address threats and respond to opportunities. Collectively these sections identify prioritised potential areas for nature recovery which can help inform the LNRS.

1.6.3 Biodiversity Net Gain (BNG)

24. BNG is a legal requirement introduced under the Environment Act 2021 to leave new developments in a measurably better condition by increasing biodiversity by 10% compared to the pre-development condition of a site. The requirement comes into force in February 2024, and requires planning applicants to calculate biodiversity on a site

prior to, and following, development. Whilst developers are encouraged to deliver BNG on-site, this will not always be possible, so off-site BNG will be required.

25. This study will help to inform the production of Norwich CC's Biodiversity Net Gain (BNG) Guidance Note and subsequent Supplementary Planning Document (SPD) to ensure at least a 10% gain in new development.

26. BCAs can also be used to identify areas of Strategic Significance (Section 6: Applying the BBS to Biodiversity Net Gain (BNG)), that are eligible for uplift based on county significance within the metric used to calculate BNG.

1.6.4 Strengthened 'Biodiversity Duty'

27. This study provides the baseline data to inform reporting on requirements (DEFRA 2033b) placed on local authorities under the strengthened 'Biodiversity Duty' (DEFRA 2023c). The actions that authorities take for biodiversity will contribute to the achievement of national goals and targets set out in the Government's Environmental Improvement Plan (DEFRA, 2023d) and implemented through the Environment Act 2021. Recommendations on monitoring for reporting can be found in Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework.

    Under the strengthened duty local authorities MUST:

    - Consider what they can do to conserve and enhance biodiversity.
    - Agree policies and specific objectives based on this consideration.
    - Act to deliver those policies and achieve their objectives.
    - Local authorities must give first consideration to policies and objectives by 1 January 2024 and producing a Biodiversity Report by 1st January 2026, reporting thereafter within 5 years of the end of the previous reporting period. Norwich CC has made its first consideration through the adoption of its Biodiversity Strategy and Development Plan.

28. Local authorities involved with development plans and decisions, should consider their biodiversity duty when complying with requirements under strategic environmental assessment; environmental impact assessment and Habitats Regulations assessment. (DLUHC & MHCLG,2020; DLUHC & MHCLG, 2020a; DEFRA *et al*. 2023; DEFRA 2023c)

29. Protected sites that public authorities own or manage can be protected by other legislation. For example: sites of special scientific interest; special areas of conservation or special protection areas; national nature reserves; local nature reserves and local sites; Ramsar sites (wetlands of international importance) (Natural England, 2023; DEFRA et. al. 2021; Natural England, 2024). Local authorities should already be helping to conserve and enhance biodiversity on this land: Public bodies already have a duty to take all reasonable steps to conserve and enhance sites of special scientific interest. In addition, the Environmental Improvement Plan (EIP) set the expectation that all public authorities should ensure they have management plans in place by the end of 2023 to

support their sites to reach favourable status (DEFRA, 2023d). Authorities should be producing those plans and working actively with Natural England and others to identify and implement the actions needed to improve site condition.(DEFRA 2023c).

1.6.5 National Planning Policy Framework (NPPF) – Conserving and Enhancing the Natural Environment

30. The NPPF (DLUHC, 2023) states that planning policies and decisions should contribute to and enhance the natural environment, such as by establishing coherent ecological networks that are resilient to current and future pressures.

31. To protect and enhance biodiversity and geodiversity, plans should identify, map and safeguard components of local wildlife-rich habitats and their wider ecological networks, including protected sites and the wildlife corridors and stepping stones that connect them. They should also promote the conservation, restoration and enhancement of priority habitats, ecological networks and the recovery of priority species.

32. This BBS provides an evidence base to support plan-making and decision-making as required by the NPPF.

1.6.6 Local Strategies

1.6.6.1 Norwich CC Biodiversity Strategy 2022-2032 and associated Development Plan

33. The Norwich CC Corporate Plan and Vision sets the council's direction on the environment. Norwich CC declared a climate and environmental emergency in September 2019 and produced an Environmental Strategy for the period 2020-25. The strategy has the overarching declaration to "'*create a city where biodiversity can sustainably recover and thrive, halt species decline and increase species diversity and abundance by 2030 or sooner*'" *(*Norwich City Council, 2022a*).* To deliver on the priorities and ambitions set within the Environmental Strategy, the Norwich CC Biodiversity Strategy 2022-2032 and associated Development Plan have been created (Norwich City Council, 2022b).

34. The BBS delivers key elements of the plan by:
    - Providing an evidence-based biodiversity baseline from which changes can be monitored.
    - Providing a framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework) for a survey and monitoring programme to ensure that: "City-wide biodiversity change will be measured and reported upon on no less than on a 5-year basis".
    - Identifying and mapping existing and new habitats where biodiversity can thrive. This is provided through asset mapping (Section 3: Norwich City Natural Assets), identifying BCAs (Section 4: Biodiversity Character Areas in Norwich City) and detailing opportunities for biodiversity (Section 8: Opportunities for Biodiversity Enhancement in Norwich City).

- Determining nature corridors along which biodiversity can thrive, travel, and access the higher density areas of the city (Section 8: Opportunities for Biodiversity Enhancement in Norwich City).
- Determining significant and smaller informal green spaces and blue assets, to produce nature network stepping-stones (Section 8: Opportunities for Biodiversity Enhancement in Norwich City).
- Meeting the need for current data for ongoing biodiversity strategy commitments. This responsibility is addressed through the Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework).

1.6.6.2 Greater Norwich Green Infrastructure Strategy (GNGI)

35. The development of the BBS has run in parallel to the development of the GNGI strategy. These distinct reports are focused on different objectives and use different approaches but there is overlap and synergy between them (Greater Norwich Growth Board, 2023). To ensure cohesion between the two pieces of work, there has been ongoing engagement between the two project teams.

36. The Norwich BBS study presents habitat mapping for both the Natural England Living Map and Norfolk Living Map. This will be replaced with the Norfolk and Suffolk Habitat Map once this has been released, following the completion of testing. The new habitat map will provide a more spatially accurate and detailed map of habitats, classified using the UKHab system to align with BNG, and will undergo regular updates. The emerging GNGI Strategy is already using an early version of this map, with classifications to UKHab Level 2.

37. The BCAs and recommendations developed within this study could also be worked into a GI Strategy delivery plan. The GNGI team has the option to incorporate these findings into updating the GI asset map and validating Greater Norwich GI data, including points of access to greenspace.

1.6.6.3 Greater Norwich Local Plan (GNLP)

38. The Greater Norwich Local Plan is being prepared by Broadland, Norwich and South Norfolk Councils and is planned for adoption in 2024. Policy 3 of the GNLP seeks to secure at least 10% Biodiversity Net Gain (BNG) on development sites.

39. The BBS identifies connectivity between the biodiversity found in Norwich City and that in surrounding districts and has resulted in the proposal of BCAs that extend beyond the administrative boundary of the city. This acknowledges the joint planning arrangements of the Greater Norwich authorities, and that biodiversity is not restricted by administrative boundaries.

40. Local plans offer the opportunity to influence good outcomes for biodiversity through the planning process. Where planning applications are made for sites specifically mentioned in the BBS, the actions and recommendations made could be included as planning considerations.

1.6.6.4 Norfolk Green Infrastructure Recreational Avoidance Mitigation Strategy (GIRAMS)

41. The Norfolk GIRAMS strategy (Place Services, 2021) mitigates the potential impacts of recreational visitors to designated Natura 2000 wildlife sites (sites with highest level of designation for wildlife interest in Europe: Special Protection Areas, Special Areas of Conservation and Ramsar sites) from new housing proposed in the current round of local plans.

42. As competent authorities under the Habitats Regulations, Local Planning Authorities need to ensure that plans and projects under their jurisdiction do not lead to adverse effects on the integrity of European sites.

43. However, it's important to note that while GIRAMS addresses the impacts of new housing development on protected sites, it does not inherently provide strategies for improving biodiversity more broadly outside of development contexts. Therefore, this study aims to offer insights and recommendations for enhancing biodiversity beyond the scope of housing development.

1.6.6.5 Nutrient Neutrality

44. Guidance on nutrient neutrality (Norwich City Council, 2023b) has overlap with the outputs from this study, although full consideration of this legislation (The Conservation of Species and Habitats Regulations 2017) is outside of the scope of this report. The information provided as part of this study on habitat restoration and mapping of designated sites and habitats will be useful to inform future work.

1.6.6.6 Other Policies and Guidance

45. There are a number of other policy documents and strategies that may be related to this BBS, including but not limited to local site development strategies, water management plans, etc. This BBS may be a useful resource for the review and implementation of other documents not directly referred to in this report.

1.7 The Lawton Principles

46. In 2010, Sir John Lawton led a review of England's wildlife sites and the connections between them, which set out how to create a healthy, coherent and resilient ecological network. To create an ecological network that operates more naturally and effectively, the resulting report, 'Making Space for Nature', called for more, bigger, better and connected sites within the landscape (Lawton, 2010). These have become known as the Lawton Principles:
    - Better - Areas of existing but degraded habitat which can be improved or restored (the core areas for biodiversity).

- Bigger - Areas of existing habitat which can be expanded by creating buffer zones around the outer edges, extending them, or increasing the hectarage, biomass, resource or population of that habitat or species.
- More - Areas of habitat that can be created to increase overall coverage, potentially creating new wildlife sites.
- Connected - Connections between existing or planned habitats that can be enhanced or created through corridors and stepping-stones.

47. Figure 1 illustrates the main components of an ecological network as a schematic, while the eight approaches that provide a toolkit for developing a more coherent and resilient ecological network (by enacting the Lawton Principles) are illustrated in Figure 2.

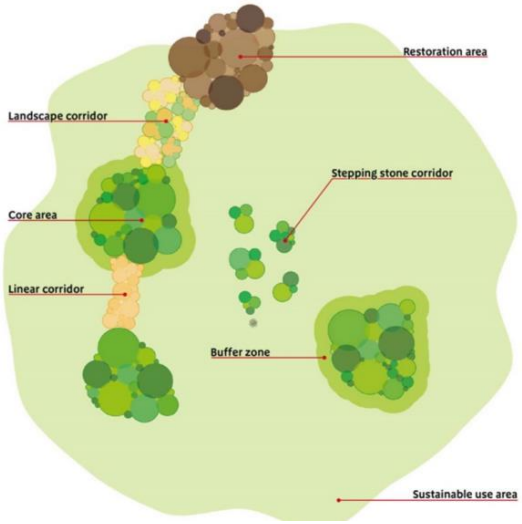
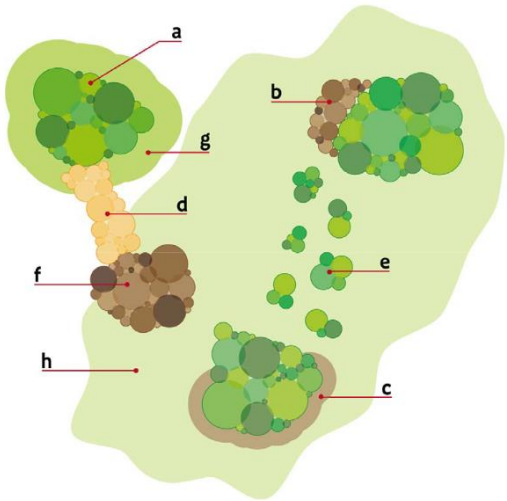


Figure 1: The components of ecological networks as a schematic (adapted from Lawton, 2010)



These approaches include:
(a) improving the quality of habitat patches
(b) making existing sites bigger
(c) creating ecotones
(d) enhancing connectivity through a continuous corridor
(e) enhancing connectivity through a stepping stone corridor
(f) creating new sites
(g) reducing pressures on sites by establishing buffer zones
(h) reducing pressures on sites by enhancing the wider environment

Figure 2: The eight approaches that provide a toolkit for developing an ecological network (adapted from Lawton, 2010).

48. The Lawton Principles have stood the test of time and are still used to inform government policy. These principles have been used as a framework for assessing the biodiversity baseline, threats and opportunities in this report.

1.8 Overview of Study Approach and Methodology

49. There are two key documents that supplement this report. The first (Norwich BBS Appendix BBS1 – Study Approach and Methodology) details the methodology and study approach used throughout. The study involves a series of tasks (summarised in Figure 3), including desk-based data collation and research, consultation, and supporting field survey. Norwich BBS Appendix BBS1 – Study Approach and Methodology presents the types of data that have been collected, including spatial and written information covering habitats, species, sites, and other relevant contextual information. These data have been processed to create a repository of information to be used for the development of the biodiversity baseline, and to create the Natural Asset Map presented in Section 3: Norwich City Natural Assets. The methods used to identify gaps in the existing data are presented, highlighting where field surveys are most needed. Consultation and engagement were carried out to obtain knowledge from relevant stakeholders which was then used to shape the development of the study. This consisted of a stakeholder workshop, online engagement, and site visits. These initial tasks led to the development of opportunity mapping, which underpins the key recommendations of this report, and follows the four Lawton Principles to categorise actions for enhancing biodiversity. As part of this, Biodiversity Character Areas (BCAs) were defined to represent areas with cohesive and distinct characteristics. These provide a way of prioritising opportunities within thematic areas across the city.

50. Further sections of Norwich BBS Appendix BBS1 – Study Approach and Methodology present methods relating to the prioritisation of opportunities, and the development of recommendations within the Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework). It is recommended that these detailed methods are viewed in conjunction with the main report, to aid understanding of the analyses and reasoning underpinning the outputs.

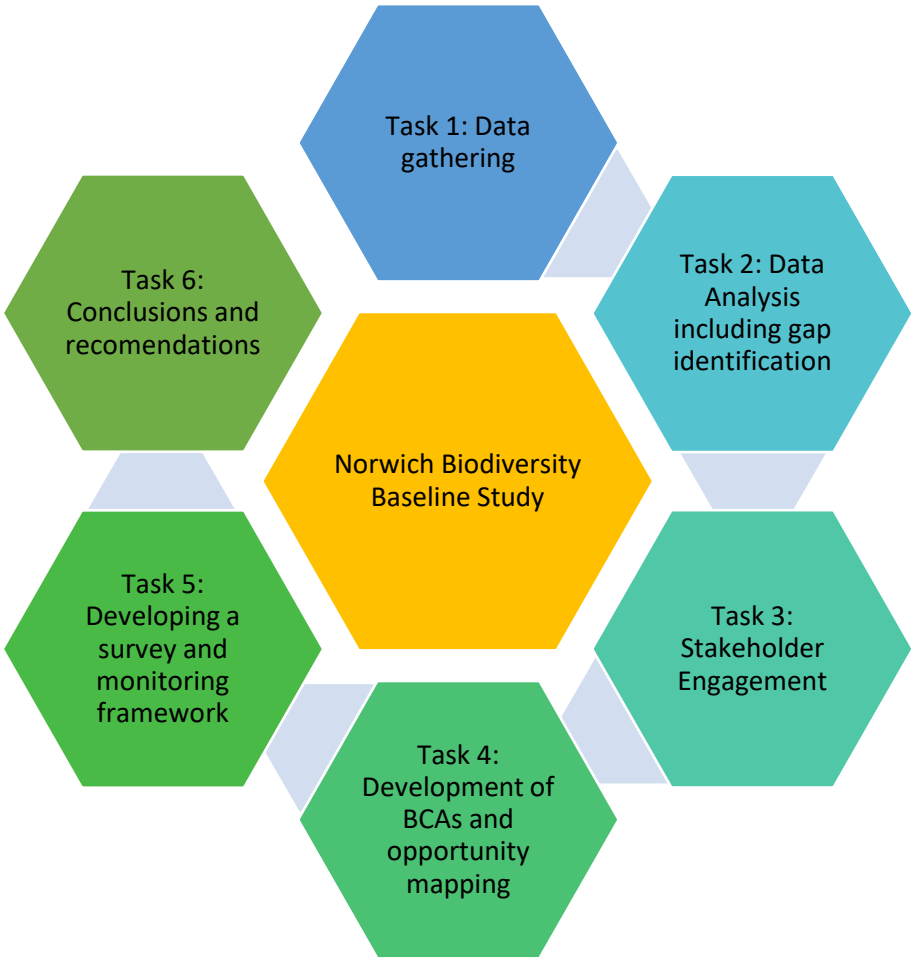


Figure 3: Overview of BBS study approach

1.9 Survey and Monitoring Framework

51. The second key document is the Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework), which can be considered as both a vital component of the BBS as a whole, and as a standalone document. The purpose of the framework is to set clear recommendations for how to set up an area-based survey and monitoring programme to record species, sites, and habitats in a more structured way. This is essential to monitor change and measure success, helping to better understand the status of biodiversity within the city, and the effectiveness of actions discussed in the wider report.

52. The framework sets out key considerations for survey design, including selecting the most appropriate methods, identifying suitable sampling sites, and resourcing different types of survey. Specific survey and monitoring recommendations are detailed, both in the Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework, and SMF Appendix SM1 BBS - Survey and Monitoring List. Each recommendation consists of comprehensive information on the priority level, reasoning, methods and types of surveying or monitoring needed. Recommendations are also linked to opportunities

identified within the main report and are intended to provide methods to measure the success of these actions as well as monitor wider changes in biodiversity.

53. The framework provides a formula for undertaking future surveys, and guidance on best practice for managing data collected. It should not be viewed as a step-by-step set of instructions, and as such the implementation of the recommendations will require further work by Norwich CC and its partners, including NBIS. This is likely to involve feasibility studies and the creation of action plans.

Section 2: Results from Data Gathering and Gaps Identification

2.1 Aims

54. This section provides a comprehensive review of the current biodiversity data available to the project. It includes the results of a workshop with expert stakeholders, where initial data was shared and participant feedback, including extra datasets, was provided. Data gaps have been identified in species, site and habitat information, and the implications of these gaps for the project aims have been assessed (Figure 4). An assessment has also been made of recorder effort across the project area, to determine the impact of this on the data and how it can be used. A full list of datasets and literature reviewed is available in Norwich BBS Appendix BBS2 - Existing Data and Information Collated. The data gathered on species, sites and habitats is presented in more detail in Section 3: Norwich City Natural Assets of this report, described as the natural assets of Norwich.

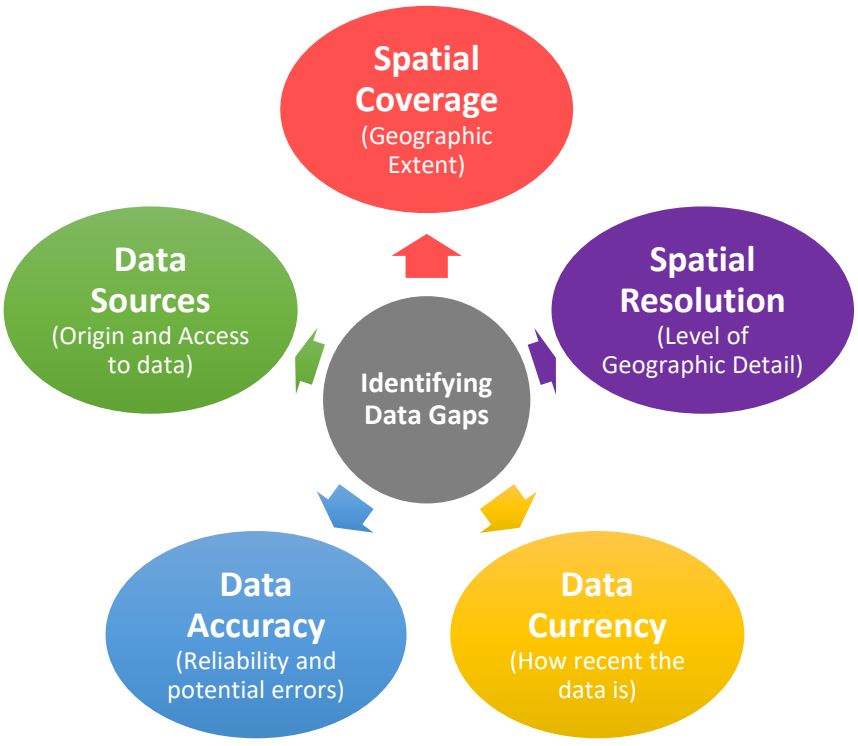


Figure 4: Overview of Data Gap Identification

2.2 Review of Existing Biodiversity Data and Literature

2.2.1 Stakeholder Feedback

55. As is detailed in Norwich BBS Appendix BBS1 - Study Approach and Methodology, Task 3 within the BBS study involved conducting a stakeholder workshop, to gather feedback and identify any new datasets that could be incorporated into the project. The Stakeholder Workshop Summary Report, which presents the main findings sent to stakeholders, can be found in Norwich Biodiversity Baseline Study Annex 2 Stakeholder Workshop Summary Report.

56. The importance of effective habitat and species management was identified as a key priority for the conservation and enhancement of biodiversity. Other factors highlighted included the significance of maintaining good habitat connectivity and the importance of woodland and chalk river habitats. The workshop findings also recognised the necessity of indicator species (such as birds and bats) to monitor trends in biodiversity and stressed the need for improved communication at a community level to promote behaviour change that benefits nature (such as among dog walkers). Furthermore, the report underscored the need for a funding model to resource projects aimed at restoring and preserving nature.

57. Following stakeholder consultation, a number of targeted site surveys were undertaken to address specific evidence gaps, providing updated inputs to strengthen the BBS analysis. The results of these site surveys are summarised in Norwich BBS Supporting Information BBS4 – Results from Field Survey.

2.3 Data Gaps Identification

58. The results of the gaps analysis work on species, sites, habitats and land use data collated in task 1 are presented in Norwich BBS Appendix BBS3 - Gaps Analysis. This spreadsheet also includes a summary of the gaps and a list of key datasets on the NBN Atlas which contain records relevant to this study that are not currently held by NBIS. The following sections summarise this information.

2.3.1 Species Data

59. The data held by NBIS consists mainly of “unstructured” records. These are records collected on an irregular or ad-hoc basis. They come from a wide range of sources, including amateur experts, ecological professionals and members of the public. This is valuable for providing an initial assessment of the biodiversity baseline and identifying data gaps, which are summarised below.

60. The recommendations in the Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework) aim to fill these data gaps, thus providing a more robust dataset. Ongoing structured survey and monitoring to assess population trends and species status is also recommended, as these cannot be accurately determined using the current NBIS data holdings.

2.3.1.1 Spatial Coverage

61. Spatial coverage in species recording refers to the extent to which different geographical areas have been surveyed or examined for species presence. When a species is not recorded at a specific location, it can either indicate that the species is not present, or simply that recording has not taken place in that location. Negative (absence) records, indicating where surveying has occurred and no evidence of the species has been found, can be of value for species like great crested newts. A full understanding of species status would require a comprehensive survey of every grid square, which is unfeasible for most species' groups. Therefore, assessments must be made based on the best available evidence and expert opinion, and variations in recording effort should be quantified in order to understand how this may impact the number of species identified.

62. The spatial coverage of species recording is not uniform across the Norwich area. An analysis of recorder effort, displayed in Map 2 reveals a bias towards recording on particular sites in Norwich. Often these are sites which are considered 'better' or 'more interesting' for biodiversity, or they are located near active recorders or have active volunteer groups. More details regarding the analysis of recorder effort can be found in Section 2.5 Assessment of Recorder Effort Across the Project Area.

1.3.1.2 Spatial Resolution

63. The spatial resolution of a species record refers to the level of precision in identifying the geographic location where a species was observed. Variation in spatial resolution can sometimes lead to misinterpretation of species data. Figure 5 and Figure 6 show the spatial resolution of NBIS data for various taxon groups, urban species and assemblages.

64. In an urban environment where habitats may be small and fragmented, it is important to capture records at a spatial resolution of 100m or below. This level of precision is also preferable when it comes to collecting roosting and nesting data, as it enhances its utility in both the planning process and for biodiversity conservation efforts. However, for highly mobile species like birds, this level of precision is not always feasible, especially when recording birds in flight.

65. Figure 5 illustrates that for many taxon groups recorded in Norwich, the majority of records are at a relatively coarse spatial resolution (greater than 1km). Notable exceptions include moths, true flies, fish, bees, wasps and ants. Historically, vascular plants and stoneworts have been recorded to the 2km (tetrad) level for the purpose of creating a species atlas. However, more recent records in this taxon group are often recorded at a finer spatial resolution.

66. The urban assemblages and species shown in Figure 6 also vary in the spatial resolution of their records. Pollinators, bats, water voles and otters have a good number of records with a 100m resolution or better. However, records for urban birds, badgers and axiophytes tend to have coarser spatial resolutions.

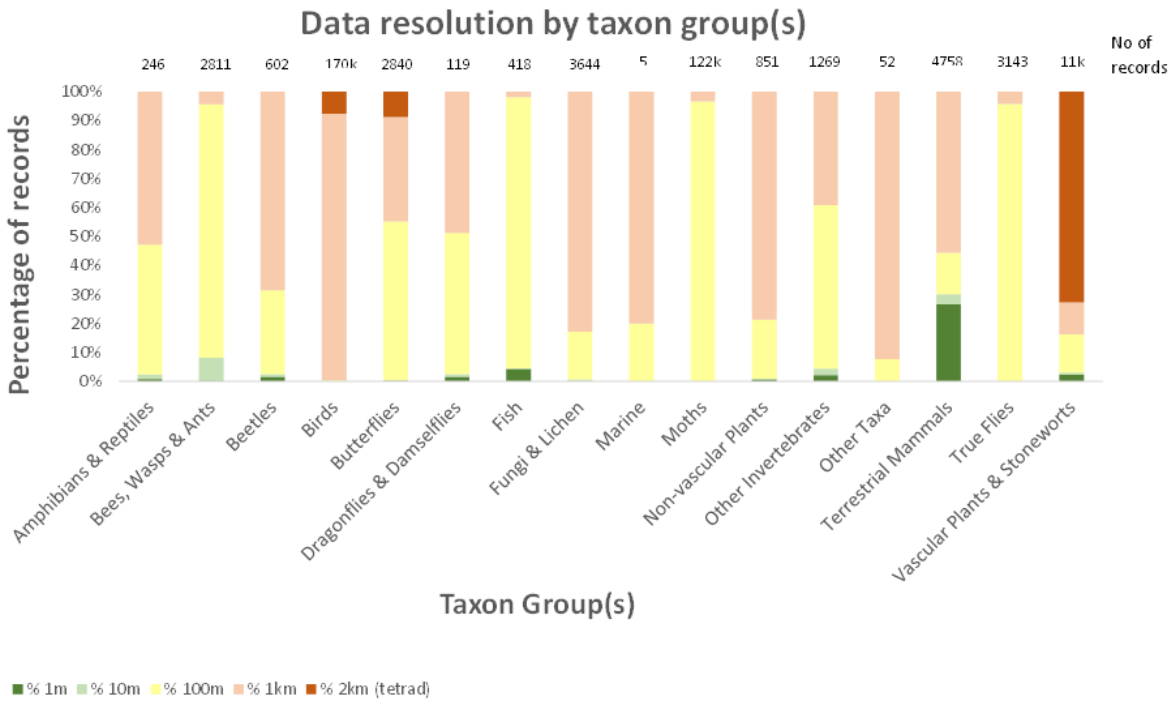


Figure 5: Species resolution by taxon group.
Green and yellow colours indicate records at a high spatial resolution and orange and red colours indicate records at a low spatial resolution.

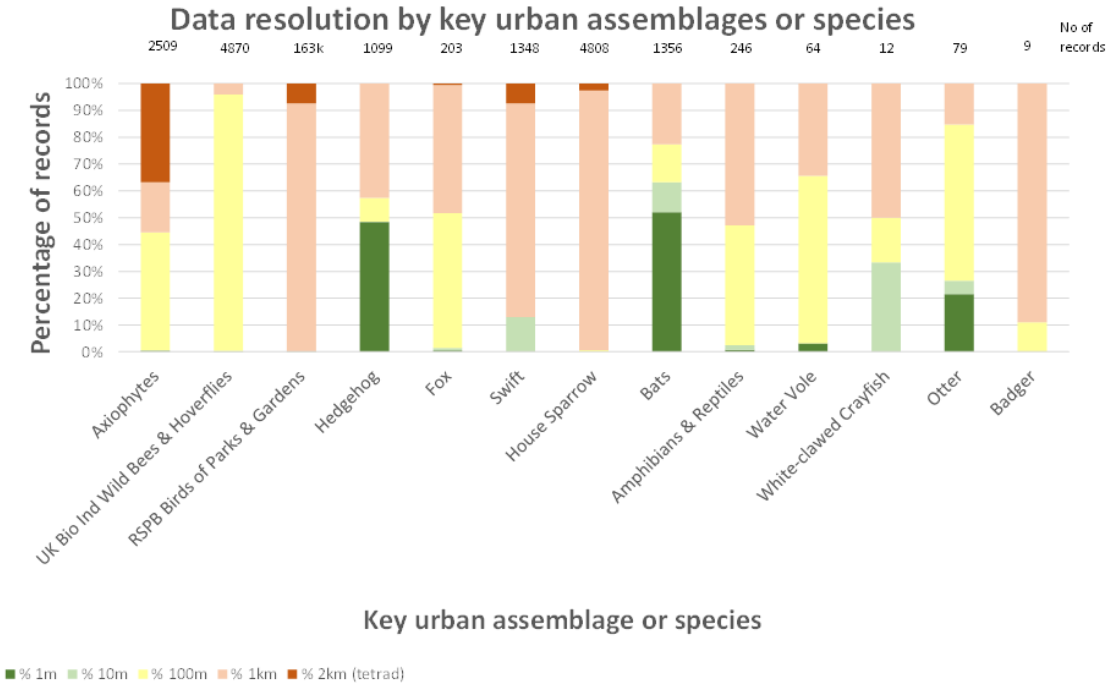


Figure 6: Species resolution by urban assemblage or species.
Green and yellow colours indicate records at a high spatial resolution and orange and red colours indicate records at a low spatial resolution.

2.3.1.3 Data Currency

67. It is widely acknowledged that data no older than 10 years is optimal for biodiversity assessment, particularly to inform planning and conservation decisions (CIEEM, 2019). This is because more recent data better reflects the existing distribution and population sizes of species, as well as current environmental conditions and threats that need to be addressed. However, older data can still hold value, particularly in its evaluation of ecological change.

68. As shown in Figure 7, many taxon groups, including beetles, butterflies, amphibians, reptiles and vascular plants, have a large proportion of records that are older than 10 years. However, mammals, true flies, non-vascular plants, moths, bees, wasps and ants do include a significant proportion of recent records. Reasons for the gaps in current records include barriers to accessing existing data, problems with verifying records from certain groups, and under-recording. For the urban assemblages and species shown in Figure 8 pollinators, bats, hedgehogs, otters, and foxes all have a significant proportion of recent records.

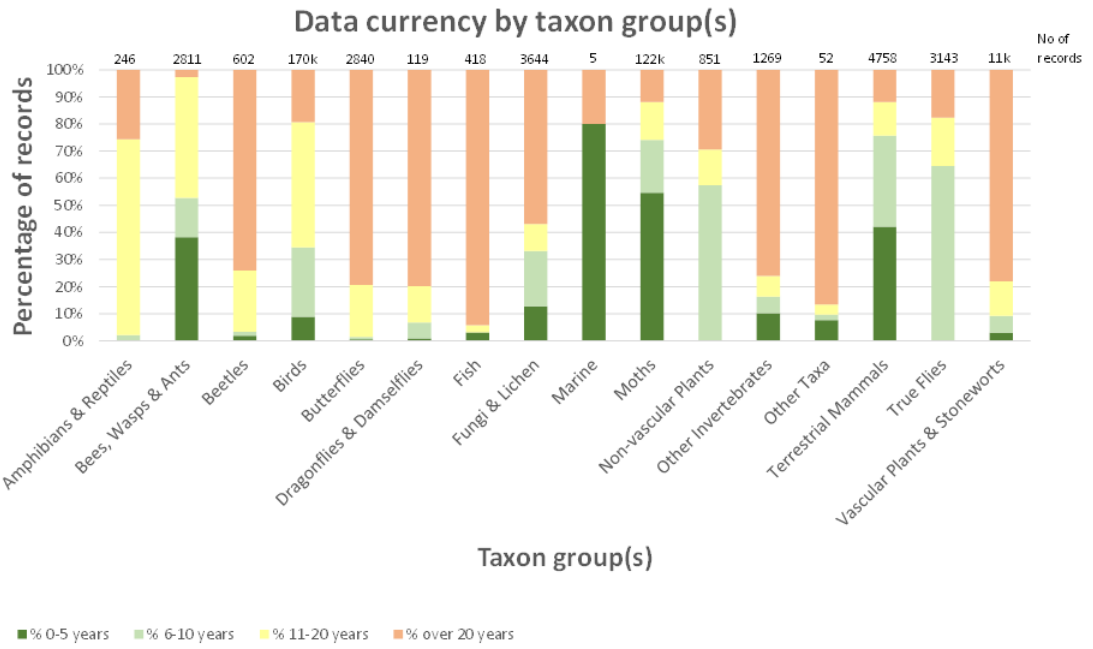


Figure 7: Species data currency by taxon group.
Green colours indicate more recent records (10 years old or less), and yellow and orange colours indicate older records (more than 10 years old).

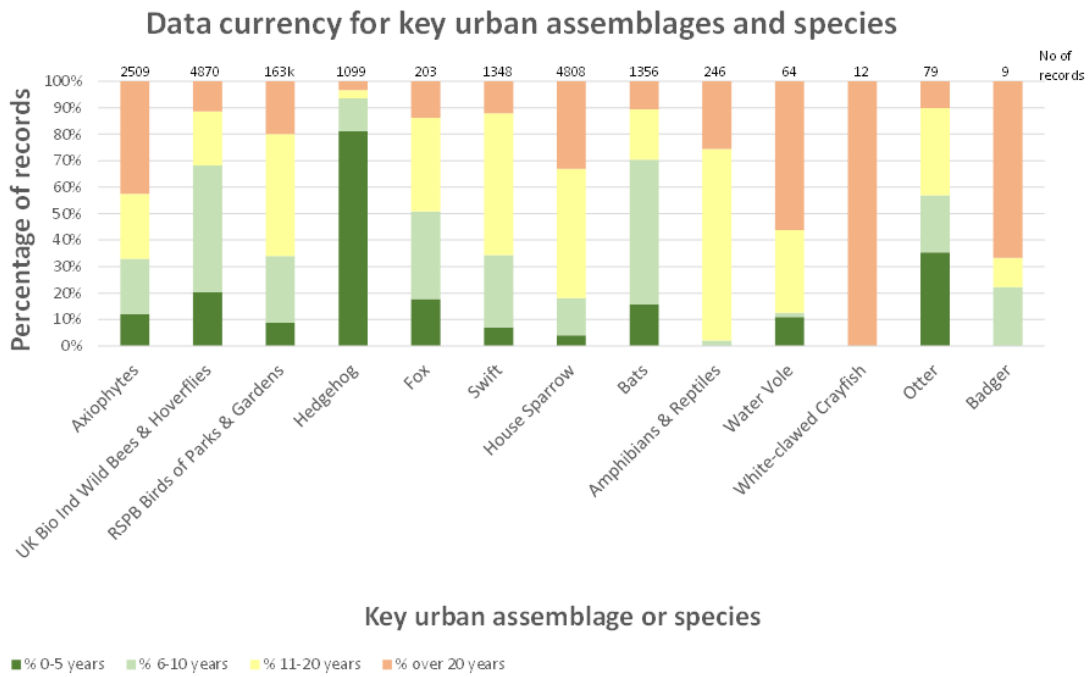


Figure 8: Species currency by urban assemblage or species.
Green colours indicate more recent records (10 years old or less), and yellow and orange colours indicate older records (more than 10 years old).

2.3.1.4 Species Coverage

a) General Records

69. Where records are collected ad hoc, not all species are recorded equally. Typically, larger, more charismatic and easily identifiable species tend to be recorded more frequently, particularly by members of the public. This often leaves smaller, more cryptic (inconspicuous or well camouflaged) and more obscure species groups under-recorded or even entirely overlooked. Some of these less-documented species groups include caddis flies, tardigrades, thrips and springtails.

70. Among amateur recorders, birds and moths are particularly popular and thus well-represented in the NBIS database. Birds are the focus of several nationally organised volunteer surveys, such as those coordinated by the BTO (British Trust for Ornithology)[1]. Although there are many bird records held within the project area that are well distributed spatially, many of these records do not contain the breeding and roosting data required for the hotspot mapping methodology (see Norwich BBS Appendix BBS1 - Study Approach and Methodology for details). Additionally, many of the bird records held are recorded at a relatively coarse spatial resolution. As a result, bird records have been excluded from the species hotspot analysis.

71. Moths are frequently recorded using moth traps in the gardens of active recorders and can yield many records over multiple trapping sessions, the distribution of which primarily reflects the location of these traps rather than the natural distribution of moth populations. Another key factor driving the popularity of recording these taxa is the availability of inexpensive field guides and identification resources, which makes them more accessible to amateur naturalists compared to taxa like beetles. Therefore, to prevent bias from affecting the results, moth records have also been excluded from the species hotspot mapping in this study.

72. Only records verified by experts are uploaded to the NBIS database. However, delays in this verification process, often caused by procedures required by national schemes or verification backlogs, have resulted in some species groups being underrepresented in the NBIS database. These notably include species such as butterflies, true flies, amphibians and reptiles.

b) Priority and European Protected Species

73. Priority species (those listed under Section 41 (S41) of the 2006 Natural Environment and Rural Communities (NERC) Act) and European Protected Species are mostly recorded at a high resolution. Species groups including bats, water voles, reptiles and amphibians are often the focus of recording by ecological consultants during the

[1] The BTO agreed to their datasets being used as part of this baseline study, which due to the size of the area would normally be subject to data restrictions.

development process. The Norfolk Bat Survey has also resulted in many high-resolution bat records.

74. However, despite strong encouragement of good practice, many consultants still do not submit their records to NBIS. Consequently, some gaps in protected species records in the NBIS database are unavoidable.

c) Nationally Rare and Scarce Species

75. Records of nationally rare and scarce species in Norwich are often recorded at a coarse resolution (many with a 1km or 2km (tetrad) grid reference). Furthermore, a significant portion of these records are over 20 years old, with most recent records primarily comprising of rare and scarce moth data. Given their rarity, it is highly likely that these species are under-recorded, as many of them will require the expertise of specialists for accurate identification.

d) Urban and Indicator species

76. NBIS holds very few records of white-clawed crayfish for Norwich City, and none from recent years, despite more recent observations further upstream in the River Wensum, which was a primary reason for the designation of the River Wensum SAC. It is possible that the species is now absent from the stretches of river within the city, due to factors such as unsuitable habitat or the spread of crayfish plague by the invasive American signal crayfish. Up to date data on both crayfish species are needed to confirm this.

77. There are no records of Desmoulin's whorl snail in Norwich City on the NBIS database. This species is important as it is a reason for designation of the River Wensum SAC. Records of the species are however held further upstream, by the Wensum at Hellesdon in 2001, at Trowse Mill in 2000 and by the Yare in Thorpe St Andrew in 2004. It is therefore possible that the species could still be present within the Norwich CC boundary. Due to the nature of the species, specialist surveys would be required to ascertain this.

78. As a part of this project, several datasets have been received to fill some of the gaps in urban indicator species. A dataset of axiophytes for Norwich City was received from the County Flora Recorder. This data was collected using systematic survey methods from the Norfolk Flora Group, and contains recent data from across the city, providing a robust evidence base for this plant group.

79. Data from the County Recorder for bumblebees, solitary bees and wasps was also received. This includes records of 27 species of particular importance to conservation. A map of the pollinator indicator species shows concentrations of records around formal parks, cemeteries, allotments and residential gardens, highlighting their significance for these species. However, it is likely that these species are still under-recorded in Norwich, with the distribution reflecting recorder effort more than the true species distribution. It is also important to note that the pollinator list used, although the best available, is

limited to the more commonly recorded species groups. Other invertebrate species are equally important for pollination and these groups are very likely to be under-recorded.

2.3.1.5 Data Sources

80. Records on the NBIS database originate from a wide array of sources. However, there are a couple of notable gaps. One gap pertains to records from iRecord, a citizen science wildlife recording app. Many of the county verifiers are hesitant to verify records submitted via iRecord due to concerns about data quality. Consequently, these records are not included on the NBIS database and therefore not included in this BBS. The second gap pertains to records on the NBN Atlas, an online platform that serves as a central hub for biodiversity data in the UK. While several NBN datasets are integrated into the NBIS database, there are numerous NBN surveys containing records for Norwich that have not yet been accessed. These are listed on the "Key NBN datasets" tab of the spreadsheet Norwich BBS Appendix BBS3 - Gaps Analysis.

2.3.2 Sites Data

81. National and international site data, including Ancient Woodland and Country Parks, is managed nationally and accessible online via the Natural England Open Data Geoportal. Local site data is held and managed by NBIS, with responsibility to the Norfolk Local Sites Partnership. Candidate County Geodiversity Site (cCGS) data is created by the Norfolk Geodiversity Partnership and held by NBIS. Veteran tree data originated from the Norfolk Heritage Tree Project in 2010 and subsequent field survey. The Woodland Trust's Ancient Tree Inventory data was also accessed.

2.3.2.1 Spatial Coverage

82. The sites datasets included are either national datasets or county-wide, therefore spatial coverage is good and as expected based on the existing habitats within the city.

2.3.2.2 Data Currency

83. National site datasets such as for Special Areas of Conservation (SAC) are maintained and updated regularly by Natural England. Data used in this study was published in 2022. County Wildlife Sites (CWS) are under-resourced for resurvey or condition monitoring, and the site resurvey period is often considerably over 10 years. The following has been found through the analysis:

    Of 141 sites within the Norwich plus 5km buffer:

    - 68 have been surveyed in 2010 or more recently.
    - 15 were surveyed in early 2000s.
    - 48 were surveyed in 1990s.
    - 10 were surveyed in 1980s/unknown.

    Of 36 sites that are within Norwich itself:

    - 19 have been surveyed in 2010 or more recently.
    - 1 was surveyed in early 2000s.

- 15 were surveyed in 1990s.
- 1 was surveyed in 1980s.

84. For many sites, including Local Nature Reserves (LNRs) and Roadside Nature Reserves (RNRs), the dates of the last survey are unknown. In many cases it is likely that the last visit was some years ago. Consequently, accurately assessing site condition is challenging, and some habitats could have changed considerably during that time.

2.3.2.3 Data Accuracy

85. The two veteran tree datasets accessed (Veteran Tree dataset and Ancient Tree Inventory) contain several data gaps, including missing information about when the trees were last surveyed, and their current status and condition. Additionally, there are concerns about the accuracy of the dataset grid references, which results in a limited confidence in tree locations. Filling these gaps will require integrating the two datasets along with obtaining additional local knowledge and conducting resurveys.

2.3.2.4 Data Sources

86. The "ManagementPlanData" tab of Norwich BBS Appendix BBS2 - Existing Data and Information Collated, provides a list of data sources relating to Norwich CC managed sites. In total, 39 management plans have been collected, where they exist. Where these plans don't exist, this has been identified during the gaps analysis process.

87. For the management plans that have been received, the management activities and the types of habitats under management have been summarised.

2.3.3. Habitat Data

88. Habitat data comes from two primary sources; the Living England Habitat Map, which is created and maintained by Natural England; and the Norfolk Living Map, developed and maintained by NBIS and its partners. Both Living Maps use a habitat probability method, based on algorithms that analyse remotely sensed satellite imagery. NBIS also has access to Phase 1 survey data for County Wildlife Sites; street tree and vegetation mapping from Norfolk County Council; churchyard and cemetery boundaries; historic parks and gardens; and mapping data from Norwich CC including parks, school grounds and allotments, and site management information. Differences in habitat datasets are discussed in Appendix BBS1 Study Approach and Methodology, Section 1.1.1 (paragraph 7-10).

2.3.3.1 Spatial Coverage

89. The coverage of field survey based habitat data is limited due to resource requirements, and primarily consists of Phase 1 habitat mapping of County Wildlife Sites. However, both the Living England Map and the Norfolk Living Map provide complete coverage of the Norwich City area, with the latter providing a higher level of granularity, presenting information at a finer scale. The habitat datasets from both Living Maps are therefore an important resource when used alongside local field survey-based data.

2.3.3.2 Data Currency

90. The currency of the habitat information used in this study varies. The Norfolk Living Map was created in 2013 (using imagery from 2006-2012, with limited updates since) whilst the Living England Map is more recent (last updated in 2022, using imagery from 2020).

2.3.3.3 Data Accuracy

91. The algorithms used in the creation of the two Living Maps differ in their accuracy in identifying different habitat types. This results in some habitats being mapped with a higher probability of accuracy than others. When comparing the mapping between the two Living Maps, it was observed that for Norwich, the Norfolk Living Map has fewer errors relating to Priority Habitats, whilst the Living England Map has fewer errors for non-priority habitats. Therefore, the Norfolk Living Map was used to identify Priority Habitats, and both maps have been presented to show non-priority habitats. Due to limited resources, ground truthing every parcel of habitat data is not feasible.

92. The work conducted by Southampton University to update the Norfolk Living Map, as outlined in Norwich BBS Appendix BBS1 - Study Approach and Methodology, Task 1 (paragraph 8) will enhance the dataset's useability and accuracy for future use. The Norfolk and Suffolk Mapping Group is currently working to address issues in habitat mapping methodologies, including cases where algorithms assign more than one habitat type per pixel, making the creation of a robust habitat map challenging. This work is integral for the implementation of the Local Nature Recovery Strategy (LNRS), for which the Norfolk and Suffolk Group was brought together, drawing expertise from various organisations to address the mapping aspects of the strategy.

2.3.3.4 Data Sources

93. During the development of this study, a newly derived habitat dataset has been obtained, which covers the historic extent of heathland and parkland, as well as areas where remnants of these habitat still exist. This dataset was developed using a combination of historical OS mapping, OS drawings and Faden's 1797 map of Norfolk. In addition to this, soil and geology information have been incorporated to ascertain the historical extent of habitats that are both rare or vulnerable to change and possess historic or long-term value. A project is currently underway to update the long-established Ancient Woodland Inventory, with an estimated completion date of September 2024. The updated inventory will be accessible for future updates to this study.

2.4 Assessment of the Implication of Data Gaps

94. Currently, there are gaps in data related to species, sites, and habitats. In addition to the information provided above, Table 1 provides a summary of these gaps, colour-coded according to the severity of impact. An overall assessment of their implications is outlined in the last row.

Table 1: Summary of data gaps and their Implications.
Green: limited impact: yellow: moderate impact; red: significant impact

Type of gap	Species	Habitats	Sites
Overview	Limited to moderate gaps regarding some key urban species. Records mainly unstructured/ad hoc, rather than from structured surveys.	Moderate gaps with differences in granularity and accuracy between datasets.	Limited gaps. Most designated sites have accessible citations (except for Local Nature Reserves).
Spatial coverage / sites	Moderate gaps. Many records with poor spatial resolution for key species groups. Potential recording bias towards particular sites.	Moderate gaps. 100% spatial coverage from the Living Maps. Field survey ground truthing and additional field surveys limited.	Limited gaps. Overall good coverage based on the distribution of semi-natural habitats.
Time coverage / currency	Moderate to significant gaps. Many records older than the 10-15 years required to be considered current for planning.	Moderate to significant gaps with old data sources, including the Norfolk Living Map (10 years old).	Moderate to significant gaps as surveys tend to be old.
Data sources / field surveys	Moderate gaps. Good variety of sources. Some NBN and iRecord datasets not yet accessed.	Moderate, with only a couple of sources of complete coverage habitat mapping available.	Moderate to significant gaps – only half of the sites have been surveyed since 2010.
Assessment of health and trends	No data of population assessment or long-term trends. No information gained through stakeholder engagement.	No data on habitat condition or long-term trends. No information gained through stakeholder engagement.	Site condition information available and recorded over several years so trends can be identified.
Implication of data gaps for the biodiversity baseline	Limited to moderate impact on the current biodiversity study, with currency and resolution issues. Surveys for some key species would strengthen the data. Recording away from the 'popular' sites should be encouraged.	Limited impact on the current study. The current gaps are being addressed by the on-going work of the Norfolk and Suffolk Mapping Group. This will be used in future revisions of the baseline when it becomes available.	Moderate impact on the current study. Future priorities should be to survey sites last visited 30 to 40 years ago. The survey and monitoring framework (Task 5) makes recommendations in this regard.

2.5 Assessment of Recorder Effort Across the Project Area

95. Species recording in the UK heavily relies on volunteer recorders. As explained in greater detail in the Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework), certain species and sites benefit from structured monitoring programmes designed with a sound scientific basis.

96. In contrast, unstructured/ad hoc recording often results in an uneven distribution of records in space and time. There also tends to be a bias towards recording in attractive, well-known sites with semi-natural habitats, and near where people live. These preferred locations yield more records, and so appear to be relatively more biodiverse than less frequented sites, where species richness remains uncertain.

97. Recorders themselves exhibit different behaviours which can influence the data collected. Recent research conducted by Pocock *et al*. 2023 categorised recorder behaviour into four types: frequent recorders; roaming recorders; thorough recorders; and twitchers (who preferentially record rarer species). Differences in how well each area is recorded creates a difficulty in accurately calculating species richness.

2.5.1 Addressing Variation in Recorder Effort

98. To address this issue, the most straightforward approach is to either use an existing scheme designed to account for recorder effort or create and implement a survey and monitoring methodology designed to mitigate recorder effort. This can be achieved by formalising methods that can quantify and define recorder effort (Groom *et al*., (BSBI) 2011). However, it is often the case that many national schemes are not originally designed with recorder effort in mind. In cases where it is accounted for, adopting these national schemes for effective local use can be time-consuming and complex. Furthermore, there may not be sufficient volunteer resources to record data locally in this way.

99. This highlights the need for a post-recording method to address and remove recorder effort biases from the data. Even for well-documented species and commonly used schemes, such a method has been necessary for creating ecological status indicators at the government and international levels, as well as for State of Nature Reports. One established method for addressing recorder bias is use of the statistical program FRESCALO (Oliver *et al.,* 2016; Hill, 2011).

100. Implementing statistical programs such as FRESCALO is out of scope of this baseline study, but it is recommended that use of FRESCALO is investigated as part of the LNRS process, to examine recorder effort impacts on county-level data.

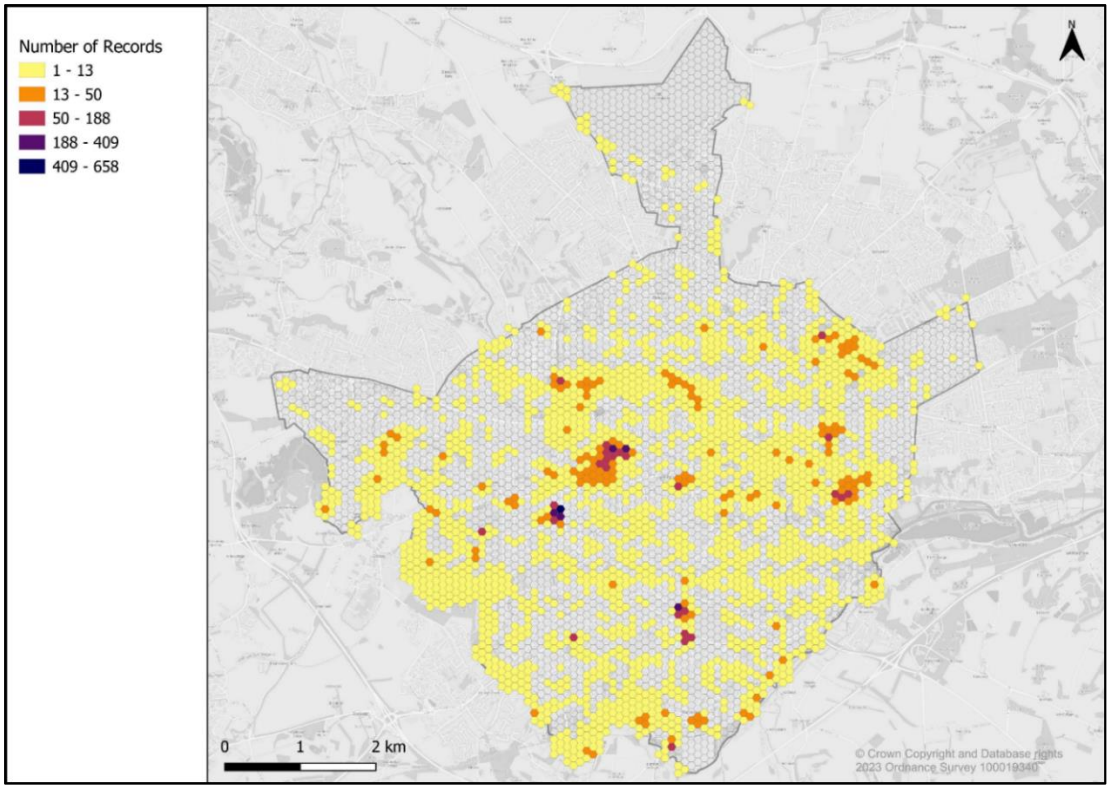
101. Map 2 illustrates the impact of recorder effort on the identification of hotspots and

other scoring factors in the species data[2]. The number of records serves as a proxy for recorder effort, revealing that many areas have no recording, and most others only a small number of records. The average count of records is just 6 within each 100m hex grid cell across Norwich. However, there are high concentrations of records in a few locations, namely Earlham Cemetery, Bluebell Allotments, and Ipswich Road, likely due to the diligent recording efforts of the Friends of Earlham Cemetery or the presence of particularly active recorders' houses or allotments. Additional medium-high recording locations are associated with significant semi-natural habitat sites renowned for their wildlife, and where a high volume of records is therefore expected.

102. It is important to note that recorder effort and recording bias towards attractive and more biodiverse sites can influence the resulting species richness and importance maps. However, these maps at present represent the best available proxy data based on unstructured/ad hoc recording. To improve the quality of species data for assessing changes over time, implementing a structured monitoring programme as outlined in the Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework) is recommended.

103. The focus on recorder effort can also serve to fill data gaps. Intelligence-led recording can create maps that show where recorder effort can be best directed, both in time and spaces (Burkmar R. & August T., 2019). Thus, it could become possible to map areas where species are theoretically expected to be present but have limited or no recorded observations.

[2] *Some data has been removed from the recorder effort mapping, as with the biodiversity hotspot mapping later in the report, due to the impact these datasets have on the presentation of data and inferences that can be made. Moth data has on its own been used locally as a dataset that takes out recorder effort, due to the regularity of the recording and the locations recorded (i.e., people's back gardens); but when used in conjunction with the other species data (especially less mobile species), there are significant impacts on the clarity of these proxy maps. Bird data has also been removed, due to its low resolution, and the large number of records of such a mobile species, again masking underlying patterns in the data.*



Map 2: Proxy Recorder Effort.
Number of records for each hex grid in Norwich City, based on records from the NBIS database as an indicator of recording effort. Number of unique records with resolution <=100m, excluding moths and birds[3], apportioned to 100m hex grid (see biodiversity hotspot methodology for further explanation). Darker colours represent a higher recorder effort, with empty grid cells indicating no intersecting records, and therefore the lowest recorder effort.

[3] Moth records were omitted due to the large number of records generated from each moth trap (often in a recorder's garden over multiple trapping sessions) which would skew the results. Record distribution reflects the location of moth traps rather than the moths themselves. Bird records were omitted as the methodology required only breeding and roosting records to be included, and these details were often not included in the records. Many of the bird records held were also recorded at a relatively low resolution.

2.6 Section 2 Key Findings

104. There are currently gaps in species, sites and habitat data in Norwich. Whilst the BBS provides a valid baseline assessment for the city, these gaps have a limited to moderate impact on the current biodiversity baseline, particularly those associated with data currency and resolution. The Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework provides methods to address these gaps going forwards.

105. Much of the species data held consists of unstructured/ad hoc records rather than more structured long-term surveillance and monitoring. This results in a disparity in recorder effort across the study area, which in turn can lead to difficulties in calculating species richness due to differences in how well each area is recorded. Mapping of indicative recorder effort across Norwich reveals many areas have no recording, whilst there are high concentrations of records in a small number of locations. Additional medium-high recording locations were associated with areas of semi-natural habitat renowned for their wildlife. Site data, whilst spatially comprehensive, is often outdated, and whilst two main habitat datasets are available, these suffer from a lack of ground truthing.

Section 3: Norwich City Natural Assets

3.1 Aims

108. This section summarises Norwich's 'natural assets': i.e., its flora and fauna, as well as the sites, habitats, and land use areas they inhabit (Figure 9). The site condition of SSSIs and CWS is presented. Species richness across the city is also mapped, including for European Protected Species, Red List species and priority species. The information obtained culminates in an asset map which sets out the existing biodiversity assets identified across Norwich.

Figure 9: An Overview of Natural Assets

3.2 Species

3.2.1 All Species Summary

109. Despite it being an urban environment, there are many species of flora and fauna that call Norwich home. Since Norwich City's first recorded entry in 1762, 4963 different species have been recorded in the project area. Figure 10 below shows the numbers of some of the key species' records within the city within different taxonomic groups. Figure 11 provides the number of species recorded in Norwich by taxon group and highlights the prevalence of records for moths, vascular plants and stoneworts, fungi and lichen compared to other groups.

Photos from left to right: Bumblebee © Darren Oddy; *Aleuria aurantia* © Tony Leech; Sedge Warbler © Jo Hobart; Seven Spot Ladybird © Darren Oddy; Cream Spot Tiger © Chris Jones; Bluebells © Danielle Engelbrecht

Figure 10: Number of species of various taxonomic groups recorded on the NBIS database for the Norwich City study area. Further details can be found in Norwich BBS Appendix BBS4 – Natural Assets

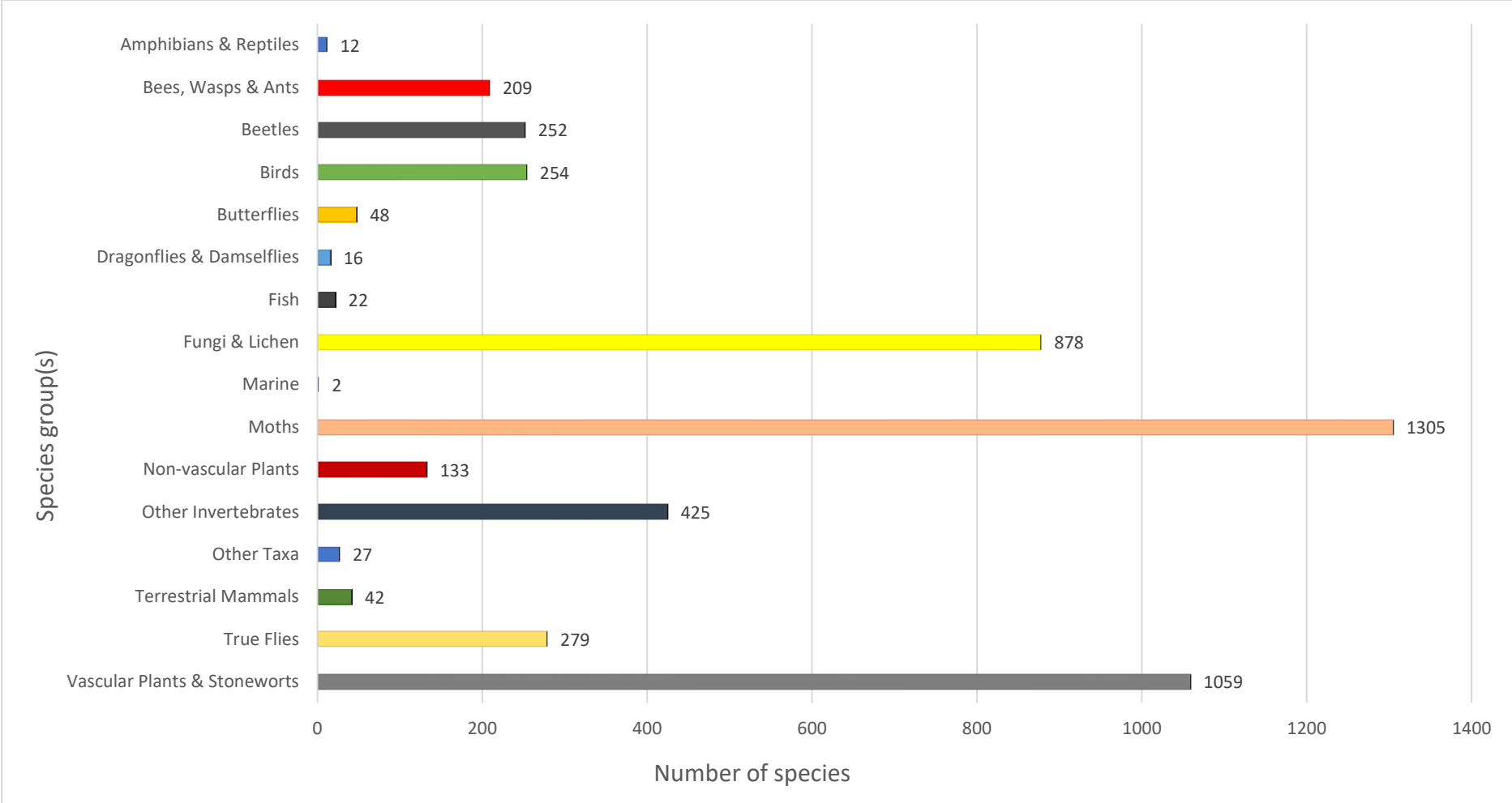


Figure 11: *Number of species recorded in Norwich by taxon group(s)*
(based on NBIS data Aug 2023; these data include all subspecies, but not records recorded to genus level or below, unless it is the only record of that genus.)

3.2.2 Protected and Priority Species

Photos from top to bottom: Brown Long Eared maternity roost © Mid Anglian Bat Group, Great Crested Newt; Sandy Stiltball © Lizzy Oddy, Tree Sparrow © Andy Hay RSPB Images

Figure 12: Species of conservation concern

110. 631 of the species recorded in Norwich are classified as 'Species of Conservation Concern' (Figure 12). This means they are rare, threatened or protected by law. Of these, 172 species are classed as 'Priority' species listed under Section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act.

111. 15 of the species recorded are European Protected Species, including great crested newt, otter and 11 species of bat including Pipistrelle, Barbastelle, Natterer's and Brown Long-eared.

3.2.3 Invasive Non-Native Species

Photos from top to bottom: Signal crayfish © Katy Owen, Crassula © Trevor Renals, Munjac © Trevor Banham, Himalyan balsam © Mike Sutton-Croft

Figure 13: Invasive non-native species

112. NBIS holds 3435 records of 54 species of invasive non-native species recorded in the Norwich City project area since 1947, including birds, plants, mammals, crustaceans and reptiles (Figure 13).

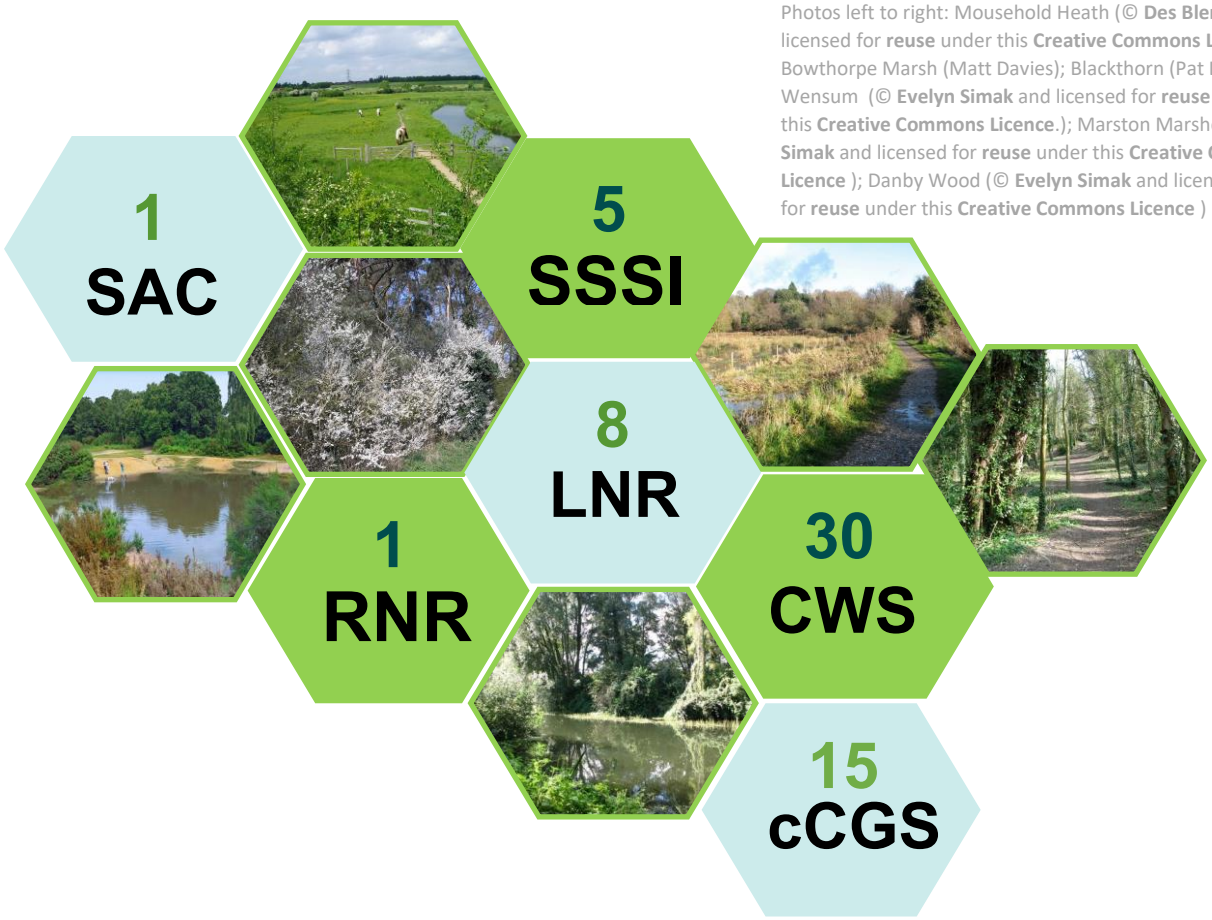
113. Invasive non-native species are one of the most serious threats to global biodiversity. Such species can impact negatively on native species by outcompeting them and limiting their available feeding and cover areas. It is an offence to spread, or cause to grow, invasive non-native plant species listed in Schedule 9 of the Wildlife and Countryside Act.

3.3 Designated Sites

3.3.1 Designated Sites Summary

114. Summary of key designated sites information:

- Norwich City contains many protected and important sites for both biodiversity and geodiversity.
- The internationally designated part of the River Wensum Special Area of Conservation (SAC) reaches into the northwest of the city.
- Five Sites of Special Scientific Interest can be found in the city, along with eight Local Nature Reserves, offering residents and visitors to the city easy access to nature.
- Thirty County Wildlife Sites are protected under the National Planning Policy Framework (NPPF) (DLUHC, 2023) and are important for a wide variety of species. There is one Roadside Nature Reserve.
- Geodiversity is also important in the city, as evident by the fifteen candidate County Geodiversity Sites.
- Two country parks can be found just outside of the Norwich City boundary.



Photos left to right: Mousehold Heath (© **Des Blenkinsopp** and licensed for **reuse** under this **Creative Commons Licence**); Bowthorpe Marsh (Matt Davies); Blackthorn (Pat Lorber); River Wensum (© **Evelyn Simak** and licensed for **reuse** under this **Creative Commons Licence**.); Marston Marshes (© **Evelyn Simak** and licensed for **reuse** under this **Creative Commons Licence**); Danby Wood (© **Evelyn Simak** and licensed for **reuse** under this **Creative Commons Licence**)

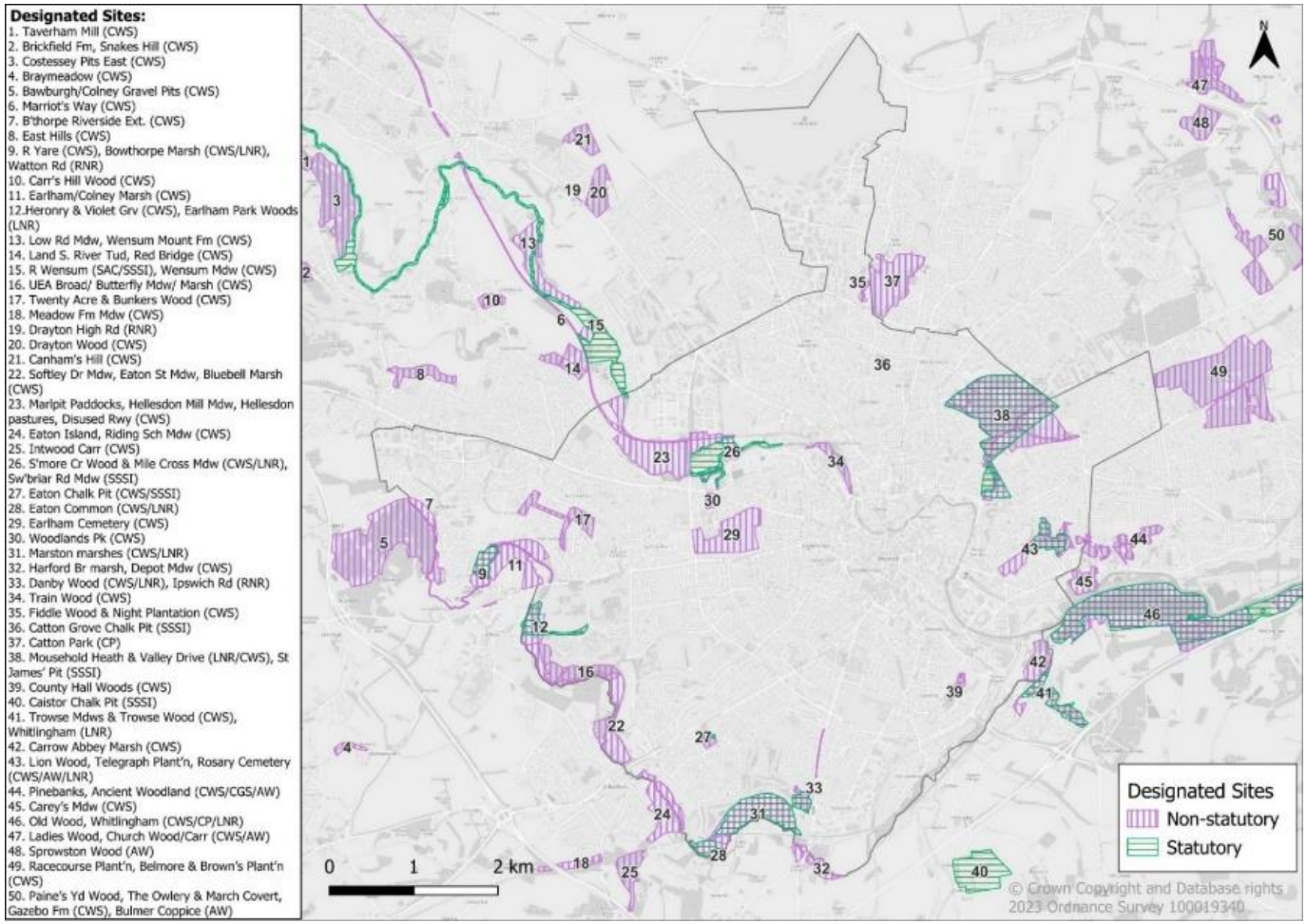
Figure 14: Designated sites in Norwich.
Further details of protected sites can be found in Norwich BBS Appendix BBS4 – Natural Assets and Norwich BBS Supporting Information BBS1 - Local Wildlife Site Citations, and are defined in Table 2

115. Table 2 provides definitions of the various site designations.

Table 2: Definition of Site Designations

Site Type	Definition
Special Areas of Conservation (SAC)	Strictly protected under the Habitats Directive 1992 and forming part of a European network (Natura 2000), these high-quality sites make a significant contribution to conserving habitats and species considered most in need of protection at a European level.
Sites of Special Scientific Interest (SSSI)	The country's best sites for wildlife or geology. They have statutory protection under the Wildlife and Countryside Act 1981 as amended by the CROW Act 2000 and the NERC Act 2006. Many SSSIs are also international or European designated sites (Ramsar, SPA, SAC), National Nature Reserves or Local Nature Reserves. Identified and designated by Natural England.
Local Nature Reserve (LNR)	Designated for the benefit of both people and wildlife. These statutory sites are controlled by Local Authorities in consultation with Natural England, LNRs are important for wildlife, geology, education and/or public enjoyment.
Roadside Nature Reserves (RNR)	Established to protect and promote those road verges in Norfolk containing rare and scarce plant species. Norfolk's road verges are often of special botanical significance and act as havens for wildlife as they are not usually sprayed or fertilised. Co-ordinated by Norfolk County Council, the non-statutory RNR scheme brings the most important verges into appropriate conservation management.
County Wildlife Sites (CWS)	CWS are considered important for wildlife in a county context. They aim to identify, protect, and enhance the most important places for wildlife outside legally protected land. While they do not have statutory protection, they are considered in planning decisions. Many CWS are privately owned and have no public access.
Country Parks (CP)	Not a statutory designation, Country Parks are public green spaces where people can experience nature in an informal semi-rural park setting.
candidate County Geodiversity Sites (cCGS)	Identified throughout Norfolk through an audit commissioned by the Norfolk Geodiversity Partnership, these sites have potential for future designation as County Geodiversity Sites (a non-statutory designation with the same status in the planning system as CWS).

116. The distribution of both statutory and non-statutory sites within and adjacent to Norwich City can be seen in Map 3. Non-statutory designations include RNRs, CWS, CGS and Country Parks, as well as Ancient Woodland. Statutory designations in Norwich consist of LNRs, SACs and SSSIs. The distribution of candidate County Geodiversity Sites (cCGS) within and adjacent to Norwich City can be seen in Map 4.



Map 3: The distribution of statutory and non-statutory designated sites in and surrounding Norwich City.
Statutory designations include SACs, SSSIs and LNRs, whilst non-statutory designations include CWS, CGS, RNRs, CPs and AW.[4]

[4] CWS sites that have not been surveyed recently may require boundary changes in the future to exclude areas built on or destroyed or no longer meeting the designation criteria; or to include new areas that meet the designation criteria and sensibly combine with the current site.

Map 4: The distribution of candidate County Geodiversity Sites within Norwich and surroundings.[5]

[5] Some cCGS will in the near future be formally designated as CGS.

3.3.2 Site Condition

117. This section summarises the condition of SSSIs and Local Sites in Norwich City.

3.3.2.1 SSSI Condition in Norwich

118. SSSIs are managed and reported on by Natural England, who regularly assess the condition of each SSSI in the country. Unfavourable recovering condition represents sites that will recover over time if current management measures are sustained, whilst unfavourable no change and unfavourable declining are assigned where special features are not being conserved or are being lost. Table 3 shows the conditions of each of the five SSSIs in Norwich.

Table 3 List of site condition (as monitored by Natural England) for all SSSI in Norwich.

SITE	**CONDITION**
Catton Grove	UNFAVOURABLE DECLINING
Eaton Chalk Pit	UNFAVOURABLE RECOVERING
St James' Pit	FAVOURABLE
Sweetbriar Road Meadows, Norwich	UNFAVOURABLE RECOVERING
River Wensum (unit 54)	UNFAVOURABLE NO CHANGE

3.3.2.2 Local Site Condition in Norwich

119. Local Sites, designated for their importance for either wildlife or geology, must be well-managed to preserve their conservation status. The number of Local Sites (County Wildlife or Geodiversity Sites) in Norwich City in Positive Conservation Management[4] (DEFRA, 2012) as of 1 April 2022 is 26/31, which is around 83% of the total county wildlife and geodiversity sites in Norwich City. This compares well with a Norfolk average of 73%, and the England figure of 47% in 2018/19[6]. It is important to note that Positive Conservation Management (PCM) is different from site condition but reflects the introduction of site management plans, the inclusion of sites in environmental management schemes or collaborative working with a local Wildlife Trust and is therefore a comparable indicator of condition.

120. It is difficult to establish a single reason for why Norwich may have higher numbers of sites in PCM than other districts. Possible factors include the smaller number and size of sites and their ownership status. Many of the sites are owned and/or managed by the City Council, allowing a more efficient use of funds and cooperative working. In addition, Norwich CC, as a local authority, is committed to delivering good management through partnership with the Norwich Fringe Project, whose remit is to "work with local people and volunteers, to manage a wide range of sites and habitats for wildlife, conservation, recreation and for everyone to enjoy, within and around the Greater Norwich area". This commitment has likely contributed to sites being managed appropriately, as well as ensuring key information about the sites and their condition is readily available.

[6] No more recent data for England is available.

121. The condition of Local Sites and their PCM status, is summarised in Table 4. The average percentage of County Wildlife Sites in Norwich in favourable or recovering condition as of 1 April 2022 is 41%.

Table 4: Local site condition and management in Norwich. Survey Range 1985-2022

Condition	Number of Sites
Favourable	13
Recovering	8
Declining	5
Unfavourable	10
Unknown	15
Total **Percentage in favourable or recovering condition**	**51** **41%**
PCM?	**Number of Sites**
NO	8
YES	43
Total **Percentage in PCM**	**51** **84%**

122. The PCM statistics in the table above are based primarily on desk-based analysis, whilst 'site condition' is always based on field survey. It should be noted that the site condition is 'unknown' for many of the sites, meaning the overall proportion in 'favourable' or 'recovering' condition is likely to differ from the relatively high reported percentages. These numbers cannot therefore be used to assess the status of these sites, and a survey is needed. It is likely that at many sites, management is not currently sufficient and further advice, survey and action needs to be taken to improve conditions of the Priority Habitat features on these sites.

3.4 Habitats and Land use

3.4.1 Habitat and Land Use Summary

123. This section sets out the various habitats and land use identified in Norwich.

124. As a city area, Norwich contains a good variety of different habitats, from the fen and grazing marsh of the river valleys to the lowland mixed deciduous woodland of the wooded ridge; from remnant heathland on Mousehold Heath to ponds, lakes and two rivers winding across the city.

125. Maps are presented below of the habitats in Norwich according to the Living England Map (Map 5) and the Norfolk Living Map (Map 6), as well as a map of priority habitats (Map 7).

126. Land uses such as 'cemeteries' including Earlham and Rosary contain crucial remnant habitats for many species. Allotments and gardens throughout the city provide opportunities for pollinators and other wildlife.

Photos from top to bottom: Marston Marshes (© **Katy Walters** and licensed for **reuse** under this **Creative Commons Licence**.); Rosary Cemetery (Nick Williams); Wooded marsh on edge of UEA (© **N Chadwick** and licensed for **reuse** under this **Creative Commons Licence**.); Lion Wood (© **Helen Renton** and licensed for **reuse** under this **Creative Commons Licence**.); Earlham Park (Lizzy Oddy); UEA Broad (© **N Chadwick** and licensed for **reuse** under this **Creative Commons Licence**.)

Figure 15: Habitats found within Norwich City.
Further details in Norwich BBS Appendix BBS4 – Natural Assets and habitat types are defined in Table 5.

127. The following table defines the various habitat types identified in Norwich.

Table 5: Habitat type descriptions

Coastal and Floodplain Grazing Marsh	Pasture or meadow that is periodically inundated. Ditches maintain water levels, and these are generally rich in invertebrates. The habitat is important for both breeding and wintering birds. In the Norfolk Living Map this habitat is split into three productivity levels – high, medium, and low.
Fen, Marsh & Swamp	This includes fen (peatlands which receive water and nutrients from ground water and surface run-off as well as rain), marsh (areas of waterlogged soil,

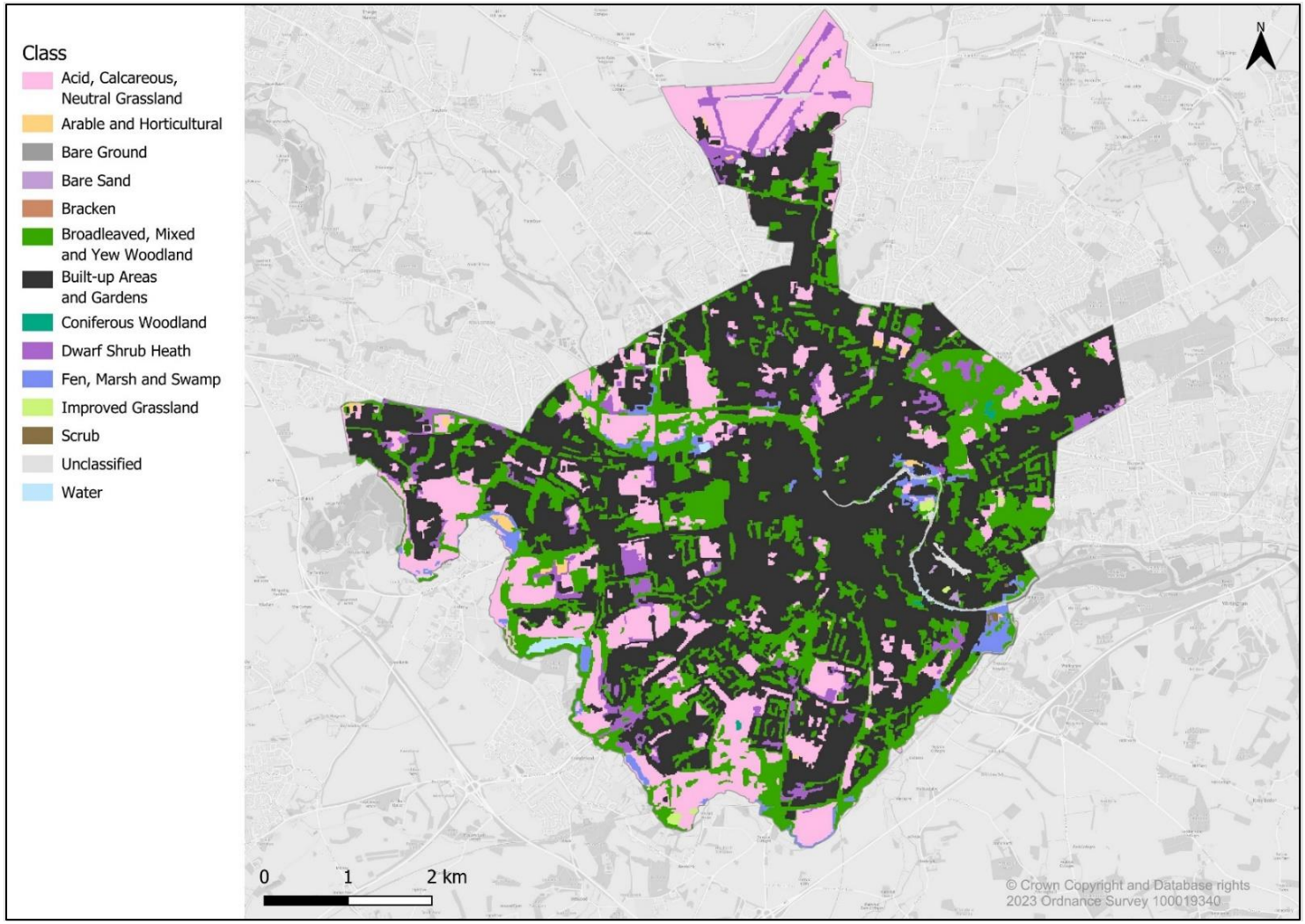
	including fen meadows and rush pasture on mineral soils and shallow peat) and swamp (areas of tall emergent vegetation such as reed bed). UK fen habitats support a diversity of plant and animal communities – up to 550 species of higher plant, up to half of the UK's dragonfly species and several thousand other invertebrates. Reed beds are amongst the most important habitats for birds in the UK.
Lowland Heathland	Occurs on acidic, low nutrient soils and is characterised by the presence of a range of dwarf shrubs such as heather and gorse. Heathland in Norfolk (and in the rest of the UK) has declined massively in the last few decades. Open heathland requires management to prevent it from scrubbing over and eventually becoming woodland.
Lowland Mixed Deciduous Woodland	Although deciduous woodlands vary in quality, the best examples are rich in biodiversity, both in tree species and ground flora, and in associated invertebrate and bird diversity. Deciduous woodland may be of ancient or recent origin and can be either semi-natural, arising from natural regeneration or planted.
Semi-improved Grassland	Semi-improved grasslands have undergone some modification, for example fertilisers, herbicides or grazing. While not species rich, they have a wider variety of plant species than improved grassland and are still of conservation value.
Waterbodies	This includes ponds, lakes, rivers, and drainage ditches. Crucial habitats for many species, they also provide corridors (in the case of rivers and ditches) along which wildlife can travel and a source of water for drinking and bathing.

3.4.2 Habitat Maps for Norwich City

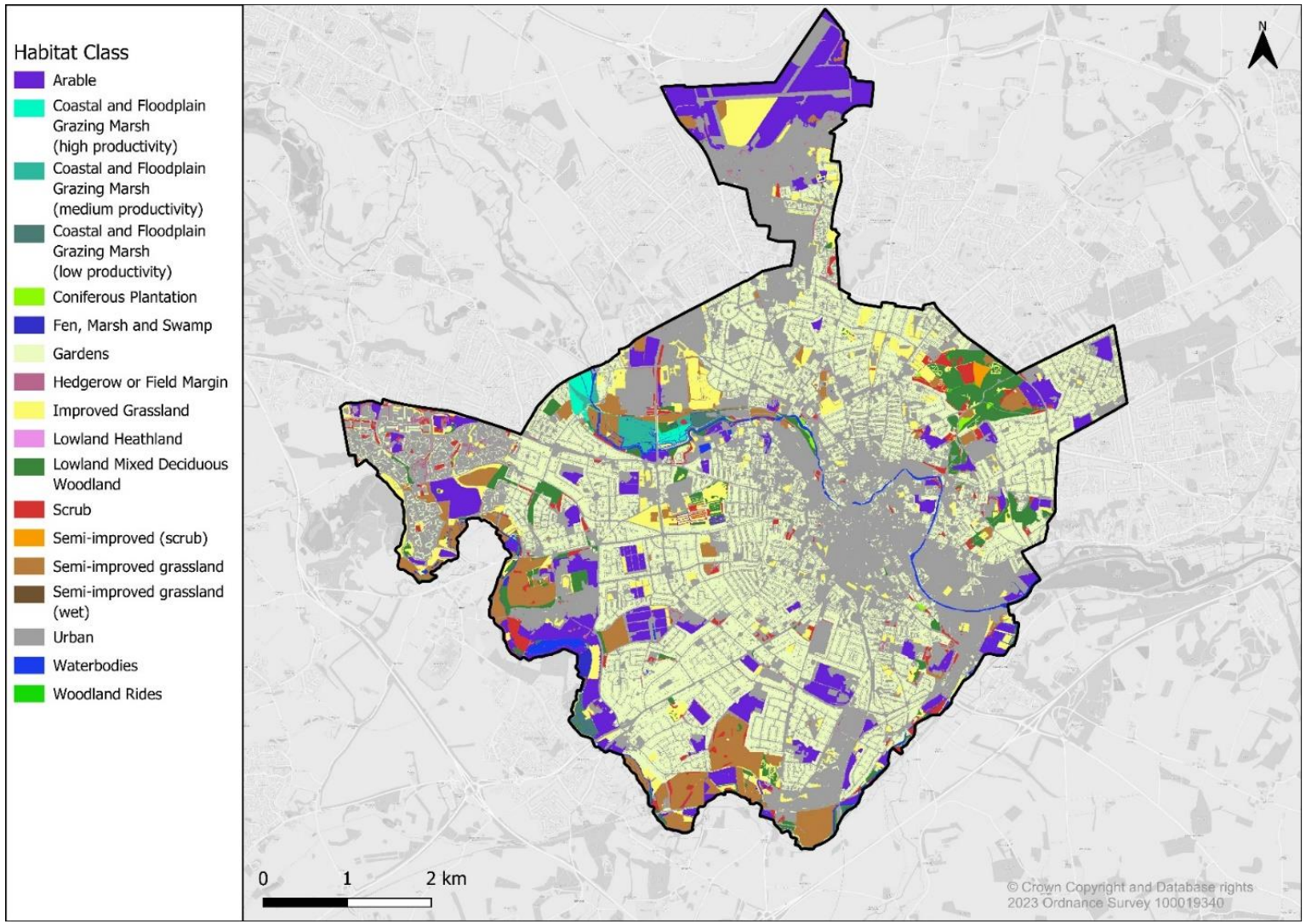
128. Presented below are the Living England (Map 5) and Norfolk Living (Map 6) Maps showing habitat types in Norwich City, based on mapping data from Natural England and NBIS, respectively. Both maps are presented for greatest habitat coverage and data accuracy but the detailed reasons for using the two datasets are explained in Norwich BBS Appendix BBS1 – Study Approach and Methodology, Section 1.1.1 (paragraph 8).

Remotely sensed data provides a less resource-intensive way of mapping habitat, however ground surveys are still optimal for providing a greater level of detail, for instance to differentiate between types of grassland.

129. There are differences in terms of the habitats mapped between the two maps. The Living England Map (Map 5) shows a significant proportion of built-up urban areas, with broadleaved woodland and grassland being the predominant natural habitats within the city. By comparison, the Norfolk Living Map (Map 6) shows a distinction between urban built-up areas and gardens, and a greater diversity in the natural habitats seen around the city, including more arable land where the Living England Map classified the same areas as grassland.



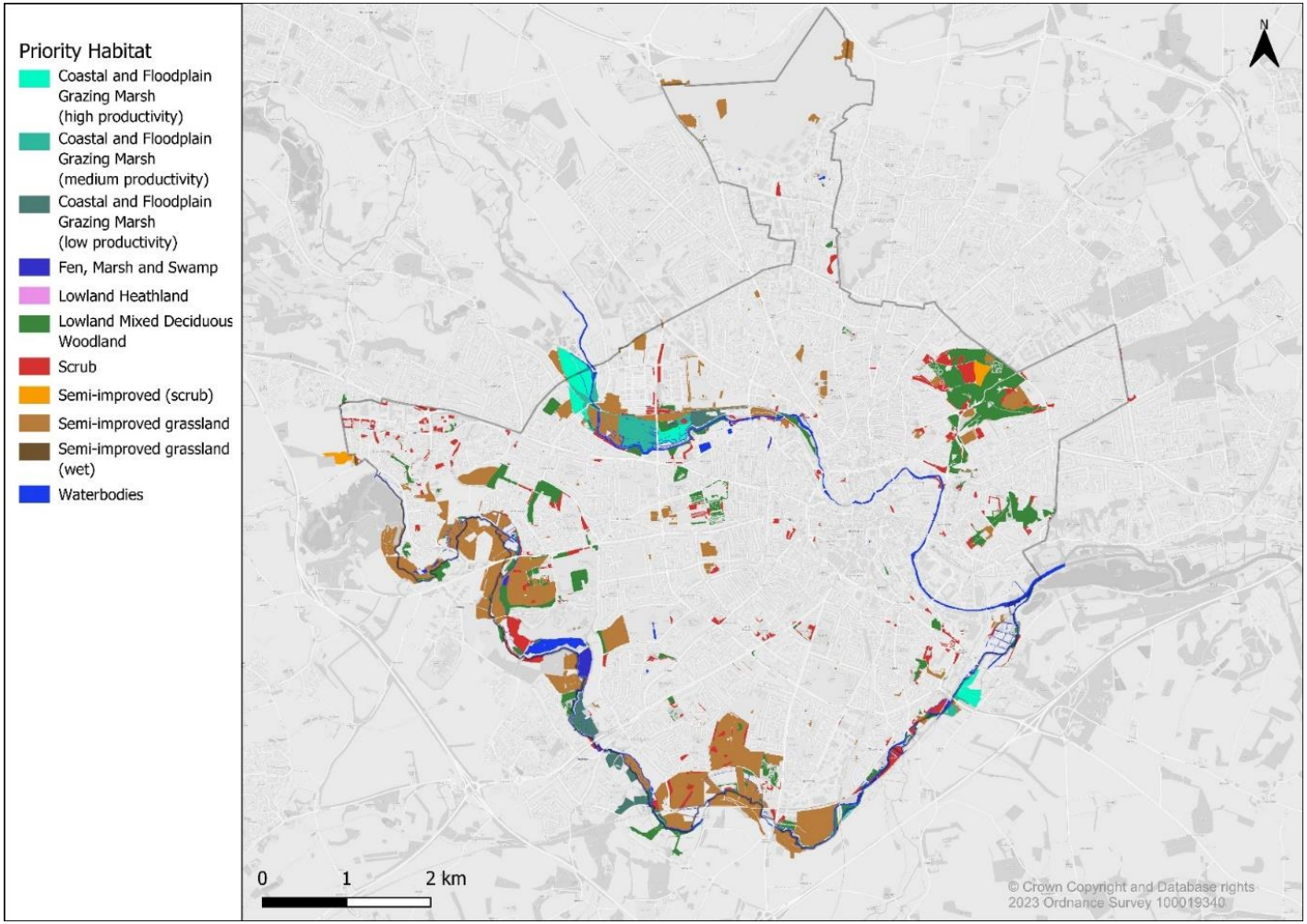
Map 5: Habitats in Norwich from the Living England Habitat Map



Map 6: Habitats in Norwich from the Norfolk Living Map

3.4.3 Priority Habitats in Norwich City

130. This section sets out the priority habitats that have been identified in Norwich. Priority habitats (also known as 'habitats of principal importance') are habitats identified as being the most threatened and requiring conservation action (Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006: habitats and species of principal importance in England). A map of priority habitats is shown in Map 7 below.



Map 7: Priority Habitats identified from the Norfolk Living Map

3.4.4 Irreplaceable Habitats in Norwich City

131. Irreplaceable habitats can be defined as habitats which would be technically very difficult (or take a very significant amount of time) to restore, recreate or replace once destroyed.

3.4.4.1 Ancient Woodland

132. Ancient woodlands are sites that have been woodland continuously since at least AD 1600. Rich both in wildlife and cultural heritage, these woodlands are irreplaceable – when they are lost, they are gone forever.

Lion Wood © Copyright Helen Renton and licensed for reuse under this Creative Commons Licence.

133. Lion Wood, to the east of Norwich in Thorpe Hamlet, along with two adjacent areas of woodland, contains some areas of ancient woodland. Lion Wood is designated as a LNR and a CWS.

3.4.4.2 Ancient and Veteran Trees

134. Ancient and veteran trees provide important habitat for wildlife, with their holes, crevices and dead/decaying wood. They can act as significant corridors within cities and often provide homes for rare or important invertebrates.

Veteran tree © **Graeme Cresswell**

135. Both the Veteran Trees Database and the Ancient Tree Inventory record 23 veteran trees within Norwich City. However, confidence in the accuracy of the spatial information of those two databases is limited.

3.4.4.3 Lowland Fen

136. Fens are biodiverse wetlands which support a large range of native plant and invertebrate species. Formed through constant waterlogging over many years, these are irreplaceable habitats threatened by fragmentation, and water extraction.

Bowthorpe Marsh © Copyright N Chadwick and licensed for reuse under this Creative Commons Licence.

137. In Norwich City, there are fragments of lowland fen along the River Yare to the south, including the University of East Anglia (UEA) and Bluebell marshes, Bowthorpe marsh and Whitlingham, all designated sites.

138. Map 8 below shows the distribution of Irreplaceable Habitats in Norfolk. The map comprises three datasets: The Ancient Woodland Inventory (being updated by NBIS as part of national update); Lowland Fen data (data from Norfolk Wildlife Trust, Broads Authority and other sources, updated by NBIS) and the Ancient and Veteran Trees (from Norfolk CC Veteran Tree Database and Woodland Trust's Ancient Tree Inventory (Woodland Trust, 2024), but significant validation required). All three datasets are currently undergoing revision or review and will be provided when available. The revisions required for the Ancient and Veteran Trees is detailed in Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework.

Map 8: Irreplaceable Habitats (Map to be provided when available)

3.5 Soils and Geology

139. Norwich City has a diversity of soils and geology types which give rise to the range of habitats and types of species found. These include bedrock (chalk along wooded ridge and river valleys, sand and gravel elsewhere); superficial geology (mostly sand and gravel with the addition of clay and silt in river valleys); and soils (sandy in most of the city, turning clayey along the Yare valley heading south). Table 6 gives an overview of the geology and soils in Norwich City.

Table 6: Overview of geology and soils in Norwich City (using BGS 2011, 50k dataset)

Bedrock	Chalk where wooded ridge and river valleys are, otherwise, sand and gravel.
Superficial geology	River valleys: clay, silt, sand and gravel; rest sand and gravel, other than elements of Diamicton (poorly sorted sedimentary rocks) in pockets plus airport/Old Catton (latter especially is more sandy than chalky).
Soils	Sandy for most of city, turning to clayey along the Yare valley as one goes south.

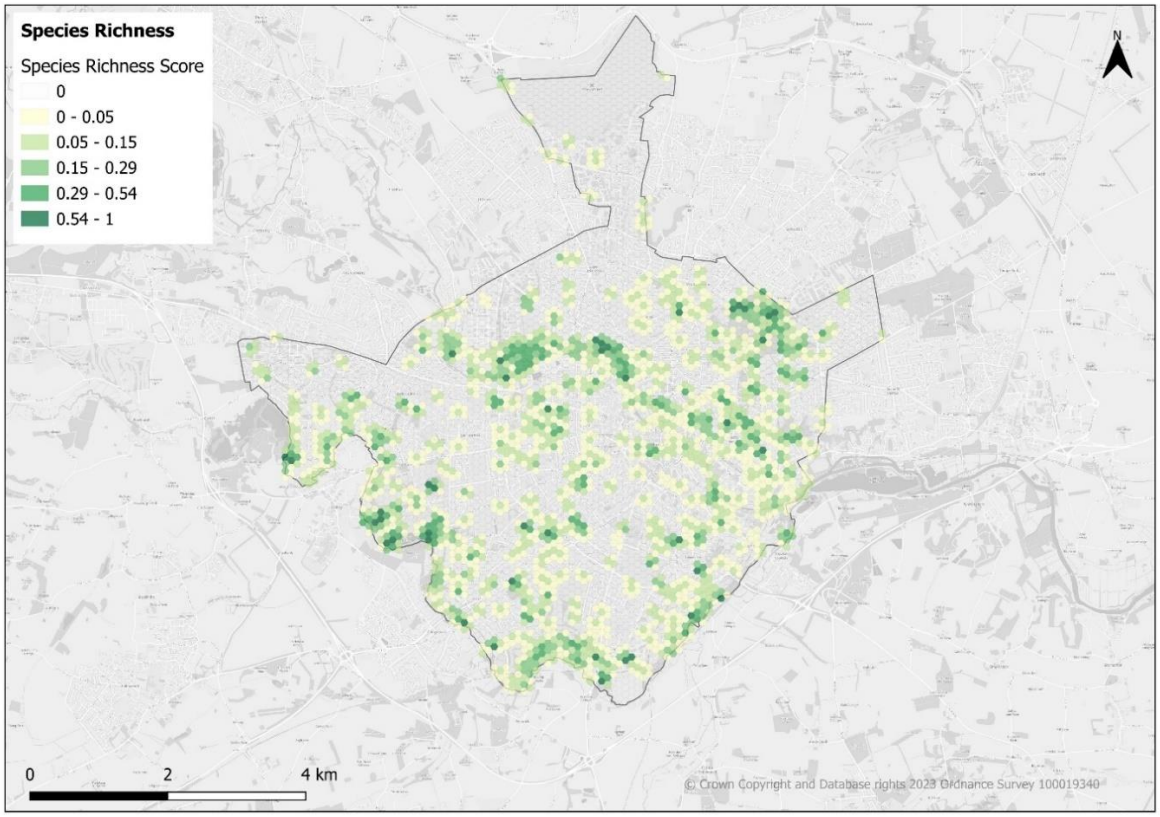
3.6 Maps of Norwich City's Natural Assets

140. The following maps bring together the data identified for species (species richness maps), and for sites and habitats (natural asset maps). Together they constitute the maps of Norwich City's natural assets.

3.6.1 Species Richness Maps for Norwich City

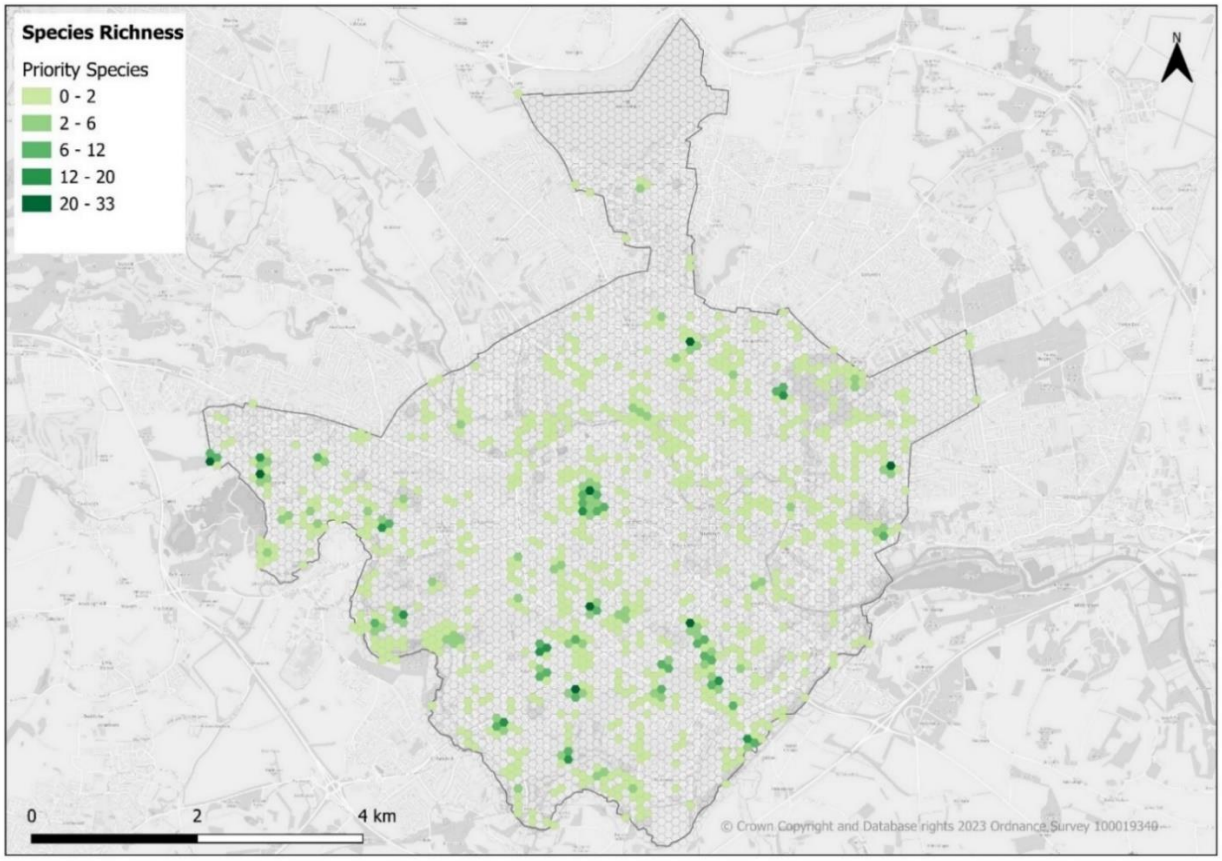
141. Due to the complexity of species data, 'species richness' has been chosen to encompass the diversity of species and their conservation significance across Norwich City. An overall species richness score was calculated across Norwich by adopting a weighting system based on each species designation levels (Map 9; see Norwich BBS Appendix BBS1 – Study Approach and Methodology, Task 4.2 for a detailed methodology). Darker greener areas indicate a higher Species Richness score, and suggest an area of high biodiversity value, with relatively greater numbers of unique and high conservation importance species. The regions exhibiting the highest levels of overall species richness score are the semi-natural habitats along the River Wensum and River Yare riparian corridors, as well as Mousehold Heath, Earlham Cemetery, and smaller Priority Habitat pockets such as Eaton Chalk Pit.

142. The following maps provide a breakdown of species richness data for Norwich City. These maps have been separated into the various conservation designations that assist with environmental assessment. Map 10Map , Map 11 and Map 12 show species richness, the count of unique species present, for Priority Species (Map 10), Red List Species (Map 11) and European Protected Species (Map 12). When analysing the distributions of Priority Species, richness levels prove high within Earlham Cemetery boundaries and throughout residential districts of the city where bat and great crested newt records have been reported in houses, churches, schools, and gardens. Regarding Red List species distribution, the foremost species richness arises along habitats in the River Wensum corridor and within Mousehold Heath. European Protected Species richness is greatest around the Wensum, with other small areas of high diversity around Eaton and the UEA campus.



Map 9: Overall species richness scores within Norwich.
The map shows a species richness score recorded within 100m hexagon tiles. The score was calculated by counting the number of species in each designation level (species richness) and then multiplying by a factor based on the conservation significance of each species designation level. The weighted counts have been summed and normalised to give score between 0-1. The greener the area, the higher the number of unique important or protected species.[7]

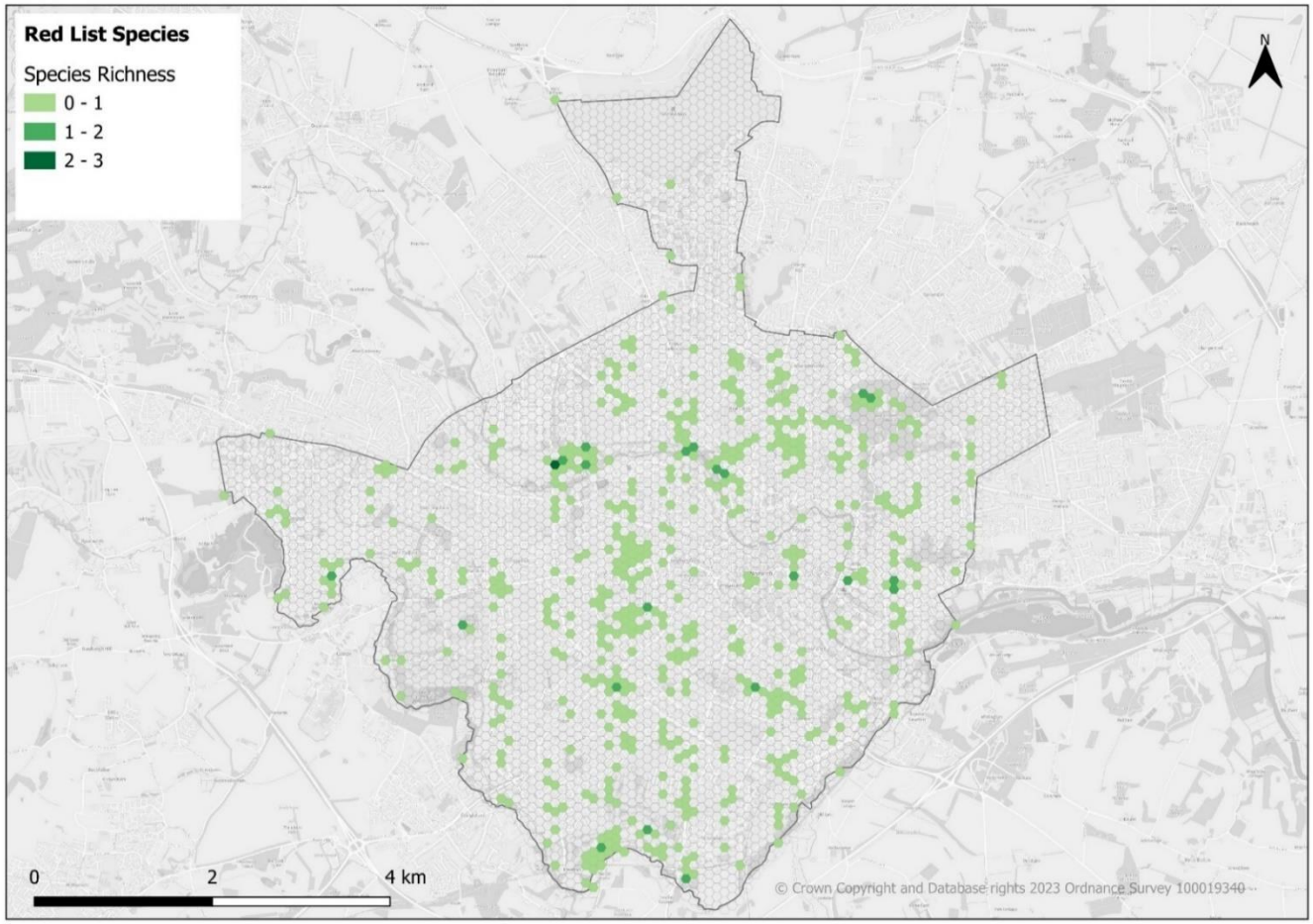
[7] Moths are often recorded at moth traps in the gardens of individual recorders. These moth traps often generate large numbers of records over multiple trapping sessions. The distribution of moth records across Norwich therefore describes the location of the moth traps more than the distribution of moth records themselves. To avoid this skewing the results, moth records have been excluded from the species hotspot mapping in this study. While the number of bird records held within the project area is high, and well distributed, the hotspot mapping method called for only breeding and roosting records to be used. This



Map 10: Priority species richness.
The number of unique UK BAP Priority Species recorded within 100m hexagon tiles[8], with darker green showing areas with a greater range of priority species (those identified as most threatened and requiring conservation action). This map represents a subset of Map 9.

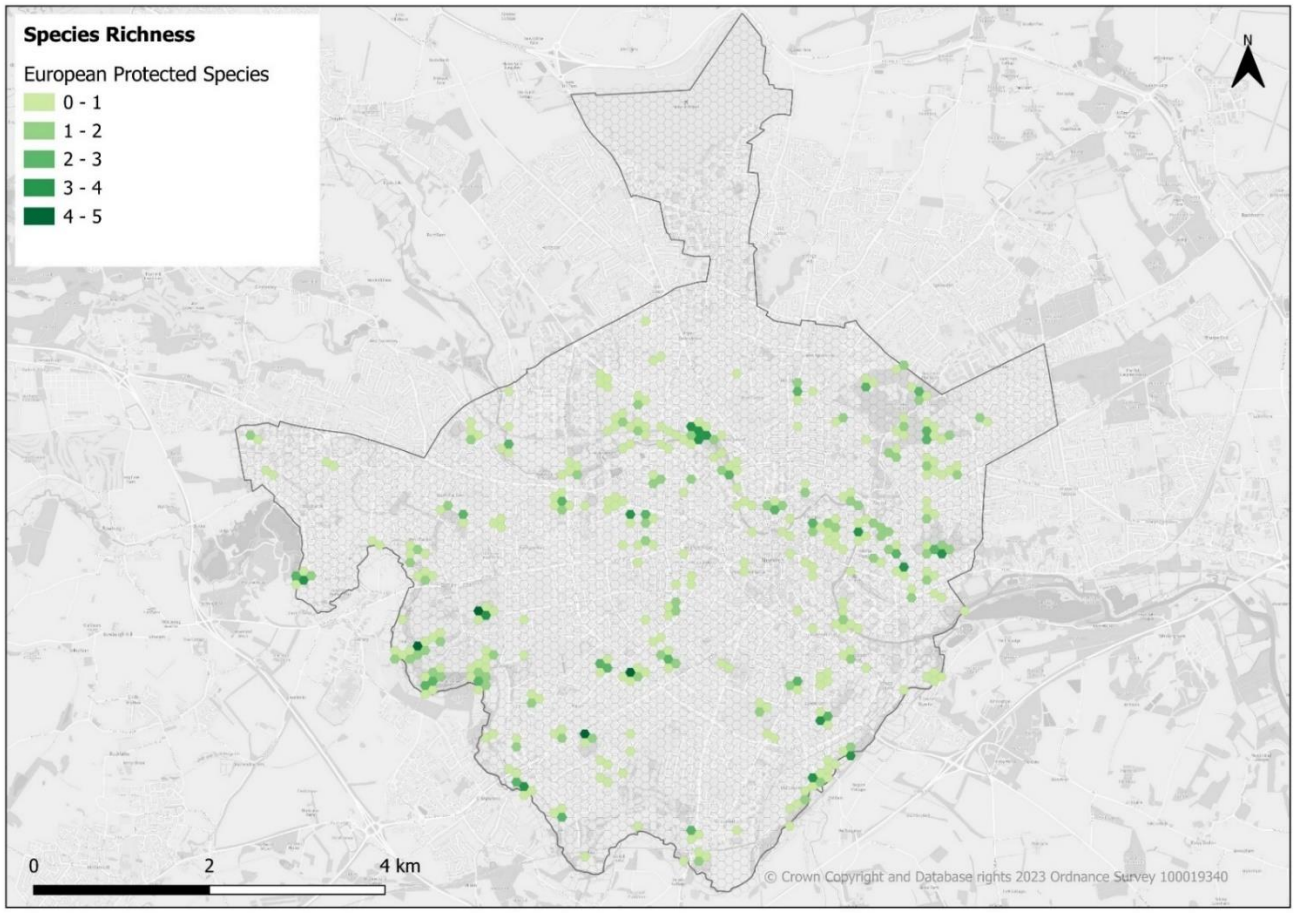
information is not present in many of the bird records held and for this reason bird records have also been excluded from the species hotspot mapping. Many of the bird records held are also recorded at a relatively low resolution. Data used is mostly collected by ad hoc recording, likely biased towards easier to record, more charismatic taxa and more 'favoured' sites. This results in recorder effort being mapped rather than true spatial resolution. Additionally, records for some taxa are old and/or of low spatial resolution.

[8] Data used is mostly collected by ad hoc recording, likely biased towards easier to record, more charismatic taxa and more 'favoured' sites. This results in recorder effort being mapped rather than true spatial resolution. Additionally, records for some taxa are old and/or of low spatial resolution.



Map 11: Red list species richness.
The count of unique red list species recorded within 100m hexagon tiles. Darker green represents a greater range of vulnerable or endangered red list species in that area. This map represents a subset of Map 9 [9]

[9] Data used is mostly collected by ad hoc recording, likely biased towards easier to record, more charismatic taxa and more 'favoured' sites. This results in recorder effort being mapped rather than true spatial resolution. Additionally, records for some taxa are old and/or of low spatial resolution.



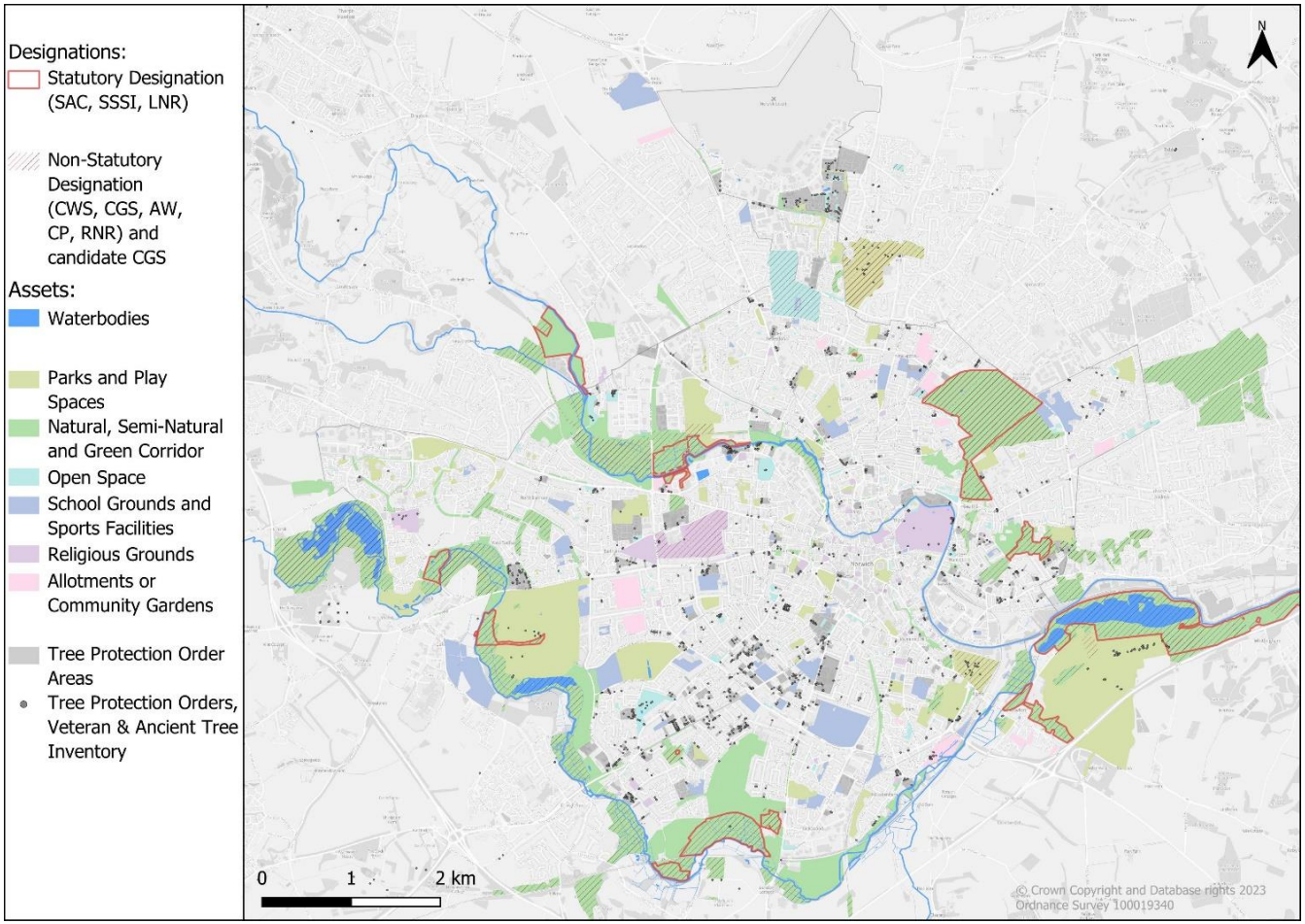
Map 12: Protected species richness
The number of unique European Protected Species (EPS) records within 100m hexagon tiles. Darker green represents a greater range of EPS (protected within EU law) in that area. This map represents a subset of Map 9 [10].

[10] Data used is mostly collected by ad hoc recording, likely biased towards easier to record, more charismatic taxa and more 'favoured' sites. This results in recorder effort being mapped rather than true spatial resolution. Additionally, records for some taxa are old and/or of low spatial resolution.

3.6.2 Natural Asset (Site and Feature) Map for Norwich City

143. Key natural assets (sites and features such as trees) in and around Norwich City have been mapped according to their land use and designation. These include key sites previously identified through their designated status, including LNRs, SSSIs and CWS, as well as other sites identified as significant to the biodiversity of the city, such as churchyards, allotments, other amenity, and recreational open spaces. The full list of natural asset types is presented in Norwich BBS Appendix BBS1 - Study Approach and Methodology.

144. The natural assets shown below in Map 13 are categorised according to a dominant land use and any relevant designations. Most sites serve as multifunctional spaces, with value both to biodiversity and people, and so whilst a distinction has been made between categories like natural spaces, parks, sports facilities, and other open spaces, in many cases this does not reflect clear cut differences in land use. It should also be noted that whilst certain types of natural assets are generally associated with high levels of biodiversity, the categorisations used do not directly reflect the value of individual assets. A more detailed view of each natural asset category can be found in the Norwich BBS Appendix BBS6 - Layered PDFs.



Map 13: Natural Assets by type and designation, in and around Norwich City[11]

[11] Data caveats: Veteran tree dataset is known to be incomplete and has low confidence in spatial accuracy. Manual checks suggest some data currency issues with open spaces data, where sites may have been developed/land-use has changed. Asset categorisation may not reflect the full range of functions a space provides.

3.7 Section 3 Key Findings

145. The key findings of the natural asset assessment for Norwich City can be summarised as follows:

- Norwich contains a wealth of species (including protected and priority species). statutory and non-statutory designated sites and a variety of different habitats.
- Three out of five SSSIs in Norwich are in 'favourable' or 'unfavourable recovering' condition.
- 83% of County Wildlife Sites and County Geodiversity Sites are in Positive Conservation Management, and 41% of CWS are in 'favourable' or 'recovering' condition.
- Norwich contains areas of 'irreplaceable habitat' – that is, habitat that if lost can never be replaced with habitat of the same value. These are the areas of ancient woodland, veteran trees, and lowland fen.

Section 4: Biodiversity Character Areas in Norwich City

4.1 Aims

146. This section describes how areas across and around Norwich City have been thematically grouped into biodiversity character areas (BCAs) based on sets of shared characteristics, aiming to enable a more strategic approach to identifying opportunities. BCAs with relevance across the entire county, including river corridors, heathland, wooded ridge and historic habitats, are defined alongside two locally relevant BCAs, Green Streets and Community and Active Spaces. For each BCA, key sites and attributes have been defined alongside maps of spatial boundaries. Additional definitive information can be found within the Norwich BBS Appendix BBS5 - BCA Profiles. The methods for creating the BCAs are outlined in Norwich BBS Appendix BBS1 - Study Approach and Methodology, Task 4 and summarised in Figure 16.

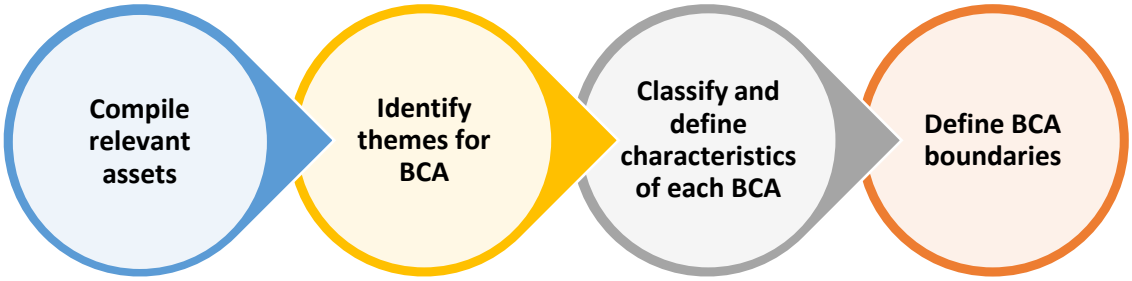


Figure 16: Illustration of the steps used to identify the biodiversity character areas (BCAs)

4.2 BCA Profiles

147. BCAs have been created to contextualise the natural assets and ecosystem services within the study area. Collating similar assets together by shared themes allows for a more strategic approach to nature recovery based on the Lawton Principles within the planning system, especially with the advent of BNG. Planning nature recovery using a thematic approach, such as through defining BCAs, is more efficient and cost effective. It enables decisions (e.g., about on-site management) to be based not only on individual sites and their site-specific habitats, species, threats or planning constraints, but also by considering these natural assets within the wider environmental context.

148. Each BCA has been categorised into 'County Level' or 'Local Level'. The purpose of these two tiers is to show whether the BCA is strategically important at a county scale or is a theme specific to Norwich, capable of delivering important nature recovery at a very local level.

149. Several of the BCAs include sites that overlap with, or are adjacent to, the Norwich City boundary. These cross-boundary sites have been included to demonstrate connectivity with South Norfolk and Broadland District's biodiversity. These sites materially influence the BCAs as a whole and are frequented by Norwich residents, regardless of lying outside of the city boundaries.

150. Following the approach detailed above, the following BCAs have been identified within Norwich City (Table 7).

Table 7: BCA Descriptions.
Summary statements for each Biodiversity Character Area (BCA) in Norwich – covering their key themes and attributes

Biodiversity Character Area (BCA)	Description
COUNTY LEVEL BCAs	
River Corridors (River Yare and River Wensum)	River corridors are important for connectivity and biodiversity (particularly chalk rivers such as the Wensum and Yare). Rivers also provide water regulation, water quality and flood mitigation to Norwich. This BCA includes the floodplain/river valley, with boundaries refined by associated alluvium and river terrace geology to determine the original river corridors.
Heathland	Heathlands are semi-natural habitats resulting from tree removal and grazing. They are unique habitats for a small number of plants (predominantly heathers) and provide important cultural services. Mousehold Heath is the largest area (74 ha) and is most of what remains (alongside elements in Racecourse Plantation and other plantations going east from Mousehold) of what was probably one of the largest heathland complexes in Norfolk in the late 1700s. This would have reached almost as far as Blofield and was all called Mousehold Heath (Faden, 1797). There are also small remnants of heathland and acid grassland flora across Norwich, of which the significant areas have been included in the BCA.
Wooded Ridge	Woodland is a diverse habitat which harbours thousands of species, provides climate change regulation services, and offers recreation opportunities. Two wooded ridges intersect Norwich. These 'green arteries', made up mainly of

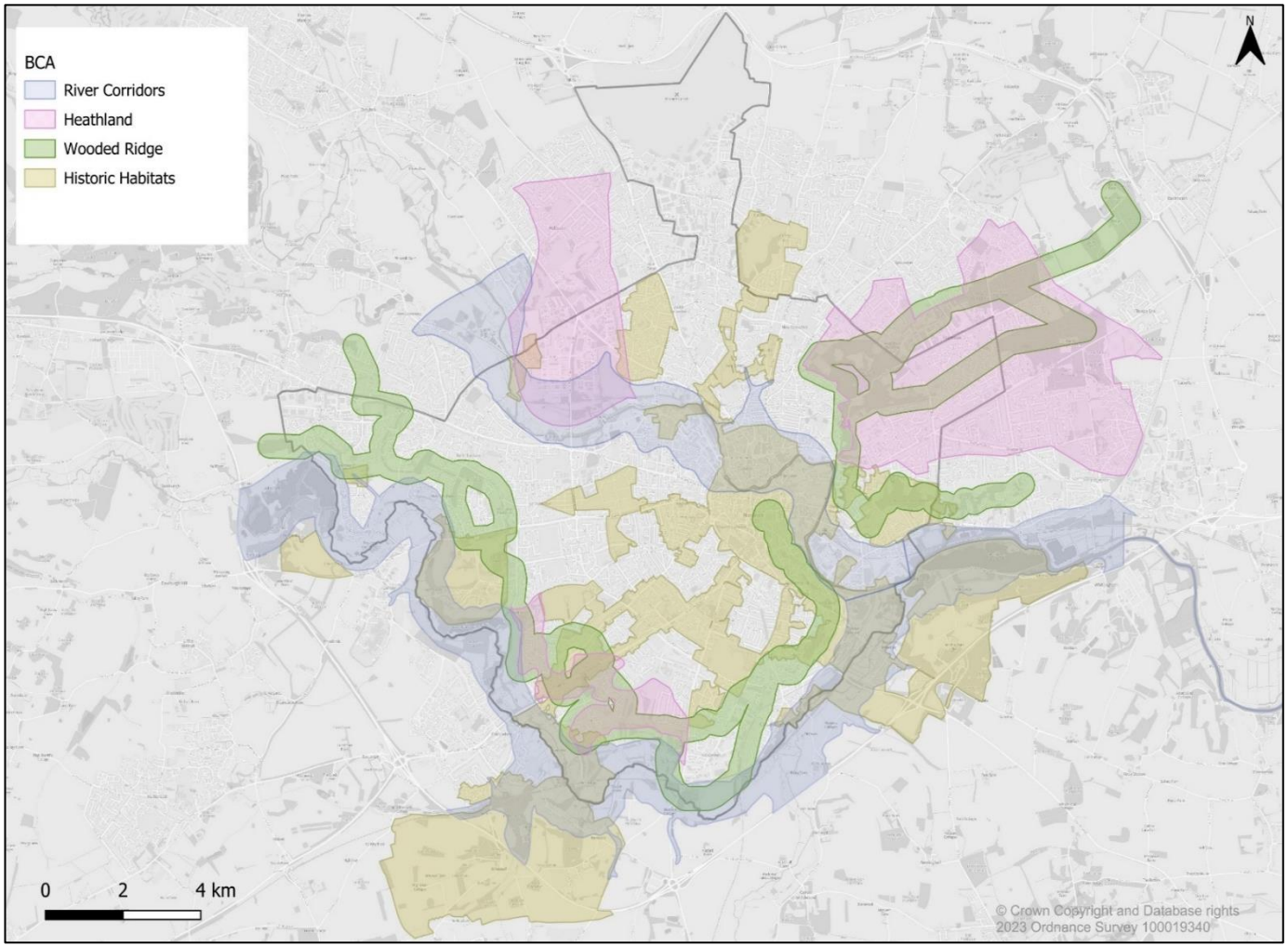
Biodiversity Character Area (BCA)	Description
	secondary broadleaved woodland, also include Bluebell, Cooper, Old Crome and Lion Woods. The two wooded ridges surround the city centre by clinging to the edge of the chalk escarpment that follows roughly the 25m elevation contour: 1. Overlooking the Yare in the south, running from the Castle via the waymarked wooded ridge area of the Bracondale ridge, through to Lakenham and Eaton, finally leaving Norwich via Bunker's Hill through Bowthorpe and New Costessey. 2. Overlooking the Wensum, starting at Thorpe Ridge in Broadland's Thorpe St Andrew, moving via Lion Wood and two other units of Ancient Woodland through Thorpe Hamlet, via Kett's Heights to Mousehold Heath. This well marked wooded ridge also has wildlife corridor opportunities out into the greater Mousehold area via Racecourse Plantation.
Historic Habitats	Churchyards and cemeteries are often the last fragments of ancient meadows in parishes, and act as island refuges for wildlife. There are over 50 churchyards in Norwich. This character area also encompasses the cathedral precinct that includes the Bishop's Garden and school fields adjacent to the Wensum. Remnant parkland is another key element of this BCA, some registered as parks and gardens and listed, others locally designated as having heritage importance to Norwich. Other fragments of remnant parklands have been newly assigned in this study, based on historic mapping and remnant parkland features. Registered Commons at Eaton, and designated Country Parks at Whitlingham and Catton, are outside the city boundary but are key natural assets for Norwich residents, and key linkages to the biodiversity value in the wider countryside.
LOCAL LEVEL BCAs	
Community and Active Spaces	Many parks and open spaces in Norwich which are not registered, listed or historically significant, remain important for the health and wellbeing of residents. These are key sites for community activities, sports and recreation. Community Gardens have also sprung up across Norwich, renewing derelict sites and fostering a connection between people and their local area. Many will have been inspired by Grapes Hill, Bowthorpe Community Gardens, and the Sustainable Living Initiative at Marlpit Community Garden. Allotments are known to be one of the most beneficial land uses for pollinators in an urban setting, and the large contribution of the 18 sites in Norwich cannot be

Biodiversity Character Area (BCA)	Description
	underestimated. School grounds, sports pitches and the prison grounds contain significant grassland area that has vast potential for adding to the pollination capacity of Norwich.
Green Streets (Zones A, B and C)	Gardens and street trees are an important BCA in an urban environment, offering huge potential for habitat connectivity. Opportunities in residential areas and commercial buildings can be difficult to achieve, but the potential for greening streets is vast. This BCA is defined by the concentration of gardens and trees/hedges from the Norfolk Vegetation Model and Ordnance Survey data, using a zoning system. Zone A represents the city centre and commercial areas; Zone B detached and semi-detached gardens and street trees; and Zone C terraced gardens, apartment communal gardens and associated street trees.

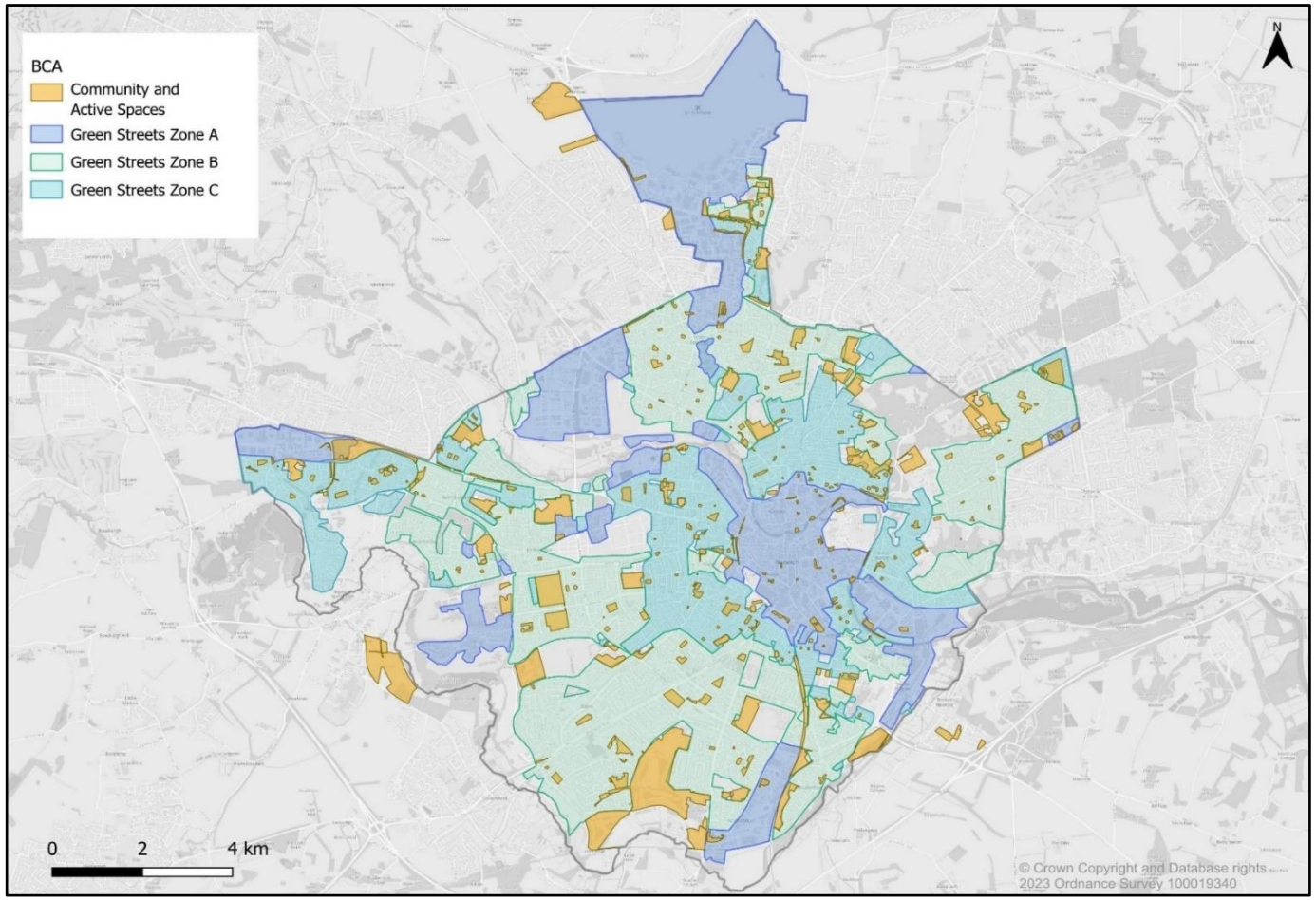
151. The above table summarises the key attributes that constitute each BCA. The BCAs presented here are the results of extensive analysis and review. For a comprehensive profile of each BCA and the information comprising each one, please refer to Norwich BBS Appendix BBS5 - BCA Profiles. These BCA profiles follow the structure of the NCA derived attributes developed in the methods (Norwich BBS Appendix BBS1 - Study Approach and Methodology, Step 4.1.1).

4.3 BCA Boundary Mapping

152. After creating the BCA profiles, spatial boundaries of each BCA were defined, as detailed in Norwich BBS Appendix BBS 1 – Study Approach and Methodology, Task 4, Step 4.1.4. The results of this have been summarised in Table 7. The primary output of this process is the spatial mapping of these boundaries. Individual BCA boundaries have been mapped as one layered PDF in a standardised format allowing for zooming in and panning around (Norwich BBS Appendix BBS6 - Layered PDFs). Individual views of the BCA boundaries are available in Norwich BBS Appendix BBS5 - BCA Profiles. Overview maps, showing the combined boundaries of the county-level (Map 14) and local (Map 15) BCAs are presented below.



Map 14: County level Biodiversity Character Areas (BCAs)



Map 15: Local level Biodiversity Character Areas (BCAs).
Includes 'Community and Active Spaces' and 'Green Streets' (Zone A combines the city centre with commercial land use; Zone B combines areas where the gardens and street tree coverage are typical of detached and semi-detached properties (almost exclusively these types of properties); Zone C combines areas where the gardens and street tree coverage are typical of terraced and apartment properties (in the main this includes these types of property, but there are areas of semi-detached and detached properties with small gardens akin to those in typical terraced areas that are included here).

4.4 Section 4 Key Findings

153. There are four key BCAs within Norwich that hold strategic importance at a county scale, these can be summarised as follows:
    - The River Corridors BCA is defined by the wider floodplain/river valley boundaries around the Yare and Wensum, encompassing a diverse range of wetland habitats in addition to the rivers themselves.
    - The Heathland BCA identifies significant remnants of heathland and acid-grassland across the city, along with wider historic extents.
    - The Wooded Ridge BCA shows two distinct areas of broadleaved woodland on chalk escarpments which cover large areas of the south and east of the city.
    - The Historic Habitats BCA underscores the importance of historic parks and churchyards to biodiversity within the city centre, characterised by fragments of ancient meadows or parkland.

154. The two additional BCAs identified as locally important represent thematic areas which are most relevant to an urban environment like Norwich. These are as follows:
    - The Green Streets BCA divides the residential and commercial gardens and streets within the city into three characteristic zones (commercial, detached/semi-detached housing, terraced/communal flats), each with differing biodiversity value and opportunities.
    - The Communal and Active Spaces BCA recognises the importance of other amenity sites within Norwich, which may offer both biodiversity value and wellbeing benefits to residents.

155. In many places the BCAs inevitably overlap, highlighting the competing priorities in many parts of the city, where areas may hold significance for multiple habitats. Defined boundaries can also extend beyond Norwich City, representing broader connectivity with the surrounding districts.

Section 5: Biodiversity Hotspots in Norwich City

5.1 Aims

156. This section presents a heatmap of biodiversity hotspots to identify areas with the highest current biodiversity value, based on analyses of species, habitats, and sites. Using a uniform grid across the city to map relative biodiversity value allows for the identification of key areas where development may pose a threat. A summary table presents average biodiversity scores across the different BCAs, providing a further comparison of ecological value at a strategic level. This is supported by additional mapping of axiophyte species richness to present evidence for targeting conservation and informing planning decisions across the city.

5.2 Biodiversity Hotspots

157. Biodiversity hotspots integrate species, sites, and habitat data into a heatmap, revealing areas within Norwich with the highest biodiversity value. Unlike a simple species richness score, biodiversity hotspots account for additional factors such as site designations and the presence of priority habitats, indicating a high ecological value. Acting as a proxy for overall biodiversity value, they utilise a hex grid to produce a uniform and clear display of the complex underlying data. These hotspots highlight areas of biodiversity value that may be impacted by development, habitat loss or other factors like climate change. The methods for identifying hotspots in the Norwich study area are outlined in Norwich BBS Appendix BBS1 - Study Approach and Methodology, Task 4.2 and summarised in Figure 17. Hotspot maps can also serve as a constraint mapping tool in land use planning, pinpointing areas that are particularly sensitive to development.

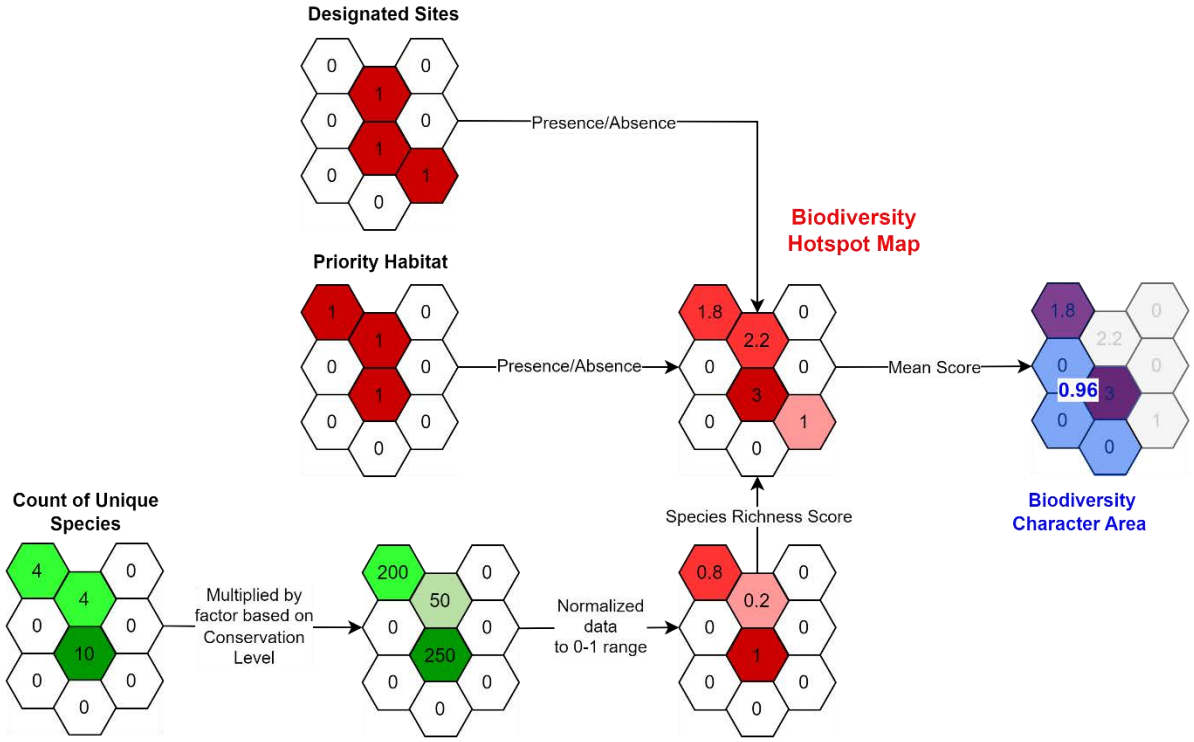


Figure 17: A diagram outlining the creation of the Biodiversity Hotspot Map

158. Table 8 and Figure 18 detail the data behind the hotspot scores heat mapping. They present a breakdown of how the three elements (sites, habitats and species) scores contribute to the overall biodiversity value and highlight differences between the BCAs. Generally, BCAs with a significant amount of priority habitat tend to have the highest total biodiversity score, as these areas are more likely to be designated as a protected site and host protected and priority species. However, the correlation observed does not confirm priority habitat presence alone. Additional influencing variables, such as surrounding land use, ecological connectivity, and disturbance levels, etc. may also contribute.

159. The River Yare part of the River Corridors BCA has been found to have the highest biodiversity hotspot value out of the BCAs in the region. This is attributable to the substantial amount of priority habitats, species, and designated conservation sites within the River Yare corridor. Whilst the River Wensum part of the River Corridors BCA is equally species rich, when it is compared to the River Yare, the overall biodiversity value is considerably lower due to a lower priority habitat score. The reduced amount of priority habitat is a result of a substantial portion of its floodplain being located in the city centre. This underscores the need for opportunities to be actioned in these urbanised areas.

160. The Wooded Ridge BCA, often recognised for its cultural value, ranks as the second most biodiverse BCA. In particular, the northern portion of the Wooded Ridge, encompassing areas like Lion Wood and Mousehold Heath, score highly. While the Heathland BCA

incorporated certain biodiversity hotspots like Mousehold, the wider historic spatial range of heathland has been found to score lower for biodiversity. The Historic Habitats BCA has a higher average score than the Community and Active Spaces BCA, indicating that although recreational green spaces can hold some ecosystem value, historic parks and churchyards have a greater value for priority habitats and species. Out of the three zones of the Green Streets BCA, Zone A, which includes the city centre and industrial areas, exhibits the highest average biodiversity scores. This is attributable to Zone A having the highest priority habitat score when compared to the other two zones, and highlights the need for actions in residential gardens, both to enhance biodiversity and better record these widespread habitats.

Table 8: Biodiversity hotspot scores for each BCA.
Higher scores indicate greater biodiversity value. This is illustrated in Map 16, albeit the scores in this table are the mean scores for each category across the whole of each BCA, as a comparison

	Mean scores across the BCA or BCA zone			
BCA or BCA zone	**Designated Site**	**Priority Habitat**	**Species-richness**	**Biodiversity hotspot score**
River Yare	0.62	0.91	0.08	1.59
Wooded Ridge	0.30	0.70	0.05	1.02
River Wensum	0.28	0.61	0.08	0.95
Heathland	0.27	0.58	0.05	0.90
Historic Habitats	0.17	0.54	0.05	0.73
Community and Active Spaces	0.08	0.46	0.02	0.56
Green Streets (zone A)	0.04	0.39	0.02	0.44
Green Streets (zone B)	0.07	0.35	0.03	0.42
Green Streets (zone C)	0.06	0.3	0.03	0.37

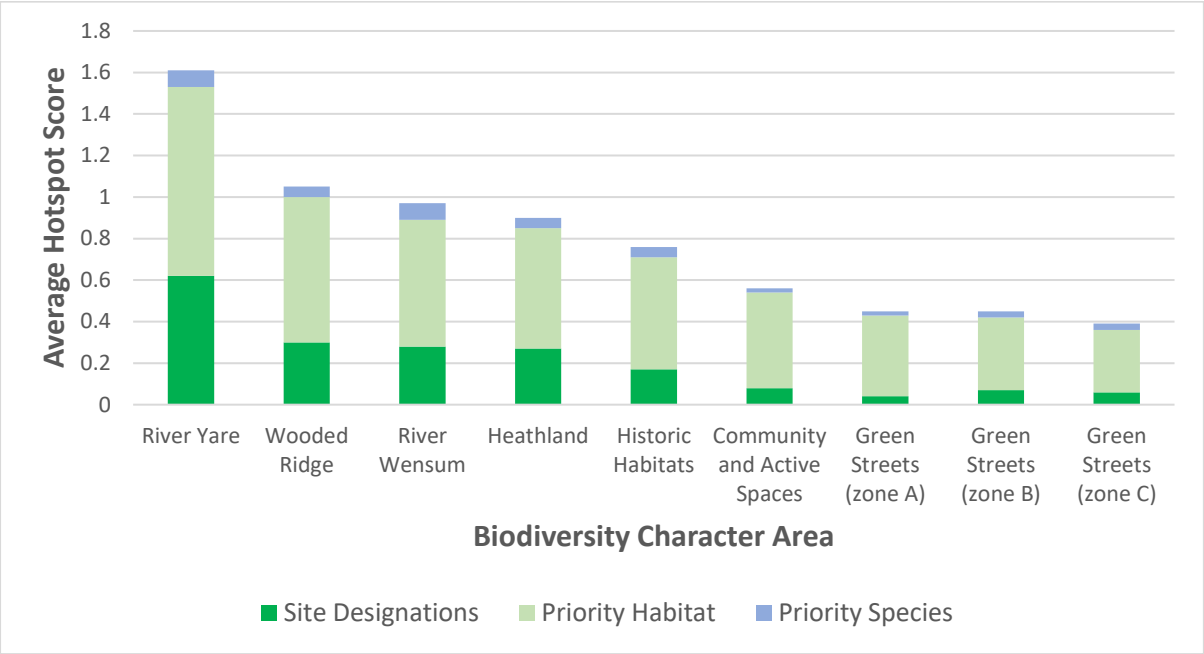
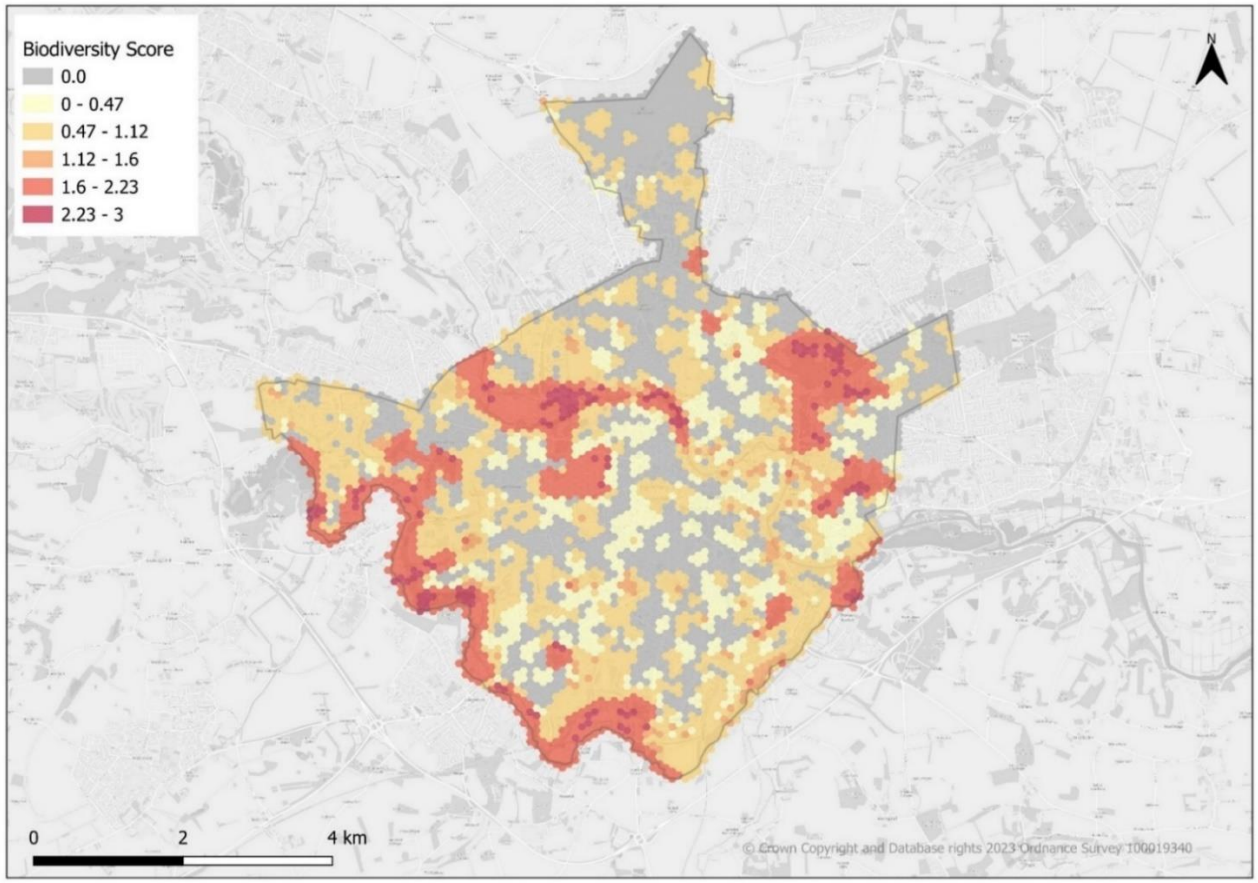


Figure 18: Biodiversity hotspot scores for each BCA.
Higher scores indicate greater biodiversity value. This is illustrated in Map 16, albeit the scores in this figure are the mean scores for each category across the whole of each BCA, as a comparison.

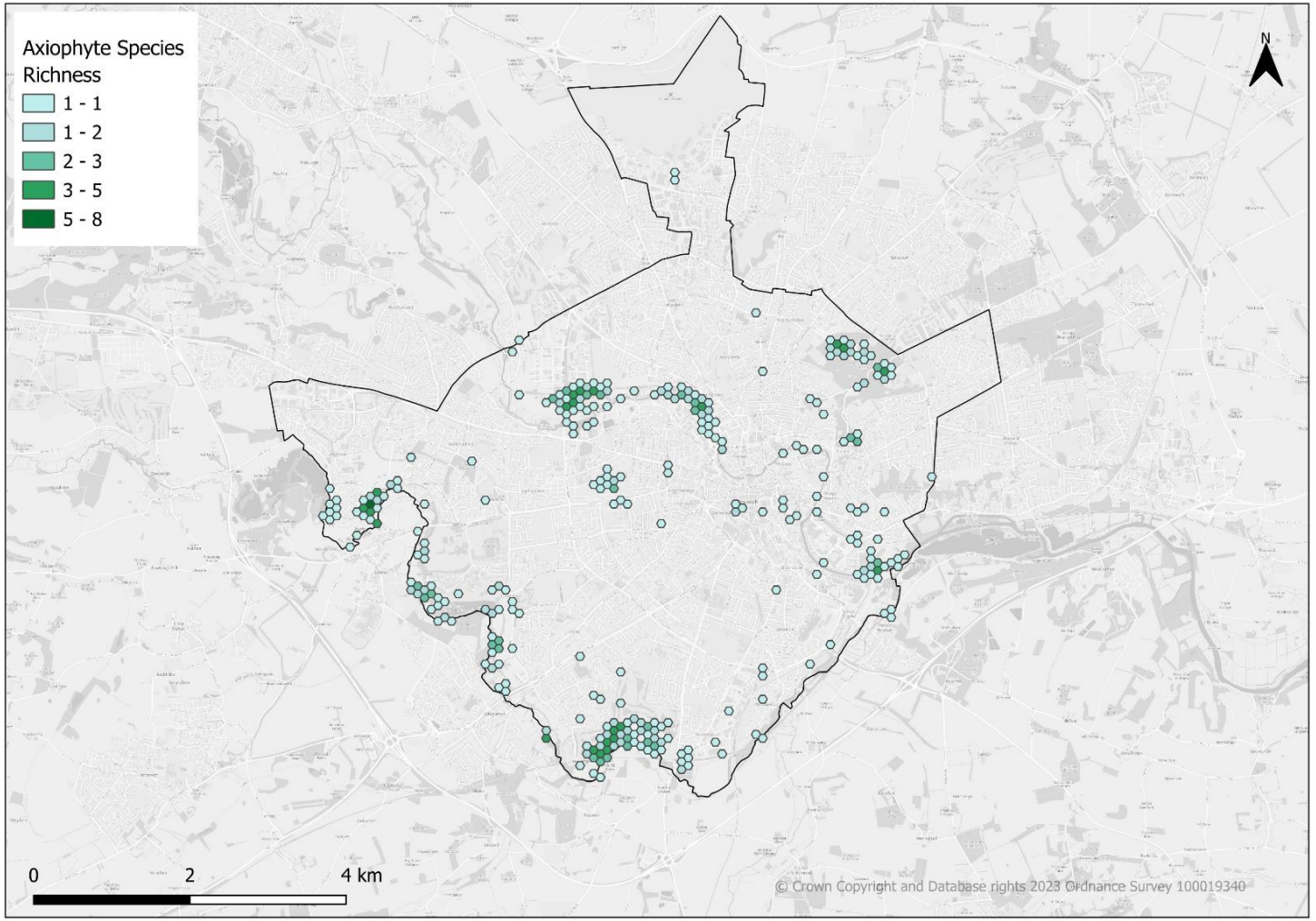


Map 16: Biodiversity Hotspot Scores within Norwich City.
The map shows a biodiversity hotspot score recorded within 100m hexagon tiles. Each tile is the cumulative score of the presence of designated sites (1), the presence of priority habitats (1) and the 'Species Richness Score' for species data in a 100m grid apportioned to the hexagon tiles. The darker red represents areas with higher scores or biodiversity hotspots[12].

[12] Species richness score is derived from Map 9 (data caveats also apply). The habitat element of the Hotspot mapping was based on the Norfolk Living Map. This map was produced from remotely sensed data and has only had limited ground truthing. Additionally, the map is more accurate for some habitat types than others, and is unable to distinguish between some habitat types, e.g., different types of grassland. As a result, areas have been included when they 'might' contain the Priority Habitat (e.g., semi-improved grassland) as well as those that definitely do.

5.3 Axiophyte Mapping

161. Other hotspot mapping can also be used to help target biodiversity conservation. For each BCA, the species richness of axiophytes, plants that indicate habitats considered significant for conservation, has also been mapped (Map 17). Sites containing many axiophytes typically hold greater biodiversity conservation importance than those with fewer, and changes in axiophyte numbers over time can be used to monitor the outcome of management practices. Key uses of axiophyte data include providing evidence to support site designation status, protecting the wider countryside, monitoring site condition and prioritising resource allocation. Map 17 demonstrates that the River Yare, western portion of the River Wensum BCA and Mousehold Heath host high axiophyte numbers. This corresponds to the high biodiversity values observed in the hotspot mapping and highlights the considerable biodiversity conservation value of these areas.



Map 17: Axiophyte species richness in Norwich City.
Darker green indicates greater axiophyte species richness[13].

[13] A proportion of the Axiophytes data held is at low resolution, although more recent, high-resolution data has been received for use within this project.

5.4 Section 5 Key Findings

162. The key findings of the biodiversity hotspot analysis are summarised as follows:

- The River Yare part of the River Corridors BCA exhibits the highest biodiversity values and highest number of axiophytes, thanks to its considerable extent of priority habitats. The River Wensum part of the River Corridors BCA in contrast has a comparatively lower biodiversity value; although it is rich in axiophyte species in the upper reaches, the urban floodplain within the city centre exhibits lower biodiversity. This highlights the importance of ecological actions in these urban sections of the corridor.
- The Wooded Ridge also has a high biodiversity value, as does the Heathland BCA, though this is primarily due to the ecological significance of Mousehold Heath, as the wider historic heathland extent has been found to score relatively lower in many areas.
- Regions with greater historical continuity (e.g., parts of the wooded ridge containing Lion Wood, historic parklands and churchyards) displayed higher biodiversity values than even some present-day designated sites, highlighting the ecological value inherent to minimally disturbed legacy ecosystems.

Section 6: Applying the BBS to Biodiversity Net Gain (BNG)

6.1 Aims

163. This section introduces statutory Biodiversity Net Gain (BNG) and the use of the associated statutory Biodiversity Metric Tool to adhere to the legislation and guidance. It summarises the elements of BNG guidance relevant to the BBS and highlights the key aspects for consideration in the Norwich CC BNG guidance note.

164. This section also describes how the identification of Biodiversity Character Areas (BCAs) developed in this study to spatially prioritise conservation action (Section 4: Biodiversity Character Areas in Norwich City) can be used to identify areas of 'Strategic Significance' for uplift to the mandatory BNG units.

165. The information contained within this section does not preclude any assessment or determination of a planning application submitted to Norwich CC.

6.2 Introduction

166. Set out below is a summary of the mandatory BNG legislation and the statutory Biodiversity Metric tool. Mandatory BNG seeks to ensure that the full environmental impact of development is accounted for, resulting in an overall increase in wildlife habitats following development. This summary is included to provide important context for understanding strategic significance and how uplift can be applied.

6.2.1 Mandatory Biodiversity Net Gain (BNG) legislation

167. From 12 February 2024, a statutory framework introduced by Schedule 7A of the Town and Country Planning Act 1990 (Environment Act 2021) will require all new planning applications for major development in England to deliver a mandatory minimum of 10% BNG, subject to exemptions (DEFRA, 2023, DEFRA, 2023g). BNG aims to ensure that sites are left in a measurably better state after development by delivering at least a 10% increase in the biodiversity value of a site compared to its pre-development value. From 2 April 2024 a mandatory minimum of 10% BNG will also apply to small sites, subject to exemptions.

168. Under the statutory framework for BNG, every planning permission is deemed to have been granted subject to a general biodiversity gain condition to secure BNG. BNG can be achieved through on-site biodiversity gains, registered off-site biodiversity gains or statutory biodiversity credits (DEFRA, 2023h; DEFRA, 2023i).

169. The general biodiversity gain condition is a pre-commencement condition to be attached to all relevant grants of planning permission. Once planning permission has been granted, a Biodiversity Gain Plan must be submitted and approved by the Local Planning Authorities (LPAs) before commencement of the development (DEFRA, 2023j). The LPA will decide

whether to approve the Biodiversity Gain Plan by considering whether the 10% BNG is achieved via the biodiversity metric tool calculation.

170. Significant on site and all off-site BNG would usually be secured via a planning obligation (S106) or conservation covenant for at least 30 years (DEFRA, 2023h; DEFRA, 2023i). A Habitat Management and Monitoring Plan (HMMP) is required to be agreed with the LPA or responsible body as part of this condition (DEFRA & Natural England, 2023).

171. Developers should follow the Biodiversity Gain Hierarchy when designing a development site, and LPAs need to ensure this has been followed when determining the Biodiversity Gain Plan. The hierarchy emphasises that on-site biodiversity gains should be considered first, followed by registered off-site biodiversity gains and – as a last resort – statutory biodiversity credits. This hierarchy is distinct from the mitigation hierarchy set out in the National Planning Policy Framework (NPPF). The biodiversity gain hierarchy means the following actions in the following order of priority:
    - Avoiding adverse effects of the development on on-site habitat.
    - So far as those adverse effects cannot be avoided, mitigating those effects.
    - So far as those adverse effects cannot be mitigated, habitat enhancement of on-site habitat.
    - So far as there cannot be that enhancement, creation of on-site habitat.
    - So far as there cannot be that creation, the availability of registered off-site biodiversity gain (The Biodiversity Gain Site Register Regulations 2024).
    - So far as that off-site habitat enhancement cannot be secured, purchasing statutory biodiversity credits.

172. The finalised BNG regulations clarify that the guidance regarding the above hierarchy applies to Priority Habitats, and any other onsite habitat adversely affected by a development. *Further guidance from Defra is due on the differences between the draft regulations and those laid in Parliament and will be referenced here when available*.

173. LPAs can set policies to support BNG. They can identify local areas suitable for habitat creation and enhancement to help landowners who want to sell off-site biodiversity units and developers who need to comply with the BNG requirements.

174. LPAs can assess the quality of the process for designing and implementing BNG by referring to best practice in the form of the British Standard 8683 by the British Standards Institution (BSI) (British Standards Institution, 2021). The standard specifies requirements for a process to design and implement BNG for development projects. It doesn't cover the actual delivery of BNG but provides a framework to demonstrate that a project has followed a process based on UK-wide good practice.

175. If tree planting is planned, consideration of the below standards may be helpful:
    - The urban tree manual published by Forest Research (Forest Research, 2023).
    - The National Model Design Code (DLUHC, 2021).

176. Further BNG guidance and secondary legislation (through Statutory Instruments to be known as BNG regulations) is published from DEFRA and can be found on GOV.UK (DEFRA, 2023)

6.2.2 The Statutory Biodiversity Metric tool

177. BNG is measured using the Statutory Biodiversity Metric tool (DEFRA, 2023l). The metric is used to calculate the pre-development and post-development biodiversity value of the development's on-site habitat, as well as the value for off-site biodiversity gains and statutory biodiversity credits. It uses habitat information to generate "biodiversity units", a proxy measure for biodiversity value. The statutory biodiversity metric data value inputs include habitat type, size, distinctiveness, condition, and its location in the local area.

178. In calculating the biodiversity units allocated to each habitat, a 'strategic significance' multiplier score is applied. If a high or medium multiplier is applied, this will increase the number of biodiversity units relevant to that habitat. If a low multiplier is applied, there will be no change to the number of units. Identifying areas of medium and high strategic significance is important as it ensures that the loss of those habitats is appropriately compensated for, but also recognises the value of any newly created strategically significant habitats.

179. The Biodiversity Metric tool also assesses three risk multipliers that the tool applies to all post-development enhancement and creation interventions. These are:
    - Difficulty of creation or enhancement.
    - Temporal risk - time to reach target condition.
    - Spatial risk - reflects the distance between the location of on-site biodiversity loss and the location of off-site habitat compensation. It affects the number of biodiversity units provided to a project by penalising proposals where off-site habitat is located at distance from the impact site.

180. Table 8 (Spatial risk scores and descriptions) in the draft user guide (DEFRA, 2023m) details how the spatial risk multiplier may increase the number of units required, if the compensation is outside of the LPA or National Character Area (NCA).

181. LPAs should also be aware of the other relevant multiplier: the watercourse encroachment multiplier. This accounts for development within a riverbank or channel that impacts the function of the river corridor. Table 12 of the draft user guide (DEFRA, 2023m) should be used to assign a watercourse encroachment band for each watercourse section entered into the biodiversity metric tool.

6.3 Applying Biodiversity Net Gain in Norwich City

182. The information summarised in Section 6.2 Introduction was used as guidance, alongside data analysis and expert engagement, for the development of an approach to applying the strategic significance uplift in Norwich. Three resources are included as guidance for how to score BNG units for Strategic Significance uplift in Norwich.

6.3.1 Guidance for how to score BNG units for potential Strategic Significance uplift in Norwich

183. Strategic significance for on and off-site habitats, for both pre and post development assessment should be assigned based on whether sites are formally identified as being ecologically important within a local strategy, or where sites are ecologically desirable but not identified within a local strategy (Resource 1: Decision Tree).

184. For the purposes of assigning strategic significance in Norwich**, the County Biodiversity BCAs in this BBS** should be considered the local strategy unless this is superseded by more up to date evidence.

6.3.2 Strategic Significance decision making guidance and resources

185. To assist with assigning strategic significance uplift for BNG in Norwich, the following resources are provided:

Resource 1: Decision Tree - a decision tree to help determine whether units are given high, medium or low strategic significance uplift. This resource includes four worked scenarios.

Resource 2: Sign posting to County BCA Boundary Maps - provides signposting to each County BCA boundary map within Norwich. This is available in PDF format (Norwich BBS Appendix BBS6 – Layered PDFs).

Resource 3: Table of habitats and habitat features eligible for uplift -provides a list of habitats that are eligible for uplift.

These resources are designed to be used in conjunction with each other, to collectively provide the information needed for decision making.

Resource 1: Decision Tree

The three possible levels of strategic significance uplift that can be applied to pre and post development assessment of biodiversity units can be summarised as follows:

High Strategic Significance: Sites within locations formally identified in local strategy (County BCAs in BBS) as being ecologically important for the specific habitat type. In this report, any habitat, with a 'Priority Habitat' category or equivalent (or the 'Biodiversity Metric Habitat Name' (based on UKHabs)), identified in the Habitats Table (Table 9, Resource 3), taking into account their required and preferred attributes, within the relevant County BCA is to be given High Strategic Significance uplift in the Biodiversity Metric. Based on expert ecological opinion Local BCAs are not considered applicable for uplift due to their wide geographic coverage and numerous, isolated sites.

The Norwich Biodiversity Baseline Study (BBS) formally identifies County Biodiversity Character Areas (BCAs) within Norwich as the locations where High Strategic Significance can be used to provide uplift when calculating biodiversity units.

Medium Strategic Significance: Sites within an ecologically desirable habitat but at a location not identified in a local strategy (County BCAs in BBS). Medium Strategic Significance can be used as a lower level of uplift when calculating biodiversity units, where professional judgement is applied, and the location is deemed ecologically desirable for a particular habitat type. Where professional judgement is applied in this way, the decision should be justified, and evidence provided, either in the form of an appropriate ecological report or by referring to relevant maps, data or recommendations in relevant and evidenced reports, particularly the BBS or future iterations or updates of - the biodiversity hotspots map (Section 5 – Biodiversity Hotspots, Map 16) would be an example.

Low Strategic Significance: Sites within a habitat type and/or location not identified in local strategy (County BCAs in BBS) and no ecologically desirable habitats/location for proposed biodiversity units. Low Strategic Significance covers all other scenarios when calculating biodiversity units, where no uplift is applied.

Figure 19 demonstrates how to determine the correct strategic significance score. This Resource applies to pre- and post-development assessments. Irreplaceable Habitats are exempted from BNG, so Resource 1 does not apply. Below the decision tree, four worked scenarios are provided to show how the decision tree should be used and how it works in conjunction with the habitats table and linked County BCA maps in Resource 2: Sign posting to County BCA Boundary Maps.

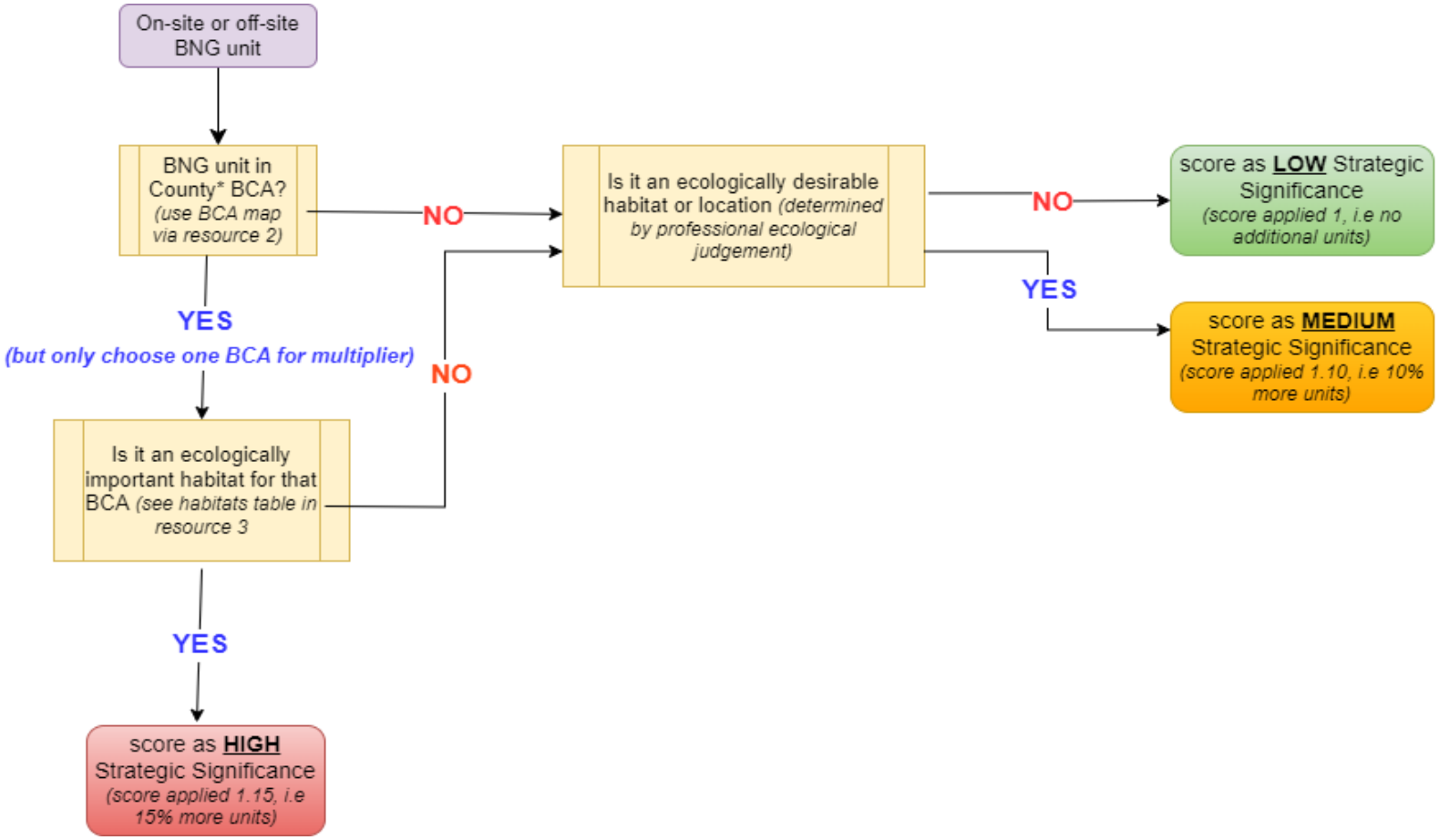


Figure 19: Decision tree for deciding how to assess units for potential Strategic Significance uplift.
BNG units refer to biodiversity units that are on-site or off-site and pre and post development. Note: uplifts are applied automatically in the metric once strategic significance has been entered.
** Based on expert ecological opinion Local BCAs are not considered applicable for uplift due to their wide geographic coverage and numerous, isolated sites*.

Example scenarios:

Using the above decision tree (Resource 1: Decision Tree) and the County BCA Map (Resource 2: Sign posting to County BCA Boundary Maps) and Habitats table (Resource 3: Table of habitats and habitat features eligible for uplift), four scenarios are worked through below, to show how the resources should be used together and how the decision tree can be used to decide on uplift scoring. The example scenarios are intended to be illustrative rather than comprehensive or site specific.

Scenario 1: Planting of what will become Lowland Mixed Deciduous Woodland within the Wooded Ridge County BCA.

Decision tree: Is the habitat in a County BCA? *Yes*. Is the habitat ecologically important and identified for the BCA in Table 9? *Yes*.

Result: Assign **high** strategic significance score.

Scenario 2: Planting of what will become Lowland Mixed Deciduous Woodland within the Green Streets Local BCA. The woodland will fill in a gap as part of a woodland stepping-stone corridor.

Decision tree: Is the habitat in a County BCA? *No*. Is it an ecologically desirable habitat or location (determined by professional ecological judgement)? *Yes**

Result: Assign **medium** strategic significance score.

Scenario 3: Creation of what will become Lowland Meadow grassland within the Heathland County BCA. The meadow will connect up with other meadows sites in proximity.

Decision tree: Is the habitat in a County BCA? *Yes*. Is the habitat ecologically important and identified for the BCA in Table 9? *No*. Is it an ecologically desirable habitat or location (determined by professional ecological judgement)? *Yes***

Result: Assign **medium** strategic significance score.

Scenario 4: Planting of what will become Lowland Mixed Deciduous Woodland within the Green Streets Local BCA. The woodland will be isolated from other woodland habitat.

Decision tree: Is the habitat in a County BCA? *No*. Is it an ecologically desirable habitat or location (determined by professional ecological judgement)? *No****

Result: Assign **low** strategic significance score.

Scenario 5: Restoration of underground bat hibernation habitat with trees planted or woodland management restored as buffer habitat, within the River Corridor County BCA. The hibernation habitat supports rare/protected bat species. The underground and woodland habitats will continue to be isolated from other similar habitats.

Decision tree: Is the habitat in a County BCA? *Yes*. Is the habitat ecologically important and identified for the BCA in Table 9? *No*. Is it an ecologically desirable habitat or location (determined by professional ecological judgement)? *Yes*****

Result: Assign **medium** strategic significance score.

Clarification notes:

*Ecological judgment is required for both the identification of ecologically desirable habitat and the importance of the location. In this example, Lowland Mixed Deciduous Woodland is an ecologically desirable habitat with the Green Streets Local BCA, due to the importance of woodland/trees. Consideration of location is appropriate to ensure connectivity is improved, by creating woodland patches in a clear corridor within the BCA.

**The habitat chosen in this scenario is not listed within Resource 3 (Table 9) as ecologically important for this BCA. It would therefore not qualify for high strategic significance uplift. However, qualification for medium strategic significance uplift could be acceptable through professional judgment, due to the location being ecologically desirable - as it increases the connectivity of meadow sites.

***Lowland Mixed Deciduous Woodland is an ecologically desirable habitat within the Green Streets Local BCA, due to the importance of woodland/trees. This habitat creation may qualify for BNG unit scoring, but the chosen location does not impact positively on connectivity of woodland within the city, therefore no additional scoring through strategic significance uplift. Professional judgement should be sought here, as the ecological benefits of increasing connectivity would be significantly greater than those achieved through creating a new isolated woodland.

****Where the habitat being created or restored is very rare or unique, lack of spatial connectivity is overridden by the habitat's strategic value. This could be due to its rarity in Norwich or its importance to key/protected species, especially where the habitat creation improves species success and ecological resilience.

Resource 2: Sign posting to County BCA Boundary Maps

186. To identify the boundaries of each of the four County BCAs (River Corridors BCA, Wooded Ridge BCA, Heathland BCA and Historic Habitats BCA) where sites are eligible for uplift, boundary maps showing the spatial extent of each area are provided as Layered PDFs in Norwich BBS Appendix BBS6 – Layered PDFs.

187. These have been produced as part of the work undertaken in this BBS study to define BCAs in Norwich. Further details on BCAs can be found in Section 4: Biodiversity Character Areas in Norwich City. The methodology used is detailed in Norwich BBS Appendix BBS1 – Study Approach and Methodology.

Resource 3: Table of habitats and habitat features eligible for uplift

188. Resource 3 is a table of habitats and habitat features eligible for uplift (Table 9), to be used in conjunction with both the decision tree (Resource 1: Decision Tree) and County BCA boundary maps (Resource 2: Sign posting to County BCA Boundary Maps) above. This table provides a list of habitats and habitat features that are ecologically important in each BCA and informs whether a strategic significance uplift can be applied. If sufficient ecological evidence is provided, other habitats or habitat feature not listed in the table may be eligible in the relevant BCA and therefore could also be eligible for uplift. Table 9 can also be used for the identification of Medium Strategic Significance uplift, as can the Biodiversity Hotspots Map in Section 5 – Biodiversity Hotspots, (Map 16), but professional ecological judgement is needed to apply these as sources of evidence. All habitats and habitat features listed are appropriate for creation or restoration to implement net gain actions, unless specifically stated.

Table 9: Habitats and habitat features eligible for uplift.
Eligible habitats and habitat features for High Strategic Significance BNG uplift or potentially to be used for Medium Strategic Significance BNG uplift, where professional judgement applied.

BCA	Habitats and habitat features eligible for uplift		Required attributes[1]	Preferable attributes[2]
	Priority Habitat category or equivalent	**Biodiversity Metric Habitat Name (based on UKHab)**		
River Corridors	Priority Habitat standing water or ponds	'Lakes - Ponds (priority habitat)'		Ghost ponds, i.e., restoration of ponds which contain an old seed bank, and are shown on historic OS mapping, such as 1st editions.
	Native hedgerows	All 'Native Hedgerow' and 'Ecologically valuable line of trees' categories, plus 'Line of trees - associated with bank or ditch' if ecologically appropriate	Only if ecologically appropriate location	Tussocky grass or scrub border (as linear features for birds e.g., barn owl/bats etc)
	Wet Woodland	'Woodland and forest - Wet woodland'		
	Dense scrub	'Heathland and shrub - Blackthorn scrub', or 'Heathland and shrub - Bramble scrub', or 'Heathland and shrub - Gorse scrub', or 'Heathland and shrub - Hawthorn scrub', or 'Heathland and shrub - Hazel scrub', or 'Heathland and shrub - Mixed scrub', or 'Heathland and shrub - Willow scrub'	Species-rich/ecologically valuable. Acceptable only in marginal stands or island refuges.	
	Lowland Calcareous Grassland	'Grassland - Lowland calcareous grassland'	Wet or seasonally wet	
	Purple Moor-grass and Rush Pastures within marshes~	'Wetland - Purple moor grass and rush pastures'~		
	Lowland Fens^	'Wetland - Fens (upland and lowland)'^		
	Reedbeds	'Wetland - Reedbeds'		
	Coastal and Floodplain Grazing Marsh	'Grassland - Floodplain wetland mosaic and CFGM'	Appropriate water levels	

BCA	Habitats and habitat features eligible for uplift		Required attributes[1]	Preferable attributes[2]
	Priority Habitat category or equivalent	**Biodiversity Metric Habitat Name (based on UKHab)**		
	Lowland dry Acid Grassland (including if seasonally wet)	'Grassland - Lowland dry acid grassland' OR 'Grassland - Other lowland acid grassland' - including if seasonally wet	On edges of wetland habitats as part of an ecotone from neutral to acid	
	Lowland Meadows	'Grassland - Lowland meadows' OR 'Grassland - Other neutral grassland'	Wet or seasonally wet	
	Rivers~	Watercourse categories: 'Priority habitat'~, 'Other rivers and streams'~, and 'Ditches' if ecologically appropriate		
Heathland	Priority Habitat standing water or ponds	'Lakes - Ponds (priority habitat)'		Ghost ponds, i.e., restoration of ponds which contain an old seed bank, and are shown on historic OS mapping, such as 1st editions.
	Lowland dry Acid Grassland	'Grassland - Lowland dry acid grassland' OR 'Grassland - Other lowland acid grassland'		
	Lowland Mixed Deciduous Woodland	'Woodland and forest - Lowland mixed deciduous woodland'; OR 'Woodland and forest - Other woodland; broadleaved' or 'Woodland and forest - Other woodland; mixed' if ecologically appropriate	Only if extending woodland at Mousehold Heath, without reducing area of heathland/acid grassland. No other locations applicable.	
	Lowland Heathland	'Heathland and shrub - Lowland heathland'		
Wooded Ridge	Priority Habitat standing water or ponds	'Lakes - Ponds (priority habitat)'		Ghost ponds, i.e., restoration of ponds which contain an old seed bank, and are shown on historic OS mapping, such as 1st editions.
	Native hedgerows	All 'Native Hedgerow' and 'Ecologically valuable line of trees' categories, plus 'Line of trees - associated with bank or ditch' if ecologically appropriate		

BCA	Habitats and habitat features eligible for uplift		Required attributes[1]	Preferable attributes[2]
	Priority Habitat category or equivalent	**Biodiversity Metric Habitat Name (based on UKHab)**		
	Lowland Mixed Deciduous Woodland	Woodland and forest - Lowland mixed deciduous woodland'; OR 'Woodland and forest - Other woodland; broadleaved' or 'Woodland and forest - Other woodland; mixed' if ecologically appropriate.		
	Ancient Woodland^	Ancient Woodland^	Restoration and enhancement only	
	Wet Woodland	'Woodland and forest - Wet woodland'		
	Dense scrub	'Heathland and shrub - Blackthorn scrub', or 'Heathland and shrub - Bramble scrub', or 'Heathland and shrub - Gorse scrub', or 'Heathland and shrub - Hawthorn scrub', or 'Heathland and shrub - Hazel scrub', or 'Heathland and shrub - Mixed scrub', or 'Heathland and shrub - Willow scrub'	Species-rich/ecologically valuable. Only if ecologically appropriately located	
	Traditional Orchards	'Grassland - Traditional orchards'		
	Lowland Calcareous Grassland	'Grassland - Lowland calcareous grassland'	As glade meadows only	
	Lowland Meadows	'Grassland - Lowland meadows' OR 'Grassland - Other neutral grassland'	As glade meadows only	
	Lowland dry Acid Grassland	'Grassland - Lowland dry acid grassland' OR 'Grassland - Other lowland acid grassland'	As glade meadows only	
Historic Habitats	Priority Habitat standing water or ponds	'Lakes - Ponds (priority habitat)'		Ghost ponds, i.e., restoration of ponds which contain an old seed bank, and are shown on historic OS mapping, such as 1st editions.
	Native hedgerows	All 'Native Hedgerow' and 'Ecologically valuable line of trees' categories, plus 'Line of trees - associated with bank or ditch' if ecologically appropriate		Tussocky grass or scrub border (as linear features for birds e.g., barn owl/bats etc)

BCA	Habitats and habitat features eligible for uplift		Required attributes[1]	Preferable attributes[2]
	Priority Habitat category or equivalent	**Biodiversity Metric Habitat Name (based on UKHab)**		
	Lowland dry Acid Grassland$	'Grassland - Lowland dry acid grassland'$ OR 'Grassland - Other lowland acid grassland'$		
	Wood-pasture and Parkland	'Woodland and forest - Wood-pasture and parkland'	Restoration and enhancement only	Extensive restoration of open grown trees - managed by pollarding and/or significant amounts of dead and decaying timber may be acceptable in combination with other features such as veteran trees
	Ancient and Veteran Trees^	'Individual trees - Urban tree' or 'Individual trees - Rural tree' ONLY if Ancient or Veteran^	Maintenance of good condition through appropriate tree management	
	Dense scrub	'Heathland and shrub - Blackthorn scrub', or 'Heathland and shrub - Bramble scrub', or 'Heathland and shrub - Gorse scrub', or 'Heathland and shrub - Hawthorn scrub', or 'Heathland and shrub - Hazel scrub', or 'Heathland and shrub - Mixed scrub', or 'Heathland and shrub - Willow scrub'	Species-rich/ecologically valuable. Rarely acceptable in this BCA unless in small managed patches connecting woodland or on boundary of the site.	
	Lowland Calcareous Grassland$	'Grassland - Lowland calcareous grassland'$		
	Lowland Heathland$	'Heathland and shrub - Lowland heathland'$		
	Open Mosaic Habitats on Previously Developed Land*	'Urban - Open mosaic habitats on previously developed land'*		
	Lowland Meadows$	'Grassland - Lowland meadows' OR 'Grassland - Other neutral grassland'$		
	Traditional Orchards	'Grassland - Traditional orchards'	Restoration and enhancement only	

All habitats/habitat features listed are appropriate for creation or restoration to implement net gain actions, unless specifically stated.
[1] = Required attributes = Listed habitats or habitat features are not acceptable for uplift unless adhering to or containing these required attributes.
[2] = Preferable attributes = Listed habitats or habitat features are more likely to be acceptable as uplift with these attributes, but they are not required.
~ = Unlikely to be deliverable/feasible in BCA, but acceptable.
* = Only acceptable if other features present, such as veteran trees.
$ = Grazed if in parkland or grazed/other appropriate management such as hay cut in other historic settings such as churchyards.
^ = Irreplaceable Habitat as defined in BNG regulations and NPPF.
All habitats listed under **Historic Habitats BCA** must be within a historic setting and this may include the restoration of remnant wood-pasture or parkland in designed landscapes/ medieval parks - especially where veteran trees survive.
If a site where BNG units are being assessed is within more than one BCA, as long as the proposed habitats are important to that BCA, as detailed in this table, any BCA can be used for uplift. Preference should be given to the option that provides the most locally appropriate and beneficial impact for nature recovery. Sites within multiple BCAs will only count once for uplift – no double counting of the multiplier is allowed.

6.3.2 Irreplaceable Habitats

189. Irreplaceable habitats are detailed in 3.4.4 Irreplaceable Habitats in Norwich City and shown spatially as Map 8. The BBS emphasises the need to support protection or improved resilience of Irreplaceable Habitats and this is detailed in the guidance in Resource 3, Table 9.

190. For the purposes of Norwich City planning, there are only three habitats present that are currently listed by the BNG/NPPF guidance as being Irreplaceable and these are listed in Table 9 and for clarity below:
    - Ancient woodland
    - Ancient and veteran trees
    - Lowland fens

191. Irreplaceable Habitats, already have significant protection in the National Planning Policy Framework (NPPF). The NPPF Para 186c states that "planning applications affecting these habitats should be refused, unless there are wholly exceptional reasons, and a suitable compensation strategy exists". BNG guidance strengthens these NPPF protections further, stating that "It is important that Irreplaceable Habitats are exempted from BNG" (DEFRA, 2023a). Hence, when added to the metric tool Irreplaceable Habitats are not scored. In the unlikely event of impacts on Irreplaceable Habitats, these must have bespoke mitigation agreed outside of BNG.

192. Action to create conditions allowing Irreplaceable Habitats to establish over time is also important for nature recovery and is encouraged here. This will also be encouraged through the emerging LNRS's role in guiding the delivery of nature funding.

6.3.3 Applying Local Nature Recovery Strategy (LNRS)to significance assessment

193. As stated in the DEFRA guidance (DEFRA, 2023k) on 'incorporating Local Nature Recovery Strategies when planning for Biodiversity Net Gain', recent amendments to the Levelling Up and Regeneration Act mean that all Local Planning Authorities will have a duty to take account of their relevant LNRS. This duty applies generally, and to specific elements of the LNRS, including the mapped proposals.

194. LNRS can support a strategic approach to off-site BNG delivery, agreeing evidence-based locations to expand and connect existing habitat and providing wider environmental benefits. This will support BNG in creating locally driven, joined-up outcomes for nature.

195. LNRS will, once developed, play a role in BNG by determining the 'strategic significance' multiplier within the biodiversity metric. In the meantime, strategic significance should be determined using other plans and policies, as already detailed in section 6.3.1 Guidance for how to score BNG units for potential Strategic Significance uplift in Norwich paragraph 183-4.

196. At the point at which the LNRS is signed off and able to provide the mapping and definitions for what 'strategic significance' could mean for Norfolk, there will likely be various possible approaches on how that is translated into the Norwich BNG planning guidance, and other policies. Engagement with the LNRS process will be key to ensure the locally significant information within the BBS is taken account of.

197. Further information on LNRS and BNG can be found on GOV.UK (DEFRA, 2023n).

6.4 Section Summary

198. This section outlines the application of the BCAs devised in the BBS, to identify areas of Strategic Significance for uplift under mandatory Biodiversity Net Gain (BNG). A literature review of BNG guidance and the development of three key resources provides a local strategy for implementing the Strategic Significance uplift and other related BNG unit scoring multipliers. These resources comprise a decision tree for deciding how to assess units for potential Strategic Significance uplift (Resource 1: Decision Tree), Sign-posting to County BCA Boundary Maps (Resource 2: Sign posting to County BCA Boundary Maps) and a table of habitat and habitat features eligible for uplift (Resource 3: Table of habitats and habitat features eligible for uplift)

199. The information contained within this section does not preclude any assessment or determination of a planning application submitted to Norwich City Council.

Section 7: Potential Threats to Biodiversity in Norwich City

7.1 Aims

200. This section presents potential threats to biodiversity within each BCA, from any source, categorising these threats under 10 themes: climate; data gaps; engagement; funding; management; impacts of non-native species; people-related; planning and development; strategy and water. All references to threats in this report should be assumed to be potential threats unless otherwise specified. Please note that although being presented as potential threats in this report, a number of these will have been or are currently actual threats. Presenting threats at the BCA level allows better allocation of resources to address them, and better potential for coordination of management activities between organisations. The text is supported by a summary table and a spreadsheet Norwich BBS Appendix BBS7 – Threats and Opportunities Table which enables the data to be filtered and sorted to aid use.

7.2 Introduction

201. There are a number of widely accepted threats to biodiversity, including but not limited to, climate change, land use change/development, non-native invasive species and pollution. Threats to biodiversity can arise from competition with other priorities, such as the need to improve recreational access to greenspaces. If these threats remain unaddressed, they will negatively impact species, habitats and sites, affecting their quality, extent, condition and resultant ecosystem service benefits. Addressing these threats not only reduces their negative impact but can also be reframed as opportunities to maximise biodiversity.

202. This section provides an overview of the key threats to biodiversity identified through analysing the data collated in task one. Each identified threat is assigned a unique code for easy cross-referencing throughout the report. Threats are presented in this report as a threat summary table (Table 10), highlighting the BCA in which the threat occurs. This table is supported by more detailed explanations in Norwich BBS Appendix BBS7 – Threats and Opportunities Table, a resource toolkit which allows threats to be sorted by BCA and theme. The relative importance of each of these threats varies between BCAs and summaries of the key threats within each are provided below to illustrate this. While many threats require immediate action, the benefits of these actions will, in many cases, only be realised in the medium to longer term. Further work to prioritise actions to address threats is presented in However, there is a strong relationship between threats and how they can be re-framed to provide opportunities for biodiversity enhancement.

203. As part of this project, most threats have not been mapped spatially due to their lack of clearly definable boundaries and/or their extension across the whole study area. It is also important to note that some threats originate outside of the study area, but their impacts threaten biodiversity within it. Where it has been possible to map threats spatially, they are included as layered PDFs in Norwich BBS Appendix BBS6 – Layered PDFs. As it is not feasible

to represent all threats and their relevant locations on one map, instead a tabular approach was used to analyse all threats using BCA and theme, the results of which are presented in Table 10 and Norwich BBS Appendix BBS7 – Threats and Opportunities Table.

204. Section 8: Opportunities for Biodiversity Enhancement in Norwich City demonstrates how each of these threats can be re-framed as opportunities for conservation action by matching the unique codes given to each threat and opportunity within the project. These connections are detailed in Norwich BBS Appendix BBS7 – Threats and Opportunities Table and in narrative text within Section 8: Opportunities for Biodiversity Enhancement in Norwich City.

7.3 Threat summary table

205. A summary of each threat is presented in Table 10. The table identifies both the threat theme, potential threat description and the BCA(s) to which it applies. This table can be used to provide a strategic overview of threats within each BCA. It is important this is used in conjunction with Norwich BBS Appendix BBS7 – Threats and Opportunities Table, which provides the full details of each potential threat. The potential threats compiled cover a wide range of factors and include elements owned and managed by a wide range of stakeholders.

Table 9: Potential Threat summary table.

Threat code	Theme	Potential Threat	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets
TH1.1	Climate	Air pollution reducing species diversity		●	●	●	●	●
TH1.2	Climate	Wildfires damaging habitats		●			●	
TH1.3	Climate	Damage to wetland habitats	●					●
TH1.4	Climate	Salinisation reducing species diversity	●					
TH1.5	Climate	Tidal surges and flooding from tidal and surface water	●					●
TH2.1	Data gaps	Data gaps resulting in incomplete understanding	●	●	●	●	●	●
TH2.2	Data gaps	No key species indicator lists for assessment	●	●	●	●	●	●
TH3.1	Strategy	Multiple stakeholders and strategies dealing with conservation management reduces effectiveness	●	●	●	●	●	●
TH3.2	Strategy	Multiple strategies dealing with conservation priorities at different scales	●	●		●	●	●

Threat code	Theme	Potential Threat	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets
		from local to landscape reduces effectiveness.						
TH4.1	Engagement	Challenges communicating biodiversity issues	●		●	●	●	●
TH5.1	Funding	Cost of undertaking changes in land management	●	●				
TH5.2	Funding	Resource constraints for ecologically sensitive management	●	●	●	●	●	●
TH6.1	Management	Loss of traditional grazing reducing species and habitat diversity	●	●		●		
TH6.2	Management	Tree management and diseases	●	●	●	●	●	●
TH6.3	Management	Loss of bare ground reducing species diversity and reducing connectivity		●				●
TH6.4	Management	Management activities not carried out at sensitive times for biodiversity		●	●	●	●	●
TH6.5	Management	Tree planting in locations that result in the loss of other habitats important for biodiversity			●	●	●	●
TH6.6	Management	Farming practices which are not environmentally sensitive have a wide range of impacts	●			●		
TH6.7	Management	Water Management activities not sensitive to biodiversity needs	●		●	●	●	●
TH6.8	Management	Nutrient loading on land favouring ruderal species	●			●	●	●
TH6.9	Management	Herbicide and insecticide use impacting on species diversity especially pollinators	●	●		●	●	●

Threat code	Theme	Potential Threat	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets
TH6.10	Management	Lack of habitat management to prevent succession resulting in loss of early successional habitats	●	●	●	●	●	●
TH6.11	Management	Lack of habitat management for structural diversity decreasing species diversity and reducing the long-term viability of the woodland	●	●	●	●		
TH6.12	Management	Loss of habitat features reducing habitat diversity			●	●	●	
TH6.13	Management	Ponds and ditches becoming silted up and overgrown and impacting species diversity.	●	●	●	●	●	●
TH7.1	Non-natives	Non-native Invasive plant species outcompeting native species	●	●	●	●	●	●
TH7.2	Non-natives	Non-native Invasive Garden plant species outcompeting native species	●	●	●	●	●	●
TH7.3	Non-natives	Non-native Invasive animal species outcompeting native species and spreading disease	●	●	●	●	●	●
TH7.4	Non-natives	Tree pests and diseases causing loss of tree diversity and loss of structural benefits within the wider landscape		●	●	●	●	●
TH8.1	People	Anti-social behaviour reducing natural resilience and age structure of habitats	●	●	●	●	●	●
TH8.2	People	Increased use of sites increases wildlife disturbance and potential spread of invasive species	●	●	●	●	●	
TH8.3	People	Loss of old building, park and garden structures reducing habitat diversity			●	●		●

Threat code	Theme	Potential Threat	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets
TH9.1	Planning and development	Increases in the amount of hard and impermeable surfaces changing water flow	●		●	●	●	●
TH9.2	Planning and development	Insufficient clear and enforceable national regulations/policies/guidance on appropriate biodiversity planning conditions	●	●	●	●	●	●
TH9.3	Planning and development	Development disrupting Great Crested Newt metapopulations reducing population viability	●	●	●	●	●	●
TH9.4	Planning and development	Ecologically isolated habitats which are not connected for wildlife	●	●	●	●	●	●
TH9.5	Planning and development	Biodiversity outcomes are not as effectively coordinated between Local Plans, Neighbourhood Plans and planning obligations	●	●	●	●	●	●
TH9.6	Planning and development	Increasing light pollution impacting natural behaviours of nocturnal species	●	●	●	●	●	●
TH10.1	Water	Moderate ecological status for the River Wensum suggesting loss of ecological function	●					
TH10.2	Water	Water pollution and nutrient loading causing loss of aquatic biodiversity and ecosystem function	●			●	●	●
TH10.3	Water	Artificial changes to the river channel causing changes to water flow	●					
TH10.4	Water	Over abstraction of water for human uses reducing water available for wildlife and ecosystem functions	●	●				●

7.4 Key threats identified by Biodiversity Character Area (BCA)

206. BCAs, (Section 4: Biodiversity Character Areas in Norwich City), allow for a more strategic approach by grouping similar natural assets together. The benefits of this approach are that it enables:
    - Identification of threat priorities at both local and landscape scales, ensuring all opportunities are being fairly addressed.
    - Better resource planning.
    - Coordination of management activities between organisations.
    - Maximisation of wider-scale benefits, for example, at a floodplain scale.

    This section presents the key threats to biodiversity for each BCA, to inform decision making.

7.4.1 River Corridors

207. Threats to biodiversity within the River Corridors BCA come from upstream of the study area as well as within it. Major upstream threats include intensification of land management causing loss of habitats (**TH6.6**), water pollution (including discharge) (**TH10.2**), invasive plant and animal species (**TH7.1-TH7.3**)**,** water abstraction (**TH10.4**) and agricultural run-off (**TH6.8**). The impacts of all these factors will be exacerbated by climate change (**TH1.3-TH1.5**).

208. The River Wensum SSSI/SAC enters the Norwich City administrative boundary, and the floodplains of both the Wensum and Yare rivers are within the city. Here, silting and channelisation (**TH43**) join the upstream threats. However, habitat loss and fragmentation (**TH9.4**) pose the most significant threat in the lower reaches. The Yare floodplain has mostly avoided development, but some development along the Yare corridor, and arable land management in the Harford area, are potentially impacting the functional wetland habitat corridor of the river valley. The Wensum has already lost its functional wetland habitats through the city centre and Riverside due to many centuries of development but does have functional wetlands entering the city from Hellesdon. Development impacts continue to threaten these, and changes in land use over time have reduced wetland habitat area, with only a small extent remaining.

209. Threatened species of particular note in both river catchments include White-clawed Crayfish (*Austropotamobius pallipes*) which have become locally extinct in the study area due to invasive crayfish species spreading crayfish plague (**TH7.3**). Also threatened is Desmoulin's Whorl Snail (*Vertigo moulinsiana*) which is found in only a small number of sites in Britain. It is dependent on high water levels, and therefore vulnerable to abstraction (Killeen IJ ,2003) (**TH10.4**). It is also vulnerable to changes in bankside vegetation due to invasive species or channelisation (**TH7.3; TH43**).

210. The presence of threats impact ecological status assessments. Within the River Corridors BCA the following impacts have been identified:
    - Water Framework Directive Ecological Status: Both rivers' surface water has been classed as moderate, meaning ecological shortcomings are leading to a moderate deviation from good status. This is a result of pollution (**TH10.2**), discharge (**TH10.2**) and abstraction (**TH10.4**).
    - Designated Site Condition Monitoring of SSSIs: The River Wensum SSSI has been classified as being in "unfavourable no change" condition due to inappropriate water levels (**TH10.4**), water pollution (**TH10.2**) and discharge (**TH6.8**) (Natural England, 2023b).
    - Designated Site Condition Monitoring of CWS: Only 50% and 44% of County Wildlife Sites within the Wensum and Yare sections of this BCA, respectively, are categorised as being in favourable or recovering condition. This implies that the majority of habitat features for which the river corridor sites were designated are currently in an unfavourable condition. The principal drivers of this are the impacts of invasive species (bank erosion, oxygen reduction, choking the channel with weed biomass) (**TH7.1**), low water levels (**TH10.4**), ditch/dyke/pond becoming overgrown and silting up (**TH6.13**), scrub encroachment and under grazing (**TH10.4**).

7.4.2 Heathland

211. Heathland and acid grassland are rare within the city because of historic losses to this once extensive habitat type. This has resulted in remnant heathland existing in ecologically isolated habitat patches, the most significant being Mousehold Heath. The lack of connectivity between heathland and acid grassland patches impacts on species diversity and the gene pool of key species such as heathland pollinators (**TH9.4**). Light pollution (**TH9.6**) presents a significant threat to bats which are a key protected species that rely on heathland habitats such as Mousehold Heath. The light pollution negatively affects their foraging activities by reducing time spent foraging, changing the timings of foraging activity (missing peak insect abundance just after dusk) and disrupting foraging routes. These disturbances not only expose them to increased threats from predators but may also potentially delay or prevent their emergence from roosts (Bat Conservation Trust, 2023a and 2023b). Air pollution (**TH1.1**) is also an important threat to the sensitive lichen and bryophyte communities found on heathlands, and increased nitrogen deposition from pollution raises nutrient levels, which can result in heathland plant species being outcompeted. Heathland and acid grassland require ongoing habitat management, to prevent succession to woodland (**TH6.10**).
212. In terms of management options, there is a need to balance multiple land uses as well as managing expectations. Heathland areas in Norwich outside of Mousehold Heath are threatened by the conflicting uses and management needs for these sites (part of a wetland matrix and Golf Course respectively) (**TH3.2**). Woodland is an essential part of the matrix of habitats at Mousehold Heath and provides connectivity through the Wooded Ridge.

However, with the benefits the woodland brings comes the constant requirement to manage the threats of invasive species (**TH7.1-TH7.3**)**,** tree pests and diseases (**TH7.4**) and scrub/tree encroachment (**TH6.10**).

7.4.3 Wooded Ridge

213. On the Wooded Ridge, infill development could pose a threat, if it further fragments the already disconnected areas of secondary woodland habitat (**TH9.4**). Fragmentation reduces the resilience of the habitat making it more vulnerable to tree pests and diseases (**TH7.4**) and invasive species (**TH7.1-TH7.3**). Most resources for woodland and tree management are focussed on managing health and safety and fire risks, while ecologically sensitive woodland management is traditionally under-resourced (**TH5.2**). This has led to the development of single-age structure woods, the regeneration of invasive tree species, and a lack of transitional woodland edge habitat and species-diverse glades, which are important contributors to species richness. These factors also make the wood more likely to be affected by climate change and less resilient to tree pests and diseases (**TH7.4**) and invasive species (**TH7.1-28**).

214. Losing important habitat features (**TH6.12**) such as veteran trees, deadwood, hibernating and nesting habitats, ponds, hedges and drainage ditches can occur due to site management being carried out without appropriate prior ecological assessment. This is a particular threat at woodland sites. In an urban environment, management for safety is needed alongside any potential benefits for wildlife. Factors such as anti-social behaviour (**TH8.2**) may mean that the density of woodland cover and associated shrub and ground flora may need to be lower than that which would be optimal for wildlife interest. In addition, litter, fire and trampling can reduce the abundance and diversity of ground flora, increasing the abundance of ruderal species and again decreasing resilience to tree pests and diseases (**TH7.4**) and invasive species (**TH7.1-TH7.3**).

7.4.4 Historic Habitats

215. Changes in historic management practices, such as the loss of grazing (**TH6.1**) in favour of short mowing on Historic Wood Pasture and Parkland Priority Habitat sites, reduces grassland condition and diversity. Losing important habitat features (**TH6.12**) such as veteran trees, deadwood, hibernating and nesting habitats, ponds, hedges and drainage ditches as a result of site management has a particularly significant impact on historic habitats. The recovery time for these habitats can be many decades, such as for mature/veteran trees. As such, ancient woodland and ancient trees are identified as being irreplaceable habitat in NPPF and BNG guidance. Tree diseases also impact on species diversity, especially those species reliant on dead or decaying wood, by reducing the available habitat niches for these sometimes rare and protected invertebrates (**TH7.4**).

216. Management activities carried out at sensitive times for biodiversity (**TH6.4**) could also impact this BCA. The use of hard surfaces and grass cutting too close to older trees could

impact their roots and potentially drown or dry them out. The loss of old walls, or repairing structures, potentially reduces habitat niches or nesting habitats for some bat, bird and plant species (**TH8.3**). Adverse impacts on conservation areas, geodiversity and the historic environment can be seen if management strategies do not follow an integrated approach which balances the needs of all these interests (**TH3.2**). Their location within the city makes these fragile historic habitats more vulnerable to air pollution (**TH1.1**). A threat common to all wildlife sites in this BCA comes from invasive non-native species. This includes encroachment by Japanese Knotweed (*Fallopia japonica*), Canadian Goldenrod (*Solidago canadensis*), Butterfly-bush (*Buddleja davidii*), Russian-vine *(Fallopia baldschuanica),* Three-cornered Garlic (*Allium triquetrum*) and over grazing by deer, including the non-native Muntjac (*Muntiacus reevesi*).

7.4.5 Community and Active Spaces

217. As with the Wooded Ridge BCA, this urban environment needs to be managed for safety alongside any potential benefits for wildlife. This limits the options for potential wildlife benefits as the placement of additional trees would need to ensure a clear line of sight is maintained, and allowing grass to grow long could increase fire risk and problems associated with anti-social behaviour (**TH8.1**). Without positive messaging (**TH4.1**) to explain the biodiversity benefits of changes being made, they are less likely to be well supported. The ecologically isolated nature of these sites, surrounded by a built environment, means that ecological connectivity is limited, and is reliant on adjacent gardens to fill that ecological role (**TH9.4**). The multi-use nature of these spaces also means that space for wildlife is often limited or marginal. Increased nutrient load from fertilisers and the use of topsoil favours fast growing ruderal species such as stinging nettles (*Urtica dioica*), and invasive species, which dominate at the expense of more diverse native wildlife (**TH6.8**).

218. Management activities carried out in sensitive seasons for biodiversity can also have an impact on species and habitats. Hedge cutting out of season could impact breeding birds, whilst mowing during flowering time may result in the loss of wildflowers, preventing seed set and the availability of nectar to pollinators (**TH6.4**). The loss of important habitat features such as veteran trees, deadwood, hibernating and nesting habitats, ponds, hedges and drainage ditches as a result of site management being carried out without appropriate prior ecological assessment are a particular potential threat at a number of sites (**TH6.12**). Increased access to sites can have a negative impact on biodiversity, for example through increased footfall leading to paths becoming wider, and the impacts of dog-walking and other disturbances to wildlife (**TH8.2**).

7.4.6 Green Streets

219. This BCA is very urbanised and as a result has a high percentage of artificial and hard surfaces (**TH9.1**), even within the ‘green’ spaces of gardens and road verges, in the form of impermeable paving, tarmac or artificial grass. These surfaces limit habitat for wildlife,

reduce soil biota and increase surface water runoff. Lack of connectivity (**TH9.4**) is a key concern in these built-up areas. Ecologically isolated habitats which lack connectivity with other sites isolate species, putting them at greater risk of local extinction and genetic bottle necks. Examples in the urban environment includes a lack of connectivity for hedgehogs and amphibians, due to fencing and roads intersecting their home range and migration routes. The uneven distribution of street trees impacts the connectivity for, and dispersal or nesting ability of, certain urban bird species and insects. Street trees are vulnerable to existing or novel pests and diseases, where the loss of individual trees could have a disproportionate effect on biodiversity, due to their high relative value as key Natural Assets within the city. Increased nutrient load from fertilisers and use of topsoil favours fast growing ruderal species such as Stinging Nettles (*Urtica dioica*), and invasive species dominate at the expense of more diverse native species assemblages (**TH6.8**). Invasive garden species (native or non-native) which are easily spread into the wider countryside are also a greater issue in this more urbanised BCA (**TH7.2**) These plants can become dominant and outcompete native species. The impacts of light pollution are also at their greatest in the most built-up areas. Light pollution impacts on bat foraging activities by reducing time spent foraging, changing the timings of foraging activity (missing peak insect abundance just after dusk), and disrupting foraging routes (**TH9.6**). Where there are multiple evidence bases and strategies for the identification of biodiversity conservation priorities from local to landscape scales, this can result in not all priorities being addressed equally (**TH9.5**). In urbanised areas this is a particular issue, as high levels of private landownership reduce the likelihood of strategic influence on biodiversity. It requires buy-in from many different owners with different objectives for their land, and there is low certainty of the long-term sustainability of actions when ownership changes.

7.4.7 All BCAs

220. Across all BCAs the need for strategic planning and joined up conservation actions are paramount to ensure threats are mitigated at a city-wide level, where this is appropriate. Strategic/national planning guidance may not provide sufficient biodiversity guidance for planning, or details of biodiversity policies for specific areas, to enable planners to have sufficient information to consider when assessing individual planning applications (**TH9.5**). Any decisions taken must balance the requirement of a wide range of interests, including biodiversity. Funding to support land management change and ecologically sensitive management is limited (**TH5.1-TH5.2**), and creative solutions will need to be sought to bridge this gap. There is a need across the city to ensure the evidence base for decision making remains robust and up to date (**TH2.1-TH2.2**). The impacts of climate change are a major threat to biodiversity (**TH1.1-TH1.5**), and whilst this study identifies some key concerns, a specific study would be required to fully understand and quantify this issue.

7.5 Key Findings

221. Threats are widespread across all BCAs and decision-making must balance diverse interests, not just biodiversity. There are also data gaps in the evidence base that could limit the proactive decision-making in the development of conservation actions. The overarching impact of climate change also brings intensifying threats by altering habitats, conditions, and ecosystem balances across all BCA types. Each area additionally faces localised threats:
    - River corridors must contend with risks such as water pollution, water abstraction and agricultural runoff. Siltation and channelisation alter natural waterway habitats and structure while invasive species (e.g. American signal crayfish) displace native species.
    - Heathlands face shrinking habitat area leading to worsened ecological isolation and fragmentation. Air pollution from surrounding regions can cause damage to fragile lichen communities whilst light pollution disrupts the natural nocturnal and breeding behaviours in bat species.
    - Wooded habitats experience loss of habitat features including dead, aged, mature trees that are good nesting sites for a range of species. Management currently focuses on health, safety, and fire risks but is presently under-resourced for ecologically sensitive management. This leads to regeneration and domination of invasive tree species, and larger trees, leading to a single-age structure which is more vulnerable to damage and disease. Management decisions can also lead to a loss of transitional woodland edge habitat and diverse glades which are important for species richness.
    - Historic habitats are impacted by the effects of modernisation, including changes in management practices shifting from grazing to mowing. The loss of old structures diminishes niches for wildlife, and urbanisation in the surrounding city leads to increased air pollution. Vulnerability to tree diseases and pests, and climate change is also heighted given the recovery time for mature trees.
    - Community sites face conflicting choices between maintaining vegetation for safety versus biodiversity. Anti-social behaviours such as littering, off-trail use, and vandalism also pose direct threats, by degrading habitats and disrupting wildlife.
    - Green city streets contain limited green space as artificial surfaces and private land are prevalent. This can make it difficult to identify areas to enhance connectivity between isolated green spaces.

222. However, there is a strong relationship between threats and how they can be re-framed to provide opportunities for biodiversity enhancement. These are detailed in Section 8: Opportunities for Biodiversity Enhancement in Norwich City.

Section 8: Opportunities for Biodiversity Enhancement in Norwich City

8.1 Aims

223. This section presents opportunities to improve biodiversity in Norwich which were identified through data collation and stakeholder engagement. Opportunities are described for each BCA under five overarching categories: Development Planning; Engagement; Site Management; Habitat restoration; and Strategic Planning. The text is supported by a spreadsheet which presents opportunities for each BCA, describing the potential for applying Lawton Principles (creating bigger, better, more joined sites) to improve habitats and biodiversity for each. Opportunities are prioritised, reflecting the urgency of action required (based on the importance of action needed and timescale over which it must take place) and individual locations of opportunity are described, providing a powerful tool to inform future conservation activities.

8.2 Introduction

224. This section provides an overview of the key opportunities for biodiversity identified through analysing the data collated in task one, which included Natural Areas management plans and stakeholder engagement, and from the threats discussed in Section 7: Potential Threats to Biodiversity in Norwich City. Identified opportunities have been given location details where possible and assigned a unique code for easy cross-referencing throughout the report.

225. Opportunities are presented as a summary table, highlighting the BCA in which they occur (Table 11). This table is supported by more detailed descriptions in Norwich BBS Appendix BBS7 – Threats and Opportunities Table, a resource toolkit which allows opportunities to be sorted and filtered by BCA, Lawton principle and management theme. The management themes assigned to opportunities are designed to allow land managers to identify all related opportunities and consider where multiple actions can be undertaken concurrently to maximise biodiversity benefits and efficiencies in funding. The ecological rationale underpinning each opportunity is also included. The relative importance of each of these opportunities varies between BCAs and summaries of the key opportunities within each BCA are provided below to illustrate this. While many opportunities require immediate action, the benefits of these actions will often only be realised in the medium to long term. To aid future assessment of feasibility and the development of action plans to maximise opportunities for biodiversity, each opportunity has been prioritised for each BCA using a traffic light coding system based on rating the importance of each action, and the timescales the actions are needed. These codes are shown in Table 11 and Norwich BBS Appendix BBS7 – Threats and Opportunities Table:

- ● – high,
- ● – medium,

- ● – lower
- ● – not currently assessed for priority.

226. Where it has been possible to map opportunities spatially this has been done. However, it was not possible to map all opportunities due to the absence of spatial boundaries or the complexity of mapped outputs. The often-fragmented urban habitats within Norwich, the coverage of urban land use and the nature of some of the opportunities means that many opportunities cannot be easily mapped, or their mapping would risk incorrect inferences. As with threats, all opportunities have been analysed using BCA and theme, the results of which are presented in Table 11 and Norwich BBS Appendix BBS7 – Threats and Opportunities Table. For the opportunities that can be mapped the most effective format was found to be to presenting four maps, each one representing opportunities across Norwich for each of the four Lawton Principles (Lawton, 2010). These are shown in Section 8.5 Opportunity mapping using the Lawton Principles.

227. Section 1.7 introduced the Lawton Principles and outlined the value in using these as a framework for presenting biodiversity opportunities. Presenting maps by each Lawton Principle has added value as Lawton provided a hierarchy to indicate how to implement these principles in order of preference. From highest to lowest:
    - Better management of existing sites to ensure they are of good quality.
    - Bigger sites.
    - More sites.
    - Enhance connectivity.
    - Create new corridors.

228. This has enabled prioritisation of opportunities by each Lawton Principle, with the highest priority given to “better management”. A caveat is required with this approach in the urban environment due to the fragmented nature of habitats, and so the following Lawton advice has been taken into account: “…in areas which only have small and isolated sites, it will be better to invest in the restoration and creation of new wildlife habitat” (Lawton, 2010). The ability to prioritise opportunities to allow a single principle to be assigned to each opportunity meant that it was possible to clearly show these opportunities as a series of four maps. This would not have been possible based on BCAs, as opportunities would have needed to be mapped multiple times. Each opportunity map based on the Lawton principles is preceded by an overview paragraph identifying the important points to note and the key elements of the opportunities that the maps are presenting. The maps illustrate city wide features as polygons and specific sites as numbered point opportunities. Key features such as rivers are shown where this is useful for interpretation.

229. In addition to the maps, Table 11 shows a summary of the opportunities which have been identified, with each one assigned a general theme, an overall priority level and referencing the BCAs and any specific localities to which it applies. Opportunities have also been assigned codes to link to the relevant threats identified earlier in Section 7: Potential Threats to Biodiversity in Norwich City.

230. Identifying opportunities for biodiversity conservation enhancement is a vital component of delivering nature recovery. These will initially require investment, but over the medium to long-term will start to reduce management costs. Further benefits of enhancing biodiversity assets in the city include improvements in wellbeing, reducing the demand on NHS services, for example, by reducing pollution.

8.3 Opportunity summary table

231. A summary of each opportunity is presented in Table 11. The table identifies both the opportunity theme, the BCA(s) and any suggested locality to which it applies. This table can be used to provide a strategic overview of opportunities within each BCA. It is important this is used in conjunction with Norwich BBS Appendix BBS7 – Threats and Opportunities Table, which provides the full details of each opportunity. The opportunities presented here are for all stakeholders and partners and subject to feasibility assessment and review. This is not an agreed action plan.

Table 10: Opportunity summary table

Priority level: ● – high; ● – medium; ● – lower ● – Not currently assessed for priority.

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
	Land Management									
OP1	**Wetland habitats Management**									
OP1.1	Wetland Management	Improve/restore wetland habitats through opening the canopy and appropriate/improved drainage and ditch network	Old Lakenham Riverbank and meadow, Coopers Wood Natural Areas, Sandy Lane	●						Better
OP1.2	Wetland Management	Improve/restore wetland habitats through opening the canopy and	Dolphin Grove Natural Area	●						Bigger

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
		appropriate/improved drainage and ditch network								
OP1.3	Wetland Management	Improve/restore wetland habitats through opening the canopy, appropriate/improved drainage and ditch network and maintaining wet woodland	Train Wood	🟢						Bigger
OP1.4	Wetland Management	Improve/restore wetland habitats through opening the canopy and appropriate/improved drainage and ditch network	Wensum Riverside Natural Area (between Swanton Road and the Wensum)	🟡						Better
OP1.5	Wetland Management	Restore wetland habitats	Wensum Park	🟡						Better
OP1.6	Wetland Management	Restore wetland habitats		🟡						Better
OP1.7	Wetland Management	Restore wetland habitats through wet meadow/marsh and ditch network restoration	Anderson Meadow	🔴						Better
OP1.8	Wetland Management	Restore wetland habitats	Cooper's Lane and along Martineau Lane	🟢						Better
OP1.9	Wetland Management	River bank restoration for otter and water vole	Wensum and Yare.	🟡						Better
OP1.10	Wetland Management	Restore natural river function - recreating floodplain within existing river channel	City Centre (New Mills to Whitlingham)	🔴						Better

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
OP1.11	Wetland Management	Restore natural river function - Create connection with the River Wensum	The Gildencroft	●						Better
OP1.12	Wetland Management	Restore natural river function - Maintain wetland water levels		●						Better
OP1.13	Wetland Management	Pond creation and restoration - 'Ghost ponds'	Mousehold Heath, Heartsease; Harford Park.	●	●	●	●	●	●	More
OP1.14	Wetland Management	Pond creation and restoration - New and restored ponds		●	●	●	●	●	●	More
OP1.15	Wetland Management	Pond creation and restoration - DLL ponds for GCN	Various locations, see Appendix BBS7 for details	●	●	●	●	●		More
OP1.16	Wetland Management	Creation of wetland habitat - Wetland features	Cathedral precinct	●						Bigger
OP1.17	Wetland Management	Creation of wetland habitat - Reversion of arable to grazing marsh	River Tas (electricity substation, areas that were marshes as recently as the 1st edition OS maps (around 1900))	●						More
OP1.18	Wetland Management	Improved coordination of River Wensum marsh management	Hellesdon to city centre	●						Connected
OP1.19	Wetland Management	Develop a River Yare (Valley) Strategy		●						
OP1.20	Wetland Management	Update River Wensum Strategy with Sweetbriar Marshes to Whitlingham 'Floodplain Habitats Restoration Plan'		●						

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
OP1.21	Wetland Management	Look into feasibility and consult on options for improved wildlife designation of Bawburgh-Colney Lakes (in SNDC, so they should lead)		🟢						Existing
OP2	**Woodland Management**									
OP2.1	Woodland Management	Increase woodland - Natural regeneration		🟢	🟢	🟢	🟢	🟢	🟢	Bigger
OP2.2	Woodland Management	Increase woodland - Tree planting close to existing woodland	Various locations, see Appendix BBS7 for details			🔴				Bigger
OP2.3	Woodland Management	Creating diverse age structures within woodland through opening up canopy		🟢	🟢		🟢	🟢		Better
OP2.4	Woodland Management	Increasing native tree diversity (notwithstanding planning for adaption to climate change)						🟢		Better
OP2.5	Woodland Management	Opening up the woodland canopy	Wensum Riverside Natural Area (between Swanton Road and the Wensum); all woodland sites	🟡	🟡	🟡	🟡	🟡		Better
OP2.6	Woodland Management	Leave deadwood on site		🟡	🟡	🟡	🟡	🟡	🟡	Better
OP2.7	Woodland Management	Green edges, trees (Including street trees) and hedgerow planting on streets				🔴	🔴	🔴	🔴	Connected

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
		or around the boundaries of green spaces								
OP2.8	Woodland Management	Management of wet woodland to 'Favourable' condition	Wensum Riverside Natural Area (between Swanton Road and the Wensum), Wensum Park, Train Wood CWS, Dolphin Grove Natural Area, Old Lakenham Riverbank and meadow, Coopers Wood Natural Areas, and potentially parts of Sandy Lane	●		●				Better
OP3	**Scrub Management**									
OP3.1	Scrub Management	Appropriate scrub management	Mousehold Heath	●	●	●	●	●		Better
OP4	**Tree Management**									
OP4.1	Tree Management	Street tree protection on council owned land for biodiversity interest		●	●	●	●	●	●	Better
OP4.2	Tree Management	Tree protection through the planning process							●	

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
OP4.3	Tree Management	Tree planting for starlings	Tuckswood/Hall Road area and Harford Tip						🟡	Connected
OP5	**Heathland/acid grassland Management**									
OP5.1	Heathland/Acid Grassland Management	Acid grassland/heathland restoration in Eaton area	Eaton Park Golf Course and Eaton Golf Club		🟢					Better
OP5.2	Heathland/Acid Grassland Management	Acid grassland restoration/creation complex in Sweetbriar area	Northern areas of Sweetbriar Marshes, the disused railway area between Marriott's Way and Sweetbriar Industrial Estate, Sloughbottom Park, Mile Cross Primary School field		🔴					Better
OP5.3	Heathland/Acid Grassland Management	Heathland expansion within historic extent of Mousehold Heath	Historic extent of Mousehold		🟡					Bigger
OP5.4	Heathland/Acid Grassland Management	Acid grassland/heathland restoration in Broadland District area	Former Norwich Golf Course		🔴					Better

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
OP5.5	Heathland/Acid Grassland Management	Maintaining the current favourable condition of Mousehold Heath's heathland and acid grassland complex	Mousehold Heath		●					Existing
OP6	**Grassland Management**									
OP6.1	Grassland Management	Creating native wildflower areas and meadows				●	●	●	●	More
OP6.2	Grassland Management	Create habitats for pollinating insects within B-lines corridors	B-line corridors particularly in the River Wensum BCA. The River Yare is only a B-line from Cringleford to Whitlingham	●	●	●	●	●	●	Connected
OP6.3	Grassland Management	Cut grassland (where appropriate) using a 'conservation cut' regime, creating areas of meadow where possible		●			●	●		Better
OP6.4	Grassland Management	Collaborative discussion to consider how it could be possible to increase the network of RNRs in Norwich		●	●	●	●	●	●	Connected
OP6.5	Grassland Management	Encourage conversion of amenity grassland towards semi-natural meadow priority habitats		●	●	●	●	●		Better
OP6.6	Grassland Management	Rough tussocky grassland creation/management to benefit small mammals and birds		●			●			More

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
OP6.7	Grassland Management	Retain some fallen leaves in parks for hedgehog and small mammal habitat	Eaton Park			🟡	🟡	🟡	🟡	Better
OP7	**Bare ground management**									
OP7.1	Bare ground management	Bare ground and disturbance for rare invertebrates			🟢	🟢	🟢	🟢		More
OP8	**Connectivity**									
OP8.1	Connectivity	Remove barriers between habitats at a very local scale through encouraging more toad and frog crossings and garden hedgehog opportunities	Boundary between Costessey and Taverham; Little Melton, just east of the Norfolk and Norwich Hospital.	🔴	🔴	🔴	🔴	🔴	🔴	Connected
OP8.2	Connectivity	Create opportunities for transitional and edge habitats (ecotones)		🟡	🟡	🟡	🟡	🟡	🟡	Bigger
OP9	**Parkland and historic habitat management**									
OP9.1a - g	Parkland and historic habitat management	Restoration of more biodiverse and historically sympathetic management regime for parkland/wood pasture	Various locations, see Appendix BBS7 for details				🟡			Bigger
OP10	**Designated Sites**									
OP10.0	Designated Sites	Implement action plan of improved management so that 70% of designated	General, Sweetbriar Marshes and River Wensum SSSI	🔴	🔴	🔴	🔴			Existing

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
		sites are in 'Favourable' or 'Recovering' condition by 2030								
OP10.1	Designated Sites	Increase number and/or size of designated sites		●		●	●	●	●	Bigger
OP10.2	Designated Sites	Improve site condition at Sweetbriar Marshes	Sweetbriar Marshes	●						Existing
OP10.3	Designated Sites	Improve site condition of the River Wensum SSSI	River Wensum SSSI	●						Existing
OP10.4	Designated Sites	Improve site condition of the River Yare County Wildlife Sites	River Yare floodplain	●						Existing
OP11	**Non-natives**									
OP11.1a	Non-natives	Manage Invasive Non-native Species across the city	Black Tower & Wilderness, Clapham Wood, Coopers Wood, Crome Wood, Lion woods.	●	●	●	●	●	●	Better
OP11.1b	Non-natives	Manage Invasive Non-native Species across the city	Area north of the Wensum, adjacent to Mile Cross Marsh and Sloughbottom Park. East of Sloughbottom Park.	●	●	●	●	●	●	Better
OP11.2	Non-natives	Assess the feasibility of addressing INNS issues at river sources (working with SNDC and Broadland)		●	●	●	●	●	●	Better

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
OP11.3	Non-natives	Householder engagement regarding Non-native Invasive Garden Plant Species		🔴	🔴	🔴	🔴	🔴	🔴	Better
OP12	**Planning and Development**									
OP12.1	Development Plan	Look into feasibility of requiring, through the planning process, biodiversity friendly building designs that benefit nature recovery; for example through appropriate lighting, bat/bird nest boxes, etc on new developments		🟢	🟢	🟢	🟢	🟢	🟢	
OP12.3	Development Plan	Look into opportunities for enhancing biodiversity on Norwich CC owned development sites.		🔴	🔴	🔴	🔴	🔴	🔴	
OP12.4	Development Management	Implement nature recovery using BNG units		🔴	🔴	🔴	🔴	🔴		Better
OP12.5	Development Plan	Create more community gardens, orchards and allotments						🟡		More
OP12.7	Development Plan	Engage with planners and developers to look at options for extending open greenspaces into adjacent developments						🟢		More
OP12.8	Development Plan	Track brownfield biodiversity opportunities		🟡	🟡	🟡	🟡	🟡	🟡	More

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
OP12.9	Development Plan	Look into the feasibility of allocating 10% of green spaces as biodiversity assets, where appropriate					🔴	🔴		More
OP12.10	Development Plan	Encourage design of Sustainable drainage systems (SuDs) to maximise opportunities for biodiversity		🔴	🔴		🔴	🔴	🔴	
OP12.11 a - f	Development Plan	Encourage, where possible and appropriate, Norfolk CC to deliver compensation ponds for GCN District Level Licencing, within Norwich city	Various locations, see Appendix BBS7 for details	🟡	🟡	🟡	🟡	🟡	🟡	
OP12.12	Development Plan	Look into feasibility of creating green roofs and walls, where appropriate; and a Green Roof planning policy for all new flat roofs - all implemented as part of a Green Roof Strategy for the city.	City Centre/Green Streets Zone A; Tuckswood/Hall Road/Lakenham area [and generally in new developments]					🔴	🔴	More
OP13	**Engagement**									
OP13.1	Engagement	Encourage rainwater collection and reuse					🟢	🟢	🟢	Better
OP13.2	Engagement	Encourage use of real grass in place of artificial grass		🟢	🟢	🟢	🟢	🟢	🟢	More
OP13.3	Development Plan	Encourage residents to create nesting habitats for wildlife through nest boxes etc on existing properties	Wooded Ridge BCA	🟡	🟡	🟡	🟡	🟡	🟡	More
OP13.5	Engagement	Increase climate change awareness and its impacts on biodiversity		🟡	🟡	🟡	🟡	🟡	🟡	

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
OP13.6	Engagement	Promote and encourage citizen science projects and wildlife recording		●	●	●	●	●	●	
OP13.7	Engagement	Look at the feasibility of setting up demonstration areas for good management for wildlife within each BCA		●	●	●	●	●	●	
OP13.8	Engagement	Local community engagement and buy-in		●	●	●	●	●	●	
OP13.9	Engagement	Install signage on walking routes and recreation sites to explain management changes and their benefits to biodiversity		●	●	●	●	●	●	
OP13.10	Engagement	Consider appointing species/site champions		●	●	●	●	●	●	
OP13.11	Engagement	Householder engagement plan to encourage action for biodiversity						●	●	
OP13.12	Engagement	Arrange talks, visits, and endorsements of conservation actions by inspirational wildlife experts							●	
OP13.13	Engagement	Create community gardens and areas for biodiversity associated with flats and City owned housing, where appropriate.							●	More
OP13.14	Green living roofs and walls	Householder engagement plan to encourage action for wildlife at home							●	More
OP14	**Strategy**									

Opp Code	Opportunity Theme	Opportunity	Suggested locations for this opportunity within the identified BCAs	River Corridors	Heathland	Wooded Ridge	Historic Habitats	Community & Active Spaces	Green Streets	Lawton Principle
OP14.0	Strategy	Devise a strategy for bat protection in Norwich		●	●	●	●	●	●	

8.4 Key opportunities identified by Biodiversity Character Area (BCA)

232. BCAs, as explained in Section 4: Biodiversity Character Areas in Norwich City, allow for a more strategic approach by grouping similar biodiversity assets together. The benefits of this strategic approach can be observed through delivering opportunities as it enables:
    - Identification of biodiversity conservation priorities at both local and landscape scales, ensuring all opportunities are being fairly addressed.
    - Better resource planning.
    - Coordination of management activities between organisations.
    - Maximisation of wider scale benefits, for example, at a floodplain scale.

233. Norwich BBS Appendix BBS7 – Threats and Opportunities Table provides the full list of opportunities identified in the BBS and gives the full details of the management actions needed and the ecological rationale for these, in addition to key localities and prioritisation scoring. This section presents the key opportunities for each BCA, to inform decision making. Table 11 summarises this list by only including the key information, for all opportunities listed in Norwich BBS Appendix BBS7 – Threats and Opportunities Table.

234. This section then provides summary paragraphs detailing the key opportunities that are most relevant, distinctive, or important to each BCA. It is preceded by a summary of opportunities that apply to all BCAs, as it is useful to present this as an overview.

235. Each opportunity described references its opportunity code which is colour coded to reflect its priority. **Priority level:** ● – high; ● – medium; ● – lower ● – Not currently assessed for priority.

NOTE: All opportunities and recommendations should be balanced against other needs and constraints for the city - just because there is a biodiversity opportunity does not mean that it is feasible. This is why further review and feasibility studies are recommended. Health and safety, fire risk, land ownership and planning constraints are key examples of why an opportunity may have to be revised or deprioritised.

8.4.1 Opportunities across all BCAs

236. A general list of opportunities that are priorities for all BCAs, grouped by theme are listed below.

Engagement opportunities

237. There are numerous opportunities for engaging Norwich's citizens, local groups, and volunteers in wildlife. Those that have come out of the data analysis work and stakeholder engagement are described below.

238. An **engagement plan is vital for households to encourage action for biodiversity (OP13.11)**. This engagement could include promoting campaigns such as '5 key actions for wildlife at home': planting trees; creating wildflower areas; creating a wildlife pond;

creating a habitat pile; installing bird/bat/bee boxes, which can be performed across all of Norwich with a focus on Green Streets BCA Zone B/housing around parks where opportunities are most abundant**.** Actions taken could also be recorded on an interactive map so that residents can see that they are making a difference (e.g., Wild Britain, Radnorshire Wildlife Trust, Wild East). This engagement plan should be area focused, based initially on the Green Street BCA zones, but can be narrowed where appropriate. In Green Streets Zone C **(OP8.1)** the engagement can be more centred on actions with a smaller but equally important footprint, where gardens are smaller or potentially non-existent in these areas of terraced housing and flats. Actions for this zone could include promoting small green roofs (Little, J. & Gedge, D.,2023); tubs, baskets, pots, walls, as well as engagement via inspirational speakers and examples of people to look up to who have lived in areas with limited access to wildlife or green space, such as the Urban Birder. Owners of flats or communal living accommodation can also be engaged to dedicate a portion of communal space to community gardens, growing spaces, or biodiversity-specific areas, with a recommended target of 10%, where appropriate and feasible **(OP13.13).** As part of the engagement exercise**, collection and reuse of rainwater should also be encouraged (OP13.1)**, building on work by the Norwich and Broadland CATCH project, as well as **encouraging the use of real grass in the place of artificial grass(OP13.2).** Householder engagement regarding Non-native Invasive Garden Plant Species is vital for the protection of people's property, helping to reduce the proliferation of these invasive species and improving conditions for native non-invasive species **(OP11.3).** A **greater awareness of climate change and its impacts on biodiversity (OP13.5)** will increase the willingness of individuals to act. Awareness raising could be through social media campaigns, posters or using the arts.

239. Improved habitat quality and extent through better management present opportunities for **local community engagement and buy-in (OP13.8)**. **Installing signage on walking routes and recreation sites to explain management changes and their benefits to biodiversity (OP13.9)** can explain ecological history and ongoing biodiversity improvements. **Demonstration areas (OP13.7)** add to this awareness raising by showcasing new management techniques, engaging residents, and promoting ways that they can help wildlife in their communities, streets, and gardens. **Creating a Species or Site Champion scheme (OP13.10)**, where community figures, councillors, or businesses take on roles as champions, can raise public awareness. Sponsorship could also be an option for funding conservation actions, with larger businesses arranging staff team building or volunteer days on sponsored sites. A higher abundance and diversity of species, coupled with increased engagement, create opportunities **to promote and encourage citizen science projects and wildlife recording (OP13.6)**. Knowledge exchange between existing recording groups in the city can be facilitated through organised events, integrating new recording volunteers into these groups to learn from the experience of existing members.

Planning and development

240. Planning and development related opportunities for biodiversity arising from the BBS analysis are described in this section. It is recommended that a Supplementary Planning Guidance (SPG) document for Biodiversity is developed as a way of bringing together many of the planning and development opportunities identified through the BBS process. The guidance could be created at a local level, although it is recommended that this be created at a wider scale potentially as part of the LNRS process because all issues will be relevant to all LPAs in Norfolk. Through the LNRS process such guidance will have a higher status and include national LNRS objectives. A wider scale document would need to be adopted by individual local authorities.

241. One of the most impactful ways of integrating elements into the planning system that benefits nature recovery at a site level would be to **look into the feasibility of requiring, through the planning process, biodiversity friendly building designs; for example through appropriate lighting** (Bat Conservation Trust, 2023a and 2023b), **bat/bird nest boxes, etc on new developments** (OP12.1)**.** These actions could then be used or encouraged as much as possible in planning applications (Day, J. *et al.*, 2023). There are clearly a number of opportunities for habitat creation to **implement nature recovery through Biodiversity Net Gain (BNG) units** (OP12.4), delivered through the Environment Act 2021.

242. **Looking into opportunities for enhancing biodiversity on Norwich CC and Norfolk CC owned development sites (OP12.3)**, allows potential significant widespread habitat restoration or improvements and improvements in ecological connectivity. This is a specific opportunity due to the number of council owned sites within Norwich that Norwich CC and Norfolk CC can influence much more easily than enhancing private sites. Opportunities could be implemented on council owned sites first and then these can be used as exemplar nature recovery sites to encourage private land owners to follow this good practice. Sites allocated for development are also a possible opportunity to steer development to benefit biodiversity where appropriate. Where **site allocations are adjacent to existing greenspace sites, engagement with planners and developers is recommended to look at options for extending open greenspaces into adjacent developments** (OP12.7) into these sites through the planning process**. Street tree protection on highways and council owned land for biodiversity interest** is also recommended **(OP4.1).**

243. Opportunities exist for the **creation of more community gardens, orchards, and allotments in the city** (OP12.5). Allotment and community garden creation are probably two of the most cost-effective opportunities for a city once the required land has been found. **Monitoring brownfield sites** (OP12.8) for their inclusion in site allocations and

planning applications, along with ownership details, may offer future opportunities for habitat creation or restoration.

244. **Sustainable Drainage Schemes (SuDS) design should be encouraged as an opportunity to maximise biodiversity** (OP12.10). Alongside any pond and ditch restoration and creation they should be integrated where possible into the local hydrology to improve water table levels and connections to and between the main river and its streams and drains/ditch network. They are now a prerequisite for planning permission and large SuDs schemes on their own could be deemed creation of wetland habitats towards priority habitats such as ponds and standing water, wet priority grasslands, Reedbed and Fen. They will also offer potential benefits to delivering on nutrient neutrality within the urban areas of the BCA. Residential areas can be useful areas for retro-fitting SuDS and rainwater harvesting – a project based on the successes of the CATCH project, would allow a head start in terms of learning gained through that project.

245. District Level Licencing (DLL) replaces previous mitigation licences required for development affecting Great Crested Newts (GCN) (DEFRA & Natural England, 2022a). From this data, Natural England has created GCN strategic opportunity areas, which predicts suitable areas that could be used to **encourage Norfolk CC to deliver compensation ponds** (OP12.11**), where possible and appropriate.** Norwich's urban setting means that there are likely to be limited options for compensation ponds, due to low land availability and development impacts. Therefore, the priority order in Norwich, from highest to lowest, should be as follows: Ghost pond restoration; Newly created general wildlife ponds; GCN compensation ponds.

246. B-lines, created by Buglife, are superhighways for pollinating insects to support the recovery of threatened species and restore abundant populations of insects that are vital for pollinating crops and wildflowers. Whilst there are city-wide pollinator opportunities, especially in private gardens, **creating habitats for pollinating insects within B-line corridors** (OP6.2), maximises benefits in establishing high-value pollinator zones through implementing management changes, conservation efforts, and habitat restoration, including ponds and pollinator flower-rich habitats. Research has shown that some urban environments can be more valuable to some pollinators than rural habitats (Baldock *et al.* 2015).

    X-Polli:Nation is a project aimed at schools, for pupils, as well as teachers and parents, to learn about pollinators, record data about pollinator visits, plant habitat for pollinators and communicate the importance of pollinators (X-Polli:Nation, 2023). It is a significant opportunity for schools across Norwich to deliver pollinator-friendly actions in school grounds and could be one of the best ways for school grounds to achieve the ambitious target to wild 30% of a school's grounds by 2030 as part of The Wilding School Project (Underwood, K. & Fidalgo M., 2023) **(OP12.9)**.

247. **Removing barriers between habitats at a very local scale through encouraging more toad and frog crossings and garden hedgehog opportunities** (OP9.1) are vital for species recovery and protection. Establishing more toad crossings and hedgehog fence holes and hedgehog streets facilitate the significant distances species cover between wintering and breeding areas, reducing road fatalities, and bolstering habitat connectivity for all species across the BCA. **Creating more nesting habitats for wildlife through wildlife nest boxes and habitat piles** (OP13.3) offers significant opportunities across all BCAs, where there are limited natural alternatives remaining. These should be installed based upon the appropriate species for that location. For example, for birds in the Wooded Ridge BCA the focus should be on boxes for tawny owls, other raptors and other woodland species that are rare or protected and dependent on connectivity within the wooded ridge, whilst along the River Corridors BCA focus should be on dead standing trees along linear features such as ditches. The Green Streets BCA has some of its best opportunities for biodiversity through nest boxes depending on the housing stock and existing niches for birds. For example, in Zone C old, terraced housing have many opportunities for swift boxes in particular.

Strategy

248. **Developing a bat protection strategy for Norwich (OP14.0)** should be considered, preferably working with the Norfolk and Norwich Bat Group and other key stakeholders, with a particular focus on underground hibernation roosts such as the network of disused quarries and pits found across the city. The strategy could address issues such as fencing, monitoring and bat box installation as appropriate. All sites should be better monitored for bat activity. Bat access should be improved, and they should be protected from disturbance. This under-appreciated underground habitat could be providing hibernation roosts for most of Norwich's bat species. This strategy should also have a clear focus on the value of churches in particular, but old buildings in general, for hibernating and foraging bats – understanding the extent and usage of these locations and their protection should dovetail with the same review of the underground habitats.

8.4.2 River Corridors

249. **Fully coordinated management** of the marshland sites in the Wensum floodplain **(OP1.18)** would maximise the benefits of collective actions for biodiversity. This more coordinated approach should utilise existing mechanisms and where appropriate strengthen them, e.g., the River Wensum Strategy Partnership (Norwich City Council, 2023a) and Broadland Rivers Catchment Based Approach via the Broadland Catchment Partnership (Broadland Catchment Partnership, 2023b), complying fully with the Water Framework Directive and all other relevant legislation. It is suggested that this coordination is achieved by updating the River Wensum Strategy Action Plan to include a Sweetbriar Marshes to Whitlingham 'Floodplain Habitats Restoration Plan' **(OP1.20)** and by continuing to engage with Norfolk Wildlife Trust on their management of Sweetbriar Marshes **(OP10.2).** For the Yare, **the**

creation of a River Yare (Valley) Strategy (OP 1.19) worked up in the same manner as the River Wensum Strategy, would be a good way of bringing the Yare priorities together.

250. The key opportunities for both river corridors in this BCA are focused on **restoring wet habitats** within the floodplain and **creating new habitat** to **reconnect the rivers with their floodplains**. These opportunities **(OP1.1 – OP1.12, OP1.16, OP1.17)** vary in scale and priority and are described in more detail below and in Norwich BBS Appendix BBS7 – Threats and Opportunities Table.

251. The Wensum floodplain is currently disconnected from the river and in the city centre it is mostly non-existent. There are two main sections along which to deliver this **reconnection between the River Wensum and its floodplain**. From Hellesdon to the city centre there are opportunities to restore habitats in poor condition or which have been converted to other uses. Through the city centre from New Mills to Whitlingham, floodplain creation would be beneficial. The key sites are:

- **Sweetbriar Marshes SSSI** site condition recovery **(OP10.2):** Sweetbriar Marshes is an important site within this BCA and actions to ensure it is in favourable or recovering condition are a priority.
- **Wensum Riverside Natural Area** (OP1.4)**:** Tree cover further opened up through the creation of wet glades, wet woodland better managed and the re-establishment of the historical drainage ditch network.
- **Anderson Meadow open space (OP1.7):** Restoration of the historical drainage ditch network while keeping the open habitat structure and restoring a proportion of the site to wet meadow. This site is the most important connection missing in the Wensum corridor before the city centre and could be considered for management by the Norwich Fringe as a Natural Area.
- **Wensum Park** (OP1.5)**:** Building on management works in winter 2022/23, other areas could be managed more appropriately for wet habitat wildlife, whilst protecting the historic setting and features.
- **Train Wood CWS** (OP1.3)**:** Tree cover to be opened-up considerably to allow more wet glades in the northern section, and to potentially remove a considerable amount of tree cover in the middle and southern parts of the site to restore to the marsh conditions of the 1840s-1900s.
- **Precinct of the Anglican cathedral** (OP1.16)**:** New wet habitats through wetland features, such as ponds and wet ditches on both playing fields (Norwich School) and Cotman Fields Park and other areas along this section of the Riverside Walk.
- **New Mills to Whitlingham (OP1.10):** Retrofitting floodplain micro-habitats should be considered, either within the channel or on bankside areas. A feasibility study would need to be undertaken. Pilots of this approach are happening by The Playhouse.

252. Key restoration opportunities in the Yare corridor include working with neighbouring South Norfolk Council to look at the feasibility of further designating the **Bawburgh-Colney Lakes site** (OP1.21) to recognise the importance of the site for biodiversity and improve its legal protection. There are a number of opportunities on Norwich City Natural Areas for further **wetland restoration and opening up tree cover** (OP1.1, OP1.8). However, the most significant could be through the **reversion of arable land to semi-natural grazing marsh, wet meadows, and other related wetland habitats** (OP1.17). It would involve partnership working and engaging landowners to explain the potential benefits of such restoration. This is a particular priority around the River Tas within the River Corridors BCA and around the electricity substation, where there were marshes as recently as the 1st edition OS maps (around 1900).

253. While scrub encroachment can be a threat, well managed scrub is important for many bird species, especially in proximity to water or wetland, and can provide vital nesting, hiding, or feeding habitats for small mammals such as wood mice and bank or field voles. **Appropriate and proportionate scrub management** (OP3.1) is necessary**.** Open wetland habitats should have scrub encroachment managed to increase open habitats, whilst leaving islands or floodplain-edge areas as appropriately managed scrub.

254. The **creation of transitional and edge habitats (ecotones)** (OP9.2) is a key part of the Lawton Principles for nature recovery, where one habitat transitions into another, such as at a woodland edge or a grassland buffer when managing wetland sites such as ponds. They can provide an important habitat for amphibians, such as GCN, that spend much of the year feeding in habitats such as tussocky grassland around ponds. These ecotone habitats are important for biodiversity, and they also provide many ecosystem services, such as filtering pollutants or nutrients from entering the main habitat.

255. There are significant opportunities to improve the **management of invasive non-native species (INNS)** across riparian and wetland areas of the river corridors **(OP11.1a)**. Control efforts should be focused on where invasive plants are threatening high value conservation sites or dealing with at/from river sources **(OP11.2)**, where INNS are spreading along waterways. Ongoing monitoring at treated areas is necessary to ensure appropriate follow up to achieve eradication. This will allow native species in these habitats to flourish.

8.4.3 Wooded Ridge

256. Within the Wooded Ridge BCA, the priority should be to improve the quality of the existing woodland habitat, followed by connecting sites, buffering sites from development, and extending sites where possible.

257. Many woodland species rely on active management to maintain a variety of habitats. Without management woodlands can become overshaded and dominated by large trees. The resultant lack of **diverse age structures** means the woodland is more at risk of significant disease and damage. This can be avoided through **management that mimics natural processes** such as **opening-up the canopy via coppicing or haloing trees and thinning woodland vegetation to create woodland glades** (OP2.5) in suitable locations to maintain a **variety of tree ages** (OP2.3) and allow more light in to encourage young saplings

to grow. Microhabitats are created, very quickly **encouraging ecotones** (or transitional habitats) to develop **(OP9.2)** and woodland edge species to return from the seedbank. Larger glades will create pockets of flowering-plant rich meadows within the woodland, further increasing the diversity of habitats and species.

258. **Natural regeneration** **(OP2.1)**, where trees develop naturally from fallen seeds or by suckering or layering, is one of the best ways of expanding ancient semi-natural woodland. It is less expensive than planting within sites, and trees established by regeneration are more likely to be best adapted to local conditions. Natural regeneration should be allowed only where appropriate, often in larger woodlands where there is more space and a larger available seed bank, such as the woodland within Mousehold Heath. It should be appropriately managed to ensure a good diversity of species and varied age structure that will benefit the woodland.

259. Where conditions are not appropriate for natural regeneration, or on smaller sites, planting new trees to expand or create new woodlands should be considered. Opportunities exist for planting new trees (protected by Tree Preservation Orders (TPOs), where possible) to **expand tree cover near existing woodland** **(OP2.2)**. Council owned land could be used as exemplar sites for this nature recovery, demonstrating good practice and encouraging wider involvement of other landowners. Existing gaps in tree cover within the Wooded Ridge corridor are priorities for improving connectivity. Specific sites to investigate are listed in Norwich BBS Appendix BBS7 – Threats and Opportunities Table.

260. Sites will need **regular management for scrub encroachment** **(OP3.1)** in those parts vulnerable to the impacts of scrub on the ground flora and age structure of the woods. Some scrub should be left and managed in pockets where appropriate, to provide a source of food, shelter, nesting and cover for many bird, small mammal and insect species.

261. **Leaving deadwood on site following management works** **(OP2.6)** benefits many invertebrates, including pollinators. Where possible, any tree works should leave as much of the wood on site as possible, as deadwood habitat piles (for saprophytic species of insect, fungi, molluscs etc.), or as stumps, large logs or standing trunks for use by bats or birds. The amount and location of the deadwood should be determined on a site-by-site basis, balancing the benefits against the risks such as safety of access, anti-social behaviour, and fire risks.

262. **Wet woodland** is an important priority habitat, and sites containing it need to be **identified and managed appropriately to 'Favourable' condition** **(OP2.8)**. Management may include opening up the woodland canopy by coppicing or haloing to create a mosaic of wet woodland and open wet meadow/fen glade habitats. Wet woodland containing alder Carr and willow Carr with birch, or where it overlaps with wooded fen or transitions into open fen, are included in the Lowland Fen Priority Habitat class and categorised within BNG and NPPF guidance as irreplaceable. It is important to protect occurrences of this rare habitat and distinguish it from other woodland habitats that happen to be wet due to their proximity to floodplains or the river.

263. There are a number of opportunities to **create and restore ghost ponds (OP1.13)** along the entire length of the Wooded Ridge BCA. Ponds are a key component of a connected landscape and provide a stepping stone between other habitats for many species.

8.4.4 Heathland

264. The main opportunities within this BCA are focussed on improving and creating heathland and acid grassland habitat.
265. **Maintaining the current favourable condition of Mousehold Heath's heathland and acid grassland complex (OP5.5)** is the most important priority. The creation of new heathland here is impracticable due to costs and site capacity so the focus should remain on heathland management, which must be undertaken with sensitivity, as biodiversity needs here can conflict with needs for access and recreational use. Keeping scrub encroachment down to a minimum is important but allowing **appropriate scrub management** (OP3.1) in some wooded areas or on the edges of grass meadows and glades would be beneficial as a transitional habitat providing ground cover for small mammals and some birds and allowing ground flora species to grow.
266. In the longer term there is an opportunity to look beyond this to **heathland expansion within the historic extent of Mousehold Heath** (OP5.3) where possible**.** This would most likely be creating or restoring new habitat where the soils, geology and hydrology are conducive to successful establishment of nationally scarce species and could make use of novel approaches like brown roofs. Ongoing management would include grazing or mowing where appropriate to prevent dominance by competitive grasses and woody plants.
267. Whilst opportunities in the vicinity of Mousehold Heath may be small, the two further parts of the BCA offer additional opportunities for restoration/creation:
    - Opportunities for **establishing an acid grassland restoration/creation complex in the Sweetbriar area (OP5.2)** including areas of Sweetbriar Marshes, the disused railway area between Marriott's Way and Sweetbriar Industrial Estate, Sloughbottom Park, and Mile Cross Primary School field.
    - A feasibility review is recommended for **acid grassland or heathland restoration in the Eaton area** (OP5.1). Potential seed donor sites should be investigated, management options considered, and the landowner engaged with, such as Eaton Park golf course and Eaton Golf Club. These sites are believed to contain remnant heathland and acid grassland species, which according to local experts may also be present in surrounding gardens. Historic mapping shows heathland covered the northern part of the Eaton Golf Club golf course in 1817. Management for both acid grassland and heathland could be possible where there is plenty of disturbance, for example in the "rough" or around tree clumps at the golf courses.
    - Opportunities to work alongside Broadland District Council **for acid grassland and heathland restoration around the Broadland District area** (OP5.4), for example the former Norwich Golf Course. It is thought remnant areas of heathland existed here and connecting this to the wider area north of this site in recreation/school grounds and to the existing Heath in the Horsford area, would provide some integrity to the heathland

landscape, alongside connections to the acid grassland restoration complex at Sweetbriar.

268. **Pond creation or restoration** (**OP1.14**), **especially of ghost ponds** (**OP1.13**), will improve habitat connectivity between the proposed areas of heathland and acid-grassland expansion in Norwich. Bringing back such habitats would enhance the number of waterbodies for species like GCN, while also managing runoff. Opportunities for ghost ponds are especially viable and important at Harford Park, on Mousehold Heath and on the school grounds and open spaces in Heartsease.

8.4.5 Historic Habitats

269. The key emphasis in this BCA is to maintain these important historic sites, habitats, and species niches, whilst looking for new opportunities to improve and add to the habitat features to benefit priority species and habitat connectivity.

270. **Cutting grassland (where appropriate) using a 'conservation cut' regime, creating areas of meadow where possible** (**OP6.3**) on dry amenity grassland, would help to maximise the variation in sward height and nectar and seed availability in many historic sites. Some degree of conservation cutting in churchyards/cemeteries and small areas of parks and Natural Areas already takes place, so reviewing the ecological effectiveness of current regimes is advised, and a plan to coordinate and increase the use of conservation cuts, could be incorporated into the Parks Regeneration Strategy. There are also equally many opportunities for this change in management on Norfolk CC managed sites.
In this BCA and the Community and Active Spaces BCA there are many options for **appropriate scrub management** (**OP3.1**), allowing areas of scrub to be left in boundary areas that are least accessible, where this would not impact negatively on the risk of anti-social behaviour.

271. An important opportunity for the larger open sites including historic parks and churchyards is to investigate the **feasibility of allocating 10% of green spaces as biodiversity assets, where appropriate** (**OP12.9**). These assets could act as a habitat bank for BNG units, though other factors such as recreation, access, cultural and historic values would need to be considered. These assets would also be one of the best locations for **setting up demonstration areas** (**OP13.7**) to provide an educational value and to showcase exemplar management for biodiversity.

272. Due to the focus on historical value of the Historic BCA, there are limited opportunities for increasing the size of any of the sites, other than through increased priority habitat by improved management. There are however some possibilities to increase the value of sites within the BCA and also opportunities to connect with the outlier areas of the BCA outside Norwich boundary. The sites where the best opportunities lie for **restoration under a more biodiverse and historically sympathetic management regime for parkland/wood pasture (OP9.1a-g)**, due to their proximity to other historic parks and gardens or existing/remnant mature/veteran trees or features include the following: St Clement's Park, Sewell Park Academy, UEA campus, Harford Park and Whitlingham Hall and country park (outside city boundary).

8.4.6 Community and active spaces

273. Adopting **wildlife friendly management practices** at community green spaces represents a significant opportunity to enhance urban biodiversity and potentially save on maintenance costs. A '**conservation cut' regime (OP6.3)**, where possible, significantly increases the biodiversity value of dry amenity grassland and is highly beneficial to flowering plants and insects especially pollinators. **Green edges, trees (including street trees) and hedgerow planting on streets or around the boundaries of green spaces (OP2.7)** would also add to the biodiversity resource. **Rough tussocky grassland creation/management (OP6.6)** at the edges of parks along linear features and within areas of grassland benefits small mammals and birds. **Retaining some fallen leaves in parks for hedgehog and small mammal habitat (OP6.7)** would improve the resource of important hibernation sites and nesting materials for hedgehogs and other small mammals. This is vital as hedgehogs have been in sharp decline over the last 30 years; The State of Britain's Hedgehogs 2018 report showed a decline of a third in urban areas since 2000 (Wilson & Wembridge, 2018), with the worst declines in the East of England, albeit with some improvement shown in the 2022 report.

274. **Creating new habitats** for wildlife is also an important opportunity in this BCA**,** options for which include the following. **Creating native wildflower meadows (OP6.1)** and **habitats for pollinating insects within B-lines corridors (OP6.2)** Consideration should be given to investing in meadow development in amenity grassland areas. There are many ways of doing this but the most cost effective and beneficial are restoration using natural regeneration (if an appropriate seedbank can be accessed) or restoration using green hay (Magnificent Meadows 2023a and 2023b). Restoring green spaces with native perennial species of local provenance is a great way to restore biodiversity and celebrate the local natural heritage of the community. Introducing wildflower areas using wildflower seed from local sites and verges around Norwich will connect Norwich better to the rural hinterland **(OP6.1)**. Using native perennials will also maximise the chances of success and its ecological value. Research has shown that some urban environments can be more valuable to some pollinators than rural habitats (Baldock *et al*. 2015). **Pond creation and restoration (OP1.14)** fringed by unmown grass could be created in community parks, school grounds and churchyards. supporting species within the urban environments, particularly pollinators. **Creating more community gardens, orchards, and allotments where appropriate (OP12.5)**. Allotments have, on average, up to 30% higher species diversity than urban parks (National Society of Allotment and Leisure Gardeners via Norfolk Allotments HAP (Norfolk County Council, 2015). Community gardens have similar value to biodiversity. Along with allotments, these areas are easy to create once suitable land is identified and cost very little to develop compared to other biodiversity opportunities.

275. **Look into the feasibility of allocating 10% of green spaces as biodiversity assets, where appropriate (OP12.9)**. These assets could act as a habitat bank for BNG and would serve as vital sources of school education and general public engagement. Where deemed appropriate, there is the opportunity for school grounds to be more ambitious, allocating 30% for biodiversity by 2030 based on The Wilding School Project

(Underwood, K. & Fidalgo M., 2023). Increasing the amount of land being managed for biodiversity assets will increase the biodiversity value across the city as a whole for both habitats and species and provide important connectivity, important for many species, especially pollinators.

276. **Increased engagement with wildlife in community and active spaces will be vital.** Dedicating even small areas to nature could substantially increase **local community engagement and buy-in (OP13.8).** This engagement and sense of ownership can be further built through **promoting and encourage citizen science projects and wildlife recording (OP13.6). Considering appointing species/site champions (OP13.10)** would also promote appreciation of local wildlife among community members using these spaces. **Installing signage on walking routes and recreation sites to explain management changes and their benefits to biodiversity (OP13.9)**, could make a real difference to public engagement, support and understanding, as would looking into **the feasibility of setting up demonstration areas for good wildlife management within each BCA (OP13.7)**

8.4.7 Green Streets

277. **Collaborative discussion to consider how it could be possible to increase the network of RNRs in Norwich**, with the NCC Environment Service and Highways department to review road verge maintenance regimes, represents an important habitat creation/restoration opportunity in locations that would not impact on road safety (visibility etc). Implementing careful conservation cuts, for example avoiding peak nesting seasons and cutting sections in rotations over multiple years, can allow more verges to develop as meadow grassland **(OP6.4)**. Verges provide vital connectivity corridors across fragmented landscapes. The only Roadside Nature Reserve (RNR) in Norwich is in the Green Streets BCA on Ipswich Road. Small-scale connectivity is vital in this BCA as there is very limited space for new wildlife features. There should be an aim of looking at how it could be possible to increase the network of RNRs in Norwich, where the verge widths are adequate and safe to do so. Additional benefits for wildlife could come from reviewing the suitability of the RNR network for roadside trees and hedges, which could increase the biodiversity value in some locations and for the city as a whole **(OP2.7)**.

278. **Street trees** are an important biodiversity asset within the city and there are a number of opportunities for enhancing this value. **Tree protection through the planning process (OP4.2)** will in this BCA cover street trees and other trees through Tree Preservation Orders (TPOs) (DEFRA, 2014). **Street tree protection on council owned land for biodiversity interest (OP4.1),** is another essential component of this. Street trees and other trees on council land across Norwich should be protected as an essential minimum through TPOs, especially if they are mature, native and in important locations. Any veteran or ancient trees should be protected by TPO as a matter of course and are protected as an Irreplaceable Habitat through BNG guidance and the NPPF. All actions required by law or within the Norwich Tree Strategy (Unpublished), TPO guidance (DEFRA, 2014) or the Norfolk County Council Tree Safety Management Policy should be followed as a minimum (Norfolk

County Council, 2015). Planting additional trees and native hedging, where possible, is also important within this BCA and will buffer urban areas from pollution, climate impacts and noise. This would be especially valuable for linking up to the wooded ridge and a task well suited to conservation groups.

279. **Looking into the feasibility of creating green roofs and walls, where appropriate**, **(OP8.2).** Targeted green roof and wall installation is an effective way of delivering habitat enhancements within urban areas. Where possible green roofs should be living roofs (as termed by Buglife), as opposed to traditional sedum green roofs. The newly installed (mid-2023) bus stop structures along St Stephens Street in Norwich are a good example of living roofs where flowering plants make up the majority of the cover, alongside sedum species. The low nutrient soils are ideal for the wildflowers and plants that attract pollinators and other insects. A wide range of insects associated with dry grasslands will find their way to an extensive green roof. Several ground nesting birds may also take up residence on a green roof depending on its size, location, and character. Starlings in particular, benefit from green roofs, especially where there are significant populations in the city centre and Tuckswood areas and especially beneficial alongside **tree planting for starlings** to roost **(OP4.3).**

    Cambridge City Council has a Green Roof planning policy for all new flat roofs. This could also be implemented in Norwich as part of a Green Roof Strategy/Policy for the city. There may also be opportunities to retrofit biodiverse green roofs on existing council structure such a bin stores or bike sheds and engage with local businesses and organisations to encourage retrofitting **(OP8.2).**

280. **New and restored ponds (OP1.14)** would be beneficial in Green Streets Zone B, especially where residents are keen to do so. Options to restore ghost ponds are likely to be easier and benefit from an existing seedbank. **'Ghost ponds' (OP1.13)** exist in the city centre and airport areas of Zone A, but these unlikely to be viable, due to safety concerns and access. Zone B has many options and should be the focus for restorations. In Zone C opportunities exist in the Lakenham flats areas. Map 20 shows the areas for potential pond creation and restoration.

8.5 Opportunity mapping using the Lawton Principles

281. Opportunities have been mapped based on the four key principles (better, bigger, more, connected) set out in John Lawton's 'Making Space for Nature' report of 2010 which are explained further in Section 1.7. This section explains for each Lawton Principle how acting on those opportunities will benefit biodiversity. It demonstrates how the opportunities mapped for each Lawton Principle have been assigned. Maps showing the opportunities associated with each Lawton Principle are presented for each.

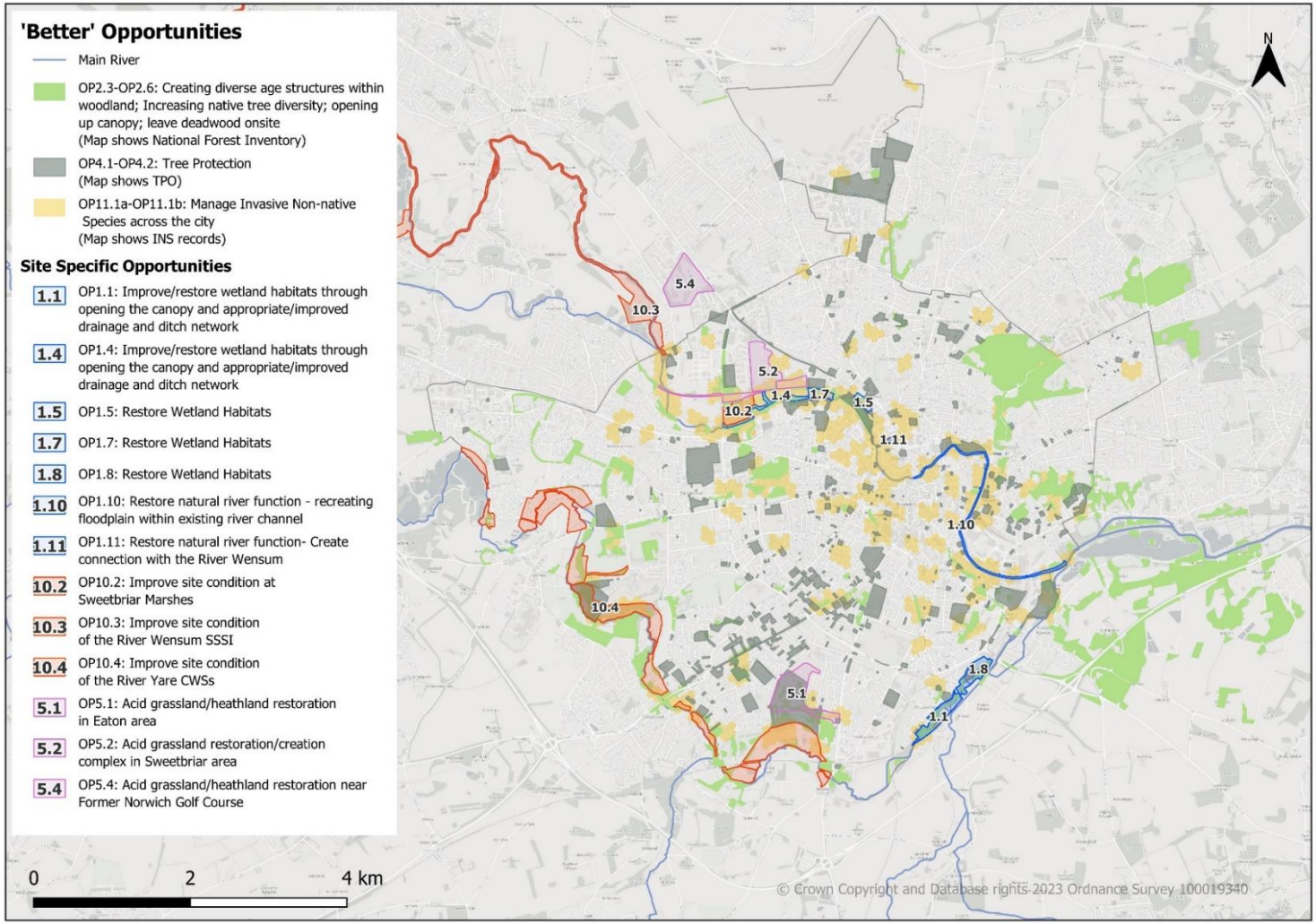
8.5.1 Better

282. Existing sites designated for their wildlife interest are a core component needed to build a resilient ecological network. These sites already support key species and/or habitats, and opportunities should be taken to make these sites as valuable to biodiversity as possible. This existing network of sites has been mapped as part of the Natural Asset (sites and features) Map in Section 3 – Natural Assets, Map 13. An overview of opportunities to enhance these natural assets are presented in Table 11, with full descriptions in Norwich BBS Appendix BBS7 – Threats and Opportunities Table. Map 18 below identifies mappable 'Better' opportunities for Norwich City.

283. A number of opportunities **(OP10.2, OP10.3, OP10.4)** support this Lawton Principle by suggesting actions to improve the condition of designated sites. This will also help to create the resilient ecological network identified by Lawton as critical, as well as meeting a recommended target that 70% of designated sites should be in Favourable or Recovering condition by 2030. Within Norwich, investment in re-survey and ecologically sensitive land management is recommended.

284. Better management of sites can lead to enormous benefits for wildlife and is broadly focused around maximising the range of habitats and vegetation structure at a site. This allows greater availability of food and shelter and ensures greater resilience to environmental changes. Better management can take many forms and varies between habitats which can become degraded in different ways. Mapped **(OP2.3)**, shows where creating woodlands with more diverse age structures, increased native species and a more open canopy could be achieved. Mapped opportunity **(OP11.1)** shows where the data analysis and literature review suggest there are opportunities to control invasive species to benefit native biodiversity. These sites are focused around but not limited to the river corridors BCA.

285. A full list of opportunities identified as 'Better' using Lawton's Principles are provided in Norwich BBS Appendix BBS7 – Threats and Opportunities Table.



Map 18: Mappable 'Better' Opportunities listed for Norwich City.
Unmapped area-wide opportunities can be found in Norwich BBS Appendix BBS7 – Threats and Opportunities Table and consist of: OP number 1.6, 1.9, 1.12, 2.8, 3.1, 5.5, 6.3, 6.5, 6.7, 10.0, 11.2-11.3, 12.4, 13.1

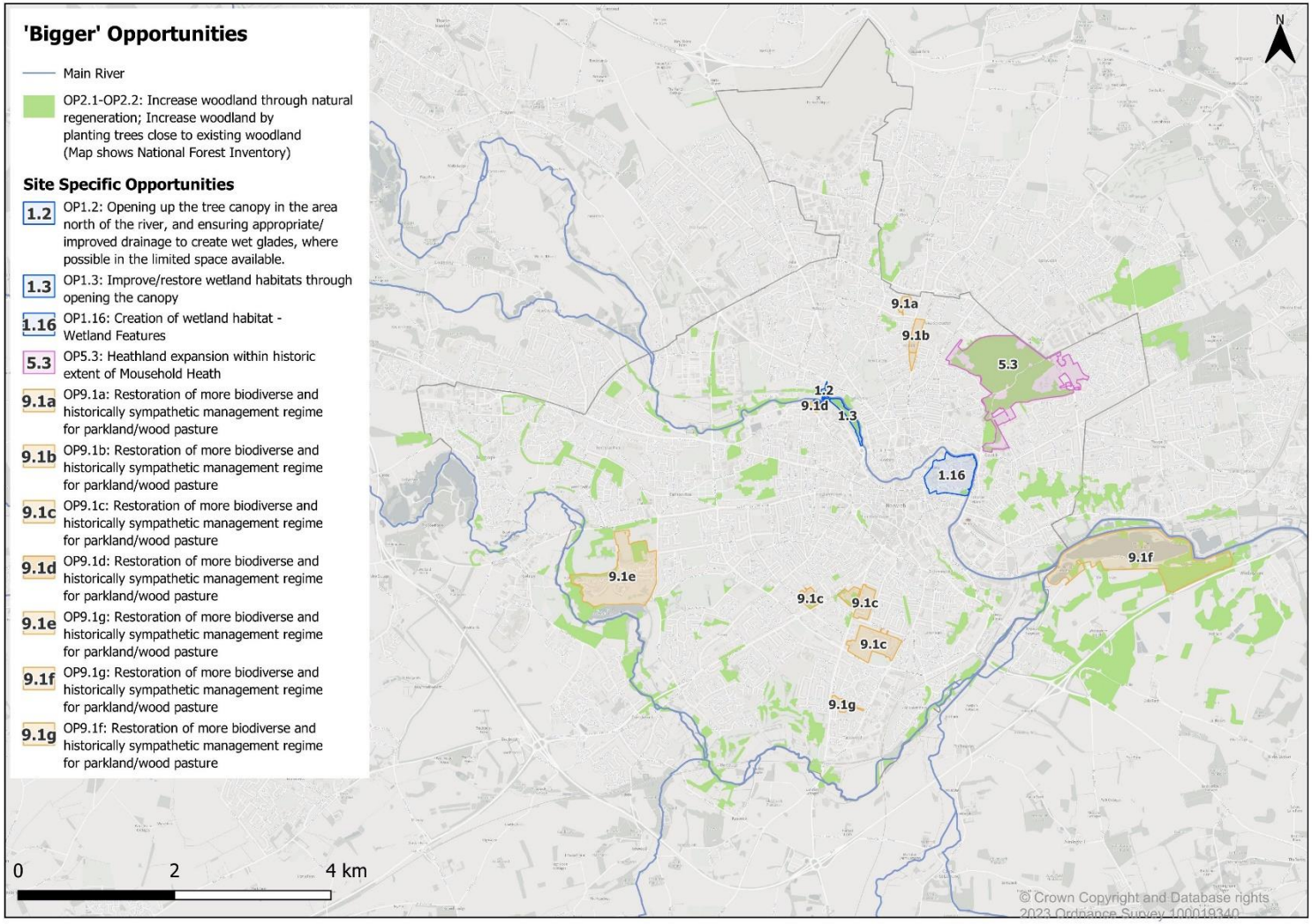
8.5.2 Bigger

286. On average, bigger sites contain more species than smaller ones and can support larger populations of individual species, so they are more resilient. Bigger sites are likely to be more variable in topography, geology and hydrology, providing greater habitat diversity to support more species. They also have proportionally less 'edge' (the edges of habitats are often very different ecologically to the centre, and they can be affected by the management of the adjacent land e.g., crop spraying). Bigger sites are therefore preferable to smaller ones.

287. Reversion to or creation of natural habitats alongside existing sites is a good way to increase site size. Sites can be expanded by extending the existing boundary to bring adjacent habitats under better management or by creating new habitats to increase the existing extent. Map 19 identifies where specific sites across a range of habitats could be expanded across the city (**OP1.16**, **OP1.2, OP1.3**, **OP5.3, OP9.1a-g**).

288. Creating ecotones **(OP9.2)**, (regions of transition between habitats), provides a softer transition between different areas as well as important habitats in their own right, which will often support a high number of species. Ecotones can be created by allowing the regeneration of natural habitats or by undertaking ecologically sensitive management.

289. A full list of opportunities identified as 'Bigger' using Lawton's Principles are provided in Norwich BBS Appendix BBS7 – Threats and Opportunities Table.



Map 19: Mappable 'Bigger' Opportunities listed for Norwich City.
Unmapped area-wide opportunities can be found in Norwich BBS Appendix BBS7 – Threats and Opportunities Table, and consist of OP numbers 8.2, 10.1.

8.5.3 More

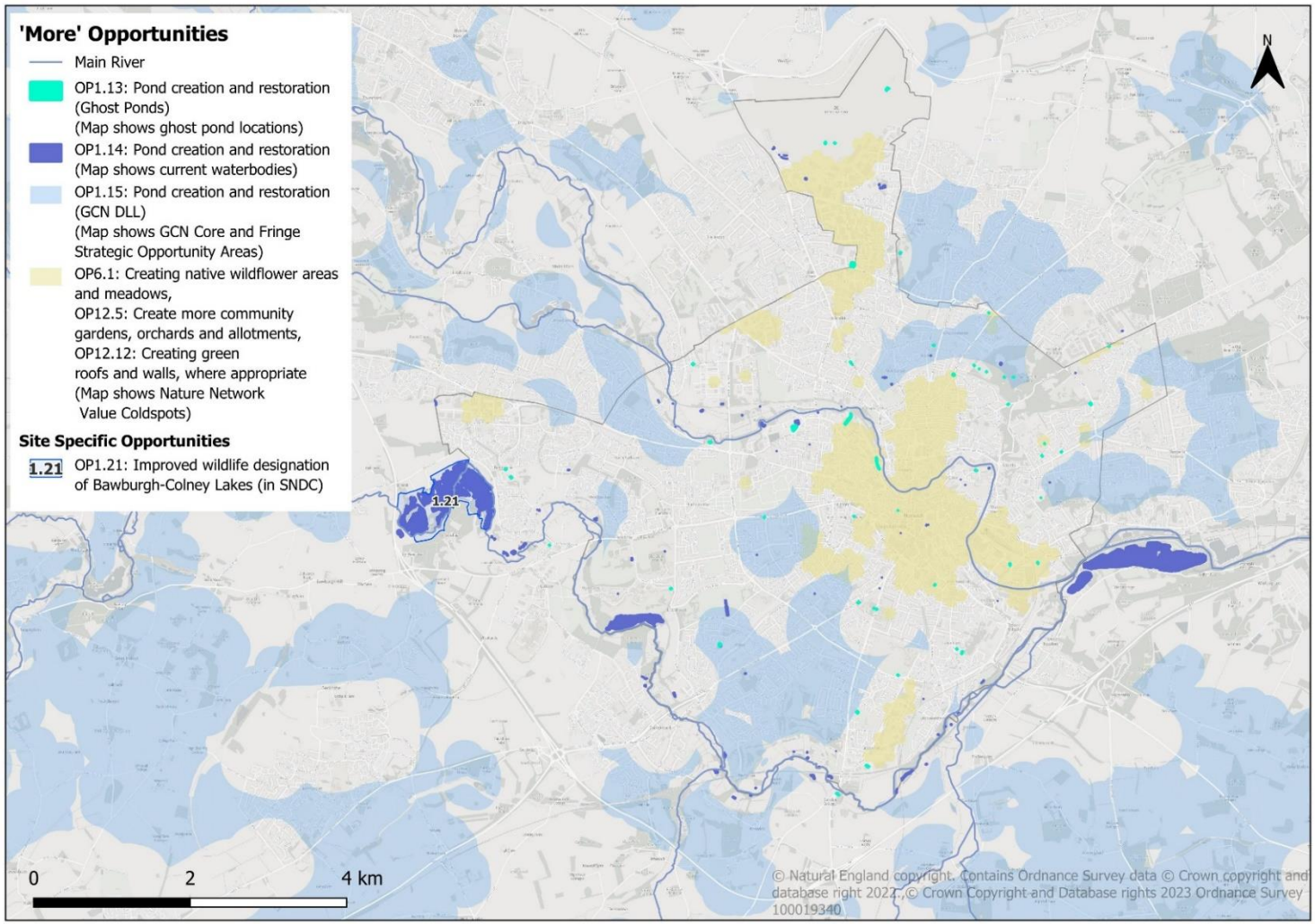
290. The creation of new sites that are managed for wildlife adds value to the overall biodiversity assets of the city. This could be in the form of newly designated sites or small stepping-stone sites that improve connectivity.

291. New sites add to the biodiversity assets of the city by increasing the total amount of natural habitat available. Increasing areas of ecologically significant habitats increases their resilience and helps to support the species of key ecological importance which require them. Opportunities to identify new sites may be limited in the city but could include the reversion of land currently used for other purposes, such as amenity grassland or brownfield sites, to natural habitats.

292. In urban areas, there is also opportunity to add new habitat that supports biodiversity within the built environment. Examples of this include green roofs and walls **(OP12.12)**, wildflower areas **(OP6.1)**, community gardens, allotments and orchards **(OP12.5)**, and nesting sites such as bird and bug boxes **(OP13.3)**. Map 20 shows areas in yellow, identified through work for the development of LNRS (see Norwich BBS Appendix BBS1 – Study Approach and Methodology for methods) where the there is a Nature Network value cold spot and therefore where such measures would have the greatest value.

293. Small stepping-stone sites both add to the overall assets and improve connectivity between existing sites (as per the fourth Lawton Principle – connected – in Section 8.5.4 Connected). The creation of new habitats that add connectivity to the existing network has a greater value than the creation of isolated sites, as they allow species to move between habitat patches. Map 20 shows an example of this through the restoration of ghost ponds **(OP1.13)** and the creation of new ponds (**OP1.14**, **OP1.15**).

294. A full list of opportunities identified as 'More' using Lawton's Principles are provided in Norwich BBS Appendix BBS7 – Threats and Opportunities Table.



Map 20: Mappable 'More' Opportunities listed for Norwich City.
Unmapped area-wide opportunities can be found in Norwich BBS Appendix BBS7 – Threats and Opportunities Table, and consist of OP numbers 1.17, 6.6, 7.1, 12.7-12.9, 13.2-13.3, 13.13-13.14.

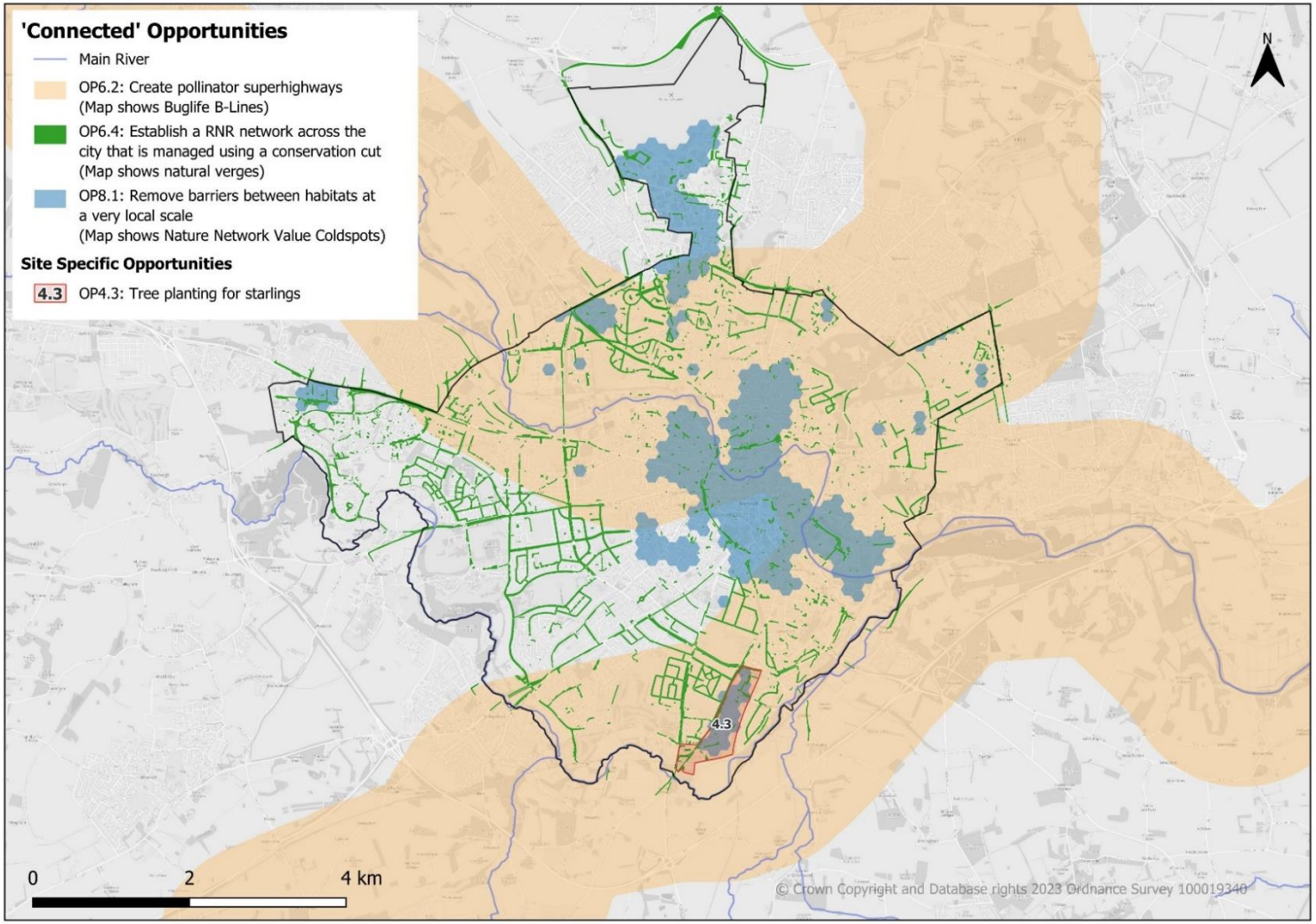
8.5.4 Connected

295. Connectivity refers to the ability of species to move through the landscape between patches of habitat. Habitat loss and fragmentation can reduce connectivity, causing species to become isolated and reduce the viability of populations. As well as supporting the robustness of species populations, improving the quality of the connections also enables natural processes and functions to operate more effectively, for example through water flow. Connectivity exists at many different scales and varies for each species based on their ecology. Some groups like birds are mobile and can move a reasonable distance between sites. Other species like plants are less mobile and are therefore more reliant on closely connected sites to facilitate seed dispersal. Many different landscape features provide connections that aid the movement of biodiversity at a variety of scales, and opportunities should always seek to improve connectivity to build ecological resilience.

296. Stepping-stones are one example of connectivity. These could be large habitat patches located in proximity to existing habitats, small habitat patches such as ponds that form a network in the wider landscape, or, at a very local scale, as wildlife crossings for toads, fish or hedgehogs **(OP9.1)**. Areas that have been identified as "nature value coldspots" with poor connectivity of habitats are shown in Map 21. These areas would benefit most from stepping-stones.

297. Linear features such as railways, rivers and hedges also play a key role. Map 21 shows the existing network for road verges, which is fragmented across the city and would benefit from increased connectivity through the creation of new RNRs **(OP6.4)**. The B-lines superhighways developed by Buglife identify areas where it would be optimal to increase connectivity for pollinators **(OP6.2)**. This could be through wildflower areas **(OP6.1)** or bee hotels **(OP13.3)** for example.

298. A full list of opportunities identified as 'Connected' using Lawton's Principles are provided in Norwich BBS Appendix BBS7 – Threats and Opportunities Table.



Map 21: Mappable 'Connected' Opportunities listed for Norwich City.
Unmapped area-wide opportunities can be found in Norwich BBS Appendix BBS7 – Threats and Opportunities Table, and consist of OP numbers: 1.18, 2.7

8.6 Key Findings

- City-wide opportunities include encouraging actions and behaviour changes that benefit biodiversity through engagement; using planning design principles for biodiversity, and considering actions through BNG, DLL, implementing SuDS and creating B-Lines to support pollinators.

- For the River Corridor BCA, specific opportunities lie in fully coordinating management between marshland sites to restore and create wetlands and floodplains along the rivers Wensum and Yare. This includes opening up canopies, maintaining water levels, creating/restoring ditches/ponds/drains, and, where possible, reverting agricultural land to semi-natural wetland habitat.

- The Wooded Ridge BCA presents chances to improve habitat quality and address the threats that arise from a lack of diverse age structure and the loss of glades and transitional edge habitats. These can be avoided through management practices that mimic natural processes, such as opening the canopy, coppicing, haloing, and selective thinning of vegetation. Aside from improving woodland, there is scope to expand woodland, and council-owned land in proximity to woodland sites should be investigated for expanding tree canopy cover.

- For the Heathland BCA, priority should be to maintain the favourable condition of Mousehold Heath while identifying potential areas to connect/extend heathland in the long-term via restored or created acid grasslands on suitable acidic soils. There is also a strong possibility that plant species of the past, many of which are rare and protected today, could be returned to life by re-excavating ghost ponds and exposing the historic seedbank.

- For Historic Habitats, the priority is to maintain important historic sites, habitats, and species niches. Shifting grassland management to a ‘Conservation Cut’ and focusing on protecting mature and veteran trees, and the species that depend on them (e.g., bats) are key opportunities. Installing bat-friendly lighting across the city would reduce wildlife disturbances and mortality.

- In both Historic Sites and Community and Active Spaces there are opportunities to expand these wildlife refuges, through apportioning at least 10% of open green spaces to biodiversity (where appropriate), creating wildlife ponds, tiny forests, pollinator areas, orchards, and community gardens. This includes historic sites such as churchyards and gardens but more specifically the larger parks, golf course, and playing fields.

- For the Green Streets BCA, opportunities lie in adjusting road verge maintenance regimes to help connectivity. Green and brown roofs on buildings present an opportunity to integrate nature into urban infrastructure, benefiting pollinators and bird life. Engaging residents in wildlife-friendly practices would also be beneficial.

Section 9: Development of a Survey and Monitoring Framework

9.1 Aims

299. This section describes the rationale behind the creation of a Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework), including details of the framework's purpose, structure, and its intended use both as a vital component of the BBS and as a standalone document.

9.2 Overview of Survey and Monitoring Report

300. Effective survey and monitoring are crucial to address gaps in baseline understanding, monitor changes and measure success. This will support the delivery of the bigger, better and more joined up sites and habitats as outlined in the opportunities and recommendations of the Norwich BBS.

301. As part of and alongside the BBS process, a Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework) has been developed. This sets out how to address local gaps in biodiversity data, monitor biodiversity change and measure conservation action success through survey and monitoring.

302. The Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework) sets out a manageable, structured foundation for recording species, sites and habitats across Norwich CC's administrative area. The Framework provides advice on how best to start tracking change and progress towards nature recovery, alongside measuring the success of biodiversity conservation actions taken, particularly the implementation of opportunities and recommendations provided in the BBS. While not intended as a detailed step-by-step set of instructions, the Framework acts as a prioritised formula to work from in developing a Survey and Monitoring Programme, with advice on further study where required.

303. The surveys recommended within the Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework) incorporate insights gained through stakeholder engagement during the BBS project. Surveys have been suggested based on the identified needs from gaps analysis, a review of existing survey and monitoring methods, and the survey and monitoring required to support the delivery of opportunities and recommendations outlined in the BBS. These focus on the requirements to monitor nature recovery, and where survey and monitoring is required under legislation this is identified. A broader range of desirable surveys are also suggested which will, if implemented, provide a more robust and comprehensive evidence base for ongoing decision making. Recommendations made as part of the survey and monitoring framework inform the recommendations in this report.

304. The Survey and Monitoring Framework (Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework) is a key output and integral part of the Norwich BBS. It has been written so that it can be used as a standalone document for relevant practitioners or appraised at the relevant points when reading the BBS and when putting together feasibility studies or a review of next steps for integrating these outputs into the Biodiversity Strategy, its Delivery Plan and wider policies and plans.

Section 10: Recommendations

10.1 Aims

305. This section makes detailed recommendations for Norwich CC, and its relevant partners and associated stakeholders, to take forward regarding opportunities identified. These are grouped under 7 key themes: Governance; Planning; Land Management; Conservation; Public Engagement; Survey and Monitoring (sites, habitats, and species); recommendations for Norfolk Biodiversity Information Service. It should be noted that these recommendations are not binding commitments, but rather suggestions put forward for further assessment and feasibility review as to their viability and fit with overall goals and priorities. Their ultimate adoption would depend on a variety of factors including budgetary constraints, community input, and integration with existing policies and programmes. The sources of the recommendations are shown in Figure 20.

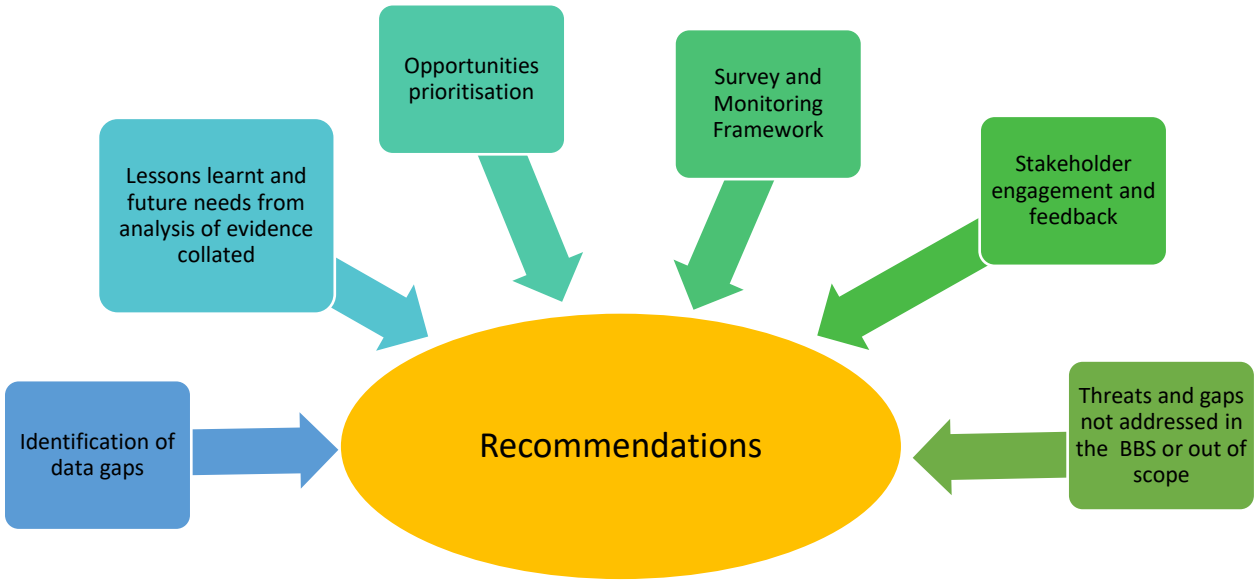


Figure 19: Sources of recommendations

10.2 On Governance

R1. Update the Norwich CC Biodiversity Strategy and Development Plan, Parks and Open Spaces and Tree Strategies in their next reviews, to incorporate key information and actions from this study. Engage the public in relevant outcomes and priorities.

R2. Continue to deliver a step-change in the culture at Norwich CC, ensuring that the strengthened biodiversity duty (Environment Act, 2021) is embraced. Manage parks, open spaces, Natural Areas, designated wildlife sites and council land, with a multifunctional approach, prioritising biodiversity irrespective of site size, quality, or location.

R3. Consider providing training, including site visits, for all appropriate staff including senior managers and contractors to raise awareness and embed R2 into everyday functions.

R4. Consider creating a Natural Assets Group, chaired by Norwich CC, bringing together local bodies for wildlife and open space management.

R5. Consider recruiting staff to coordinate and implement conservation actions, including:
    a. A Project Manager to integrate the BBS with the Norwich CC Biodiversity Strategy and Delivery Plan, Local Nature Recovery Strategy (LNRS) and other policies. Collate and write 5 yearly Biodiversity Reports as per strengthened Biodiversity Duty. Source funding and other resources.
    b. A Volunteer and Survey coordinator to support and help coordinate, where appropriate, volunteering and surveys alongside the Project Manager.
    c. A Biodiversity Opportunities Officer, working with the Norwich Fringe Project, Mousehold Heath manager and the Parks and Open Spaces team to identify pockets of natural areas for biodiversity opportunity delivery.
    d. An ecologist with planning experience (or contracting in this resource from elsewhere), to be based within the relevant planning team but to work across teams, including with the Parks and Open Spaces team, to link planning and conservation action.
    e. Explore a-c recruitment opportunities through the New to Nature (Groundwork, 2023) or similar programmes.

R6. Consider the appropriate time period to conduct a BBS review or produce a biodiversity data assessment. This is recommended to be every five years, aligned with national Biodiversity reporting periods (first being no later than 1st January 2024), to fill gaps and evaluate opportunities, threats and priorities (DEFRA, 2023b).

10.3 For Planners

R7. Conduct information and training sessions on BBS outcomes including strategic significance uplift, BNG units, and statutory credits for relevant opportunities.

R8. Use the BBS as evidence for BNG guidance / supplementary planning document.

R9. Encourage implementation of multifunctional BNG units and statutory credits on publicly owned land, with an emphasis on education and inspiring demonstrations of good practice.

R10. Consider enhanced or expanded community gardens/allotments/orchards as part of strategic planning, as these provide highest biodiversity outcomes in an urban area per money invested.

R11. Use Biodiversity Character Areas (BCAs) as a basis for BNG strategic significance uplift.

R12. Review site locations during the next revision of the local plan, incorporating opportunities identified in the BBS. Integrate appropriate conservation actions into the planning process.

R13. Consider developing a Green Living Roofs and Walls Strategy, including a feasibility study and engagement plan.

R14. Consider developing Green Roof planning policy for all new flat roofs, taking inspiration from examples like Cambridge City Council.

R15. Look into feasibility of requiring, through the planning process, biodiversity friendly building designs that benefit nature recovery; for example through appropriate lighting, bat/bird nest boxes, etc on new developments

R16. Dovetail actioning this study with actioning the emerging Greater Norwich Green Infrastructure Strategy and Local Nature Recovery Strategy (LNRS).

R17. Look in to supporting the development of a Supplementary Planning Guidance (SPG) document for Biodiversity. This could be produced at any scale, but this study recommends at a county-wide scale potentially as part of the LNRS process.

10.4 For Land Managers

R18. Conduct training sessions on study outcomes and the application of relevant opportunities

R19. Explore biodiversity and safety-focused management of roadside verges in collaboration with Norfolk County Council.

R20. Investigate modifying verge and amenity grassland management, to maximise "conservation cut" regimes for biodiversity, while maintaining mown areas for access, health, and safety issues.

R21. Review Norwich CC's parks and open spaces for biodiversity opportunities, including the addition of wildflower areas (using green hay from local sites), ponds and leaving scrub, rough tussocky grassland and fallen leaves in appropriate locations. Ecotones of transitional habitats are preferred.

R22. Investigate the feasibility of managing, where appropriate, some parks and open spaces, communal gardens, and school grounds so that a proportion of the land is managed for natural assets by 2030. Ideally this would be 10% of the site.

R23. Improve awareness of biodiversity by encouraging access, with appropriate signage demonstrating how spaces are being managed for wildlife.

R24. Test any implemented changes in site management on a pilot area before wider roll-out. Use the Survey and Monitoring Framework for guidance.

R25. Investigate targeted tree planting within the wooded ridge on Norwich CC land adjacent to existing sites and include this opportunity within the Council's Tree Strategy.

R26. Conserve and protect priority habitats and species (Section 41 of the NERC Act 2006) as a minimum requirement under law and for conservation action.

R27. Focus on opportunities that restore habitats that have been lost and reconnect up ecological networks. Key habitats to be restored are wetland habitats along both river corridors (especially Hellesdon to Whitlingham along the Wensum), and heathland/acid grassland habitats and parkland and historic habitats in their historic range.

R28. Consider developing an action plan with Norfolk Wildlife Trust aimed at enhancing at least 70% of County Wildlife Sites (CWS) to be in favourable or recovering condition by 2030, which could include updating the River Wensum Strategy to include a Sweetbriar Marshes to Whitlingham 'Floodplain Habitats Restoration Plan'.

R29. Consider conducting a review for habitat restoration potential for all Norwich City owned land, specifically wetland habitats within the Yare river corridor.

R30. Explore the benefits of a River Yare Strategy Partnership, following the Wensum model.

R31. Consider devising a strategy for bat protection in Norwich, focusing on hibernation and other roosts status and management recommendations, especially in regards to underground sites, churches and old buildings, collaboration with Norfolk and Norwich Bat Group.

R32. Consider conducting a rapid woodland assessment of all woodland sites and update management plans to include opening canopy opportunities, for glades and mini meadows, woodland edge species, deadwood, and appropriately managed scrub habitats.

R33. Explore the development of a 'tree planting strategy' for council owned/managed land, integrated into the Tree Strategy

R34. Consider creating an 'acid grassland restoration and creation complex' at Sweetbriar Marshes and Sloughbottom Park working with Norfolk Wildlife Trust and Norfolk County Council. Integrated with the proposed 'Floodplain Habitats Restoration Plan'.

R35. Review opportunities to reinstate ghost ponds.

R36. Continue to remove or appropriately manage Invasive Non-Native Species (INNS) across the city

R37. Consider reviewing the ecological effectiveness of all current conservation cut regimes and developing a plan to add to the emerging Parks Regeneration Strategy for coordinated and ambitious increase in the use of conservation cut regimes of at least the largest and most important natural assets.

10.5 For Wider Public Engagement

R38. Investigate establishing a full 'engagement programme' for delivery of key messages, including targeted activities that focus on specific opportunities in specific areas of the city, such as the "5 key actions for wildlife at home."

R39. Continue engagement started as part of the BBS process, with a view to fostering community buy-in and a sense of ownership towards the opportunities identified and recommendations made.

R40. Encourage the use of more novel approaches to engagement. Examples could include, setting up demonstration areas of good wildlife management practice within parks and open spaces; installing signage to make citizens aware when, where and why conservation actions are taking place for nature recovery; appointing species and site champions as advocates; set up talks and engagement with inspirational wildlife experts

R41. Consider significant campaigns to engage more people in wildlife recording and citizen science projects - tied into the Survey and Monitoring recommendations, especially the species recommendations set out in 10.6.2, R50-59.

10.6 For Survey and Monitoring

10.6.1 Setting up a survey and monitoring programme recommendations

R42. Investigate creating a 'Survey and Monitoring Programme', to implement actions from the Survey and Monitoring Framework to fill data gaps, measure change and monitor success of conservation actions.

R43. Consider conducting a feasibility study to look at the details for implementing recommendations from Survey and Monitoring List, including budget calculation and identification of funding sources as appropriate.

R44. Consider creating a series of key goals and targets/indicators for biodiversity using the information in the Survey and Monitoring Framework which are closely aligned to national environment monitoring targets but can also be used at a local level. These could be integrated in the Biodiversity Development Plan.

R45. Using information from the BBS and support of NBIS and other experts to investigate the creation of an appropriate network of sampling sites and locations within them on which the Survey and Monitoring Programme will take place.

R46. Consider including the requirement for ecological consultants to submit their records to NBIS in planning guidance.

R47. When conducting surveys, consider best practice guidance to conduct a survey both before and after conservation actions, following the BACI survey design approach where possible.

R48. Consider recruiting a Volunteer and Survey Coordinator (linked to R5). This post could coordinate volunteers, help coordinate surveys and the partnerships needed to deliver

them and manage the collation of data and data exchange with NBIS (this is covered more in SMF Appendix SM3 BBS - Guidance on Conducting Wildlife Surveys).

R49. Consider setting up a 'Small Grants Fund' for local groups to apply for equipment, training and resources. [Potentially this fund or some of could be annually sourced from the Norwich Neighbourhood CIL (Community Infrastructure Levy) and agreed with communities.]

R50. Explore the facilitation of a 'Local Groups' Programme' to exchange skills, knowledge, equipment and expertise. Some of which could be facilitated through Lumi.

R51. Source or divert funding to survey and monitoring where appropriate (for equipment, training, support and general resources).

R52. Investigate creating indicators for comparative analysis between successive iterations of the Norwich BBS outputs to provide a mechanism for monitoring change. Ideally these indicators would be agreed prior to revision and shortly after completion of this study.

R53. Explore reporting results from this survey and monitoring framework's activities as part of the Biodiversity Reporting required under the Strengthened Biodiversity Duty , using the recommended report structure (Section 8: Monitoring and evaluating your actions) to capture biodiversity monitoring in one place. Suggested reporting periods for each survey are provided in SMF Appendix SM1 BBS - Survey and Monitoring List.

10.6.2 Species recommendations

R54. Encourage recording at sites that currently have low recorder effort.

R55. Encourage recording at high spatial resolution across taxonomic groups, especially for axiophytes, breeding and roosting birds, rare and scarce species, and species important in planning (including all European Protected Species and badgers, further information see Table 3 in NBIS Best Practice and Ecological Standards).

R56. Encourage targeted field surveys of rare and scarce species, following advice from local experts on identifying key species.

R57. Encourage recording, at high resolution, under-recorded groups e.g., beetles, fungi, lichen, non-vascular plants, and more obscure invertebrates.

R58. Encourage long term monitoring, using, and contributing to standard national schemes/methods to enable change to be measured.

R59. Identify and use improved species indicator lists as they become available.

R60. Encourage the submission of ecological data collected from planning-related survey to NBIS via the BNG planning guidance note/SPD.

R61. Investigate increasing training in species identification skills and survey and monitoring methods, initially focusing on existing volunteer groups, but then also using wider engagement to increase the number of committed volunteers.

R62. Aim to ensure all records generated from the survey and monitoring programme are collated and submitted to NBIS as well as national schemes.

R63. Continue to support the work required to annually monitor all species protected within the planning system that need licensing to survey and mitigate. It is imperative that all existing and new sites for great crested newt in Norwich are monitored annually.

10.6.3 Sites recommendations

R64. Aim to Incorporate the Ancient Woodland Inventory update into the baseline data when available.

R65. Extract relevant information from site management plans from the Parks and Open Spaces Team, as well as those for churchyards and cemeteries where they exist, to include in the next revision of the baseline study.

R66. Site surveys which reference the biodiversity interests and how they will be protected and enhanced are recommended to inform management plans for each site.

R67. Consider setting up a Service Level Agreement (SLA) with Norfolk Wildlife Trust to fund an ongoing Local Wildlife Site survey, monitoring, and advice programme.

10.6.4 Habitats recommendations

R68. Support improvements to the LNRS habitat map through encouraging targeted field survey and the consideration of the use of historic mapping datasets, geodiversity, geology, and soils data, all of which have been vital to the development of the BBS.

10.7 NBIS recommendations

R69. Source and collate records not currently on their database – National Biodiversity Network (NBN)/iRecord, consultants, volunteer groups etc.

R70. Work with species experts to ease current bottlenecks in verification of volunteer/citizen science data.

R71. Lead on the coordination of records data flow to ensure all records from survey and monitoring are submitted to NBIS for quality control, before being made available to Norwich CC and other decision makers.

R72. Set up a Data Exchange Agreement or Data Sharing Agreement between NBIS and Norwich CC.

Section 11: Further developments of the study

11.1 Introduction

305. This BBS comprises and presents information covering baseline data collection, analysis and identification and prioritisation of opportunities. To be useful this information needs to be reviewed and integrated into the relevant activities of Norwich CC and acted upon through changes to policies and plans but most importantly, where feasible and appropriate delivered through on-the-ground conservation action. A starting point for these 'next-steps' is to create an action plan (or add to an existing one) and running feasibility studies/cost-benefit review for the implementation and delivery of opportunities and recommendations made in all the final BBS documentation.

306. To achieve these next steps, it is advisable to conduct further analysis and extend the work beyond the initial scope of the study. Suggestions for further developments are outlined below.

11.2 Baseline data collection and presentation

307. Conduct periodic updates to the study addressing data gaps (recommended every 5 years), by incorporating updated and additional data sets.

308. Consider undertaking the recommendations made to address the data gaps identified as part of this study, alongside appropriate partners including NBIS.

309. Consider in relation to the BBS, any emerging evidence from the final Habitat Map created by Natural Norfolk which will supersede the Living England and Norfolk Living Maps.

310. Update this study, especially the identification of biodiversity hotspots, in accordance with anticipated legislative definitions of 'Irreplaceable habitat', and changes in designations following the Norfolk update of the Ancient Woodland Inventory.

11.3 Further Analysis and interpretation of the data

311. Engage with LNRS process where there are opportunities to improve the BBS mapping, including of opportunities where more detailed ecological connectivity, network or opportunity mapping occurs. Detailed mapping is outside the scope of this study and is difficult to undertake in the urban environment due to lack of semi-natural habitat and fragmentation caused by the built environment.

312. Look into running statistical analysis to remove the influence of recorder effort at the Norfolk scale, focusing on specific species groups. However, this analysis depends on the amount and type of records held for the species and would ideally require a substantial number of high-resolution records for accurate results.

313. Implementing statistical programs such as FRESCALO is out of scope of this baseline study, but it is recommended that use of FRESCALO is investigated as part of the LNRS process, to

examine recorder effort impacts on county-level data (Biological Record Centre, 2024). More information about the FRESCALO analysis principals can be found in Hill 2011.

314. Consider a detailed analysis and/or modelling of other threats to biodiversity, such as those associated with climate change, land use change, and pollution.

11.4 Prioritisation scoring of opportunities

315. To provide a way of prioritising opportunities into more manageable categories a scoring matrix of 'importance of action' vs 'feasibility within timescales' has been applied in this study. The prioritisation scores of this study or subsequent studies should undergo review as part of the feasibility work and also periodically within the context of Norwich City's, and other partners', resource availability and other policy priorities. Additionally, it should consider the resource capacity of teams likely to lead, coordinate or implement on conservation actions.

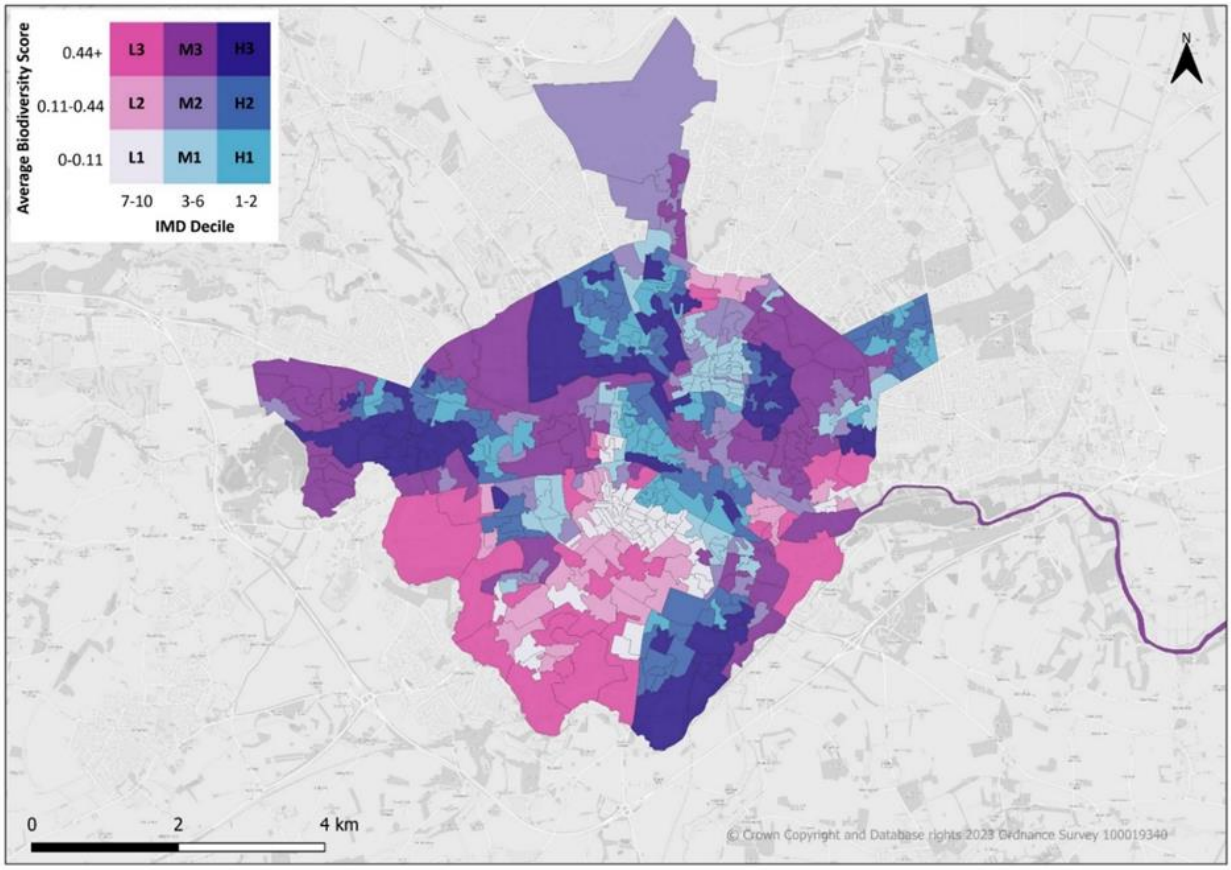
11.5 Feasibility assessments and creating an action plan

316. NBIS will continue providing ongoing support in interpreting data and methods of analysis used to assist decision makers. Supporting the development of a delivery plan is outside the scope of this study but could be part of future work integrated with LNRS or via specific Service Level Agreement (SLA) with NBIS/Natural Norfolk.

317. A feasibility study or series of feasibility studies is recommended to look at how the opportunities and recommendations identified as part of this study, could be implemented and delivered as conservation actions. Including cost-benefit analysis would be useful to refine prioritisations for action, as would engaging with external partners who could lead on delivery. Identifying potential funding streams would also be important and working with external partners would also be beneficial for this. This would form the basis of a funding model to resource projects aimed at restoring and preserving nature.

318. Piloting some of the actions recommended is encouraged, particularly those related to changes in management such as retrofitting of habitat features. This enables project successes and lessons learned to be considered before wider project rollout.

319. Map 22 is another potential tool that can be used as part of the feasibility work. This map is based on work undertaken by NBIS for Wild Anglia Local Nature Partnership (LNP) in 2012, inspired by the work of Natural Economy Northwest, which looks at the relationship between the hotspot's of biodiversity importance/value data and the Index of Multiple Deprivation (IMD) data at the Output Area scale. This type of mapping is useful in this context as it provides a tool ('socio-economic tool for spatial resource deployment of conservation action') to identify where resources spent on biodiversity opportunity actions are most needed and will have the biggest benefits for nature. Opportunities in areas of lowest biodiversity score and highest deprivation score could be suggested as receiving higher priority. Potentially this map could be used to provide an uplift to the priority scores already provided or at least identifying the most important areas of the city spatially that certain opportunities could be implemented in the short-term.



Map 22: 'Socio-economic tool for spatial resource deployment of conservation action'. The map uses Biodiversity Scores and IMD Decile for Output Areas across Norwich[14]

320. It is useful to have a resource to turn to, that provide best practice and guidance when looking into implementing opportunities identified in this BBS, that is relevant across all BCAs. Resources created and actions tested in a number of urban areas across England through the Future Parks Accelerator (FPA) programme, has been instrumental in showcasing the value of investing in urban green spaces, specifically it provides best practice and learning to better manage urban green spaces. The collaborative efforts of local authorities participating in the initiative have resulted in crucial recommendations and best practice to enhance the utilisation of green areas in urban environments. These recommendations include incorporating health into green space strategies, promoting biodiversity through urban nature networks, encouraging social entrepreneurship for income and job opportunities, and developing new sources of investments such as habitat banks. (The National Lottery Heritage Fund, 2022)(Future Parks Accelerator, 2023a).

321. The Future Parks guidance provides a clear framework for utilising data to map and address environmental injustices like access to green space and health outcomes. Targeted community engagement and investment in green spaces, parks, trees, and nature-based solutions in the areas of greatest need can significantly improve public health outcomes,

[14] Subject to the same caveats and exclusionary principles as biodiversity hotspot methodology, plus: temporal differences between the two datasets (IMD data from 2019, and a broader range for species and habitat data); biodiversity hotspots have been aggregated to the LSOA level for comparison against IMD data, leading to data smoothing effects and potential issues with data apportionment.

climate resilience, and quality of life for disadvantaged residents (Future Parks Accelerator, 2023c). In addition to actions taken as part of this study, the development of the GNGI and LNRS Strategies will also contribute to actions in this area. Resources created and actions tested in several urban areas across England to provide best practice and learning to better manage urban green spaces include:

- Habitat bank set up by Plymouth City Council (Future Parks Accelerator, 2023d)
- Future Parks Habitat Banking Guide (Future Parks Accelerator, 2023e)
- Future park Develop an Urban Nature Network Guide (Future Parks Accelerator, 2023b)

322. Following the feasibility review process, there will likely be a reprioritised set of opportunities that can become biodiversity conservation actions to be included in the Biodiversity Strategy Development Plan, BNG guidance and policies. These actions are likely to need to be included in other policies, plans and strategies across the council, its partners, and third-party stakeholders to deliver on engagement, housing and other objectives set out in these actions. It is suggested that other elements of the BBS study, including but not limited to the recommendations (Section 10: Recommendations), Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework and the guidance and ecological rationale within Norwich BBS Appendix BBS7 – Threats and Opportunities Table, will be useful to bolster, update, improve, and provide more detail to:

- The Norwich CC Biodiversity Strategy.
- Norwich CC Parks Regeneration Strategy.
- Norwich CC Tree Strategy.
- The Local Nature Recovery process.
- and potentially most significantly:

323. The strengthened Biodiversity Duty (DEFRA, 2023c) that requires local authorities to provide Biodiversity Reports every 5 years (DEFRA, 2023b), showing the policies and actions carried out to comply with the duty, communicating what the authority is doing to improve the environment and to show positive changes it is making.

11.6 Ongoing NBIS Involvement

324. As a Local Environmental Records Centre, NBIS is experienced in the collection, collation and management of biodiversity data. As such it is well placed to advise on how survey and monitoring data should be collected and formatted to ensure it is as useful as possible.

325. NBIS also have a wide network of contacts, including experts in species recording and other environmental professionals. Working alongside these expert contacts, NBIS can advise on sampling site selection and survey techniques. NBIS can provide distribution maps to support specialist recording interests and to identify specific gaps in taxon groups that need to be addressed. NBIS will work with their contacts to mobilise existing biodiversity data that is currently not available, including data from iRecord and the NBN Atlas.

326. All data submitted to NBIS are validated and then verified by species experts before being made available to decision makers and other enquirers. All records collected through survey

and monitoring should be submitted to NBIS
(as is good practice), using a mutually agreed method, to undergo this quality control process. Establishing a Data Exchange Agreement or Data Sharing Agreement between NBIS and Norwich CC will help to clarify this process. NBIS will also work with species experts to resolve current bottlenecks in verification and ensure that verified records are made available to Norwich CC in as soon as possible.

Section 12: Conclusion

12.1 Key messages from the study

327. This study demonstrates that Norwich City has important natural assets, supporting a wide range of species including those identified as priority and protected. The city also supports a number of priority habitats including, heathland, woodland, rivers and ponds and has 44 designated sites with a biodiversity focus. It will be important to ensure that these assets continue to be well-managed and maintained (where this is the case), as well as being improved where they are not currently managed to a high standard. The study has also identified areas of 'irreplaceable habitat' in Norwich City, namely ancient woodland, veteran trees and lowland fen, which if lost could not be replaced and therefore need to be protected as a priority.

328. The results of this biodiversity baseline study conclude that, in addition to protecting the natural assets of significant biodiversity value that already exist in Norwich City, there is a need to:

    a) enhance and maintain existing areas of high biodiversity value
    b) expand, connect and create new sites and habitats of biodiversity value,
    in line with the prioritised opportunities identified for each of Norwich City's Biodiversity Character Areas (BCAs), identified as part of this study.

329. Table 12 summarises the key conclusions of this study for each of Norwich City's BCAs, in line with the Lawton Principles of 'more, bigger, better and joined up'. Application of the Lawton Principles will ensure that Norwich City remains aligned with action being taken at a national level. The use of BCAs enables strategic planning and resource allocation whilst still taking account of the local environmental context. The following conclusions should be read in conjunction with the recommendations detailed in Section 10: Recommendations.

Table 11: Summary of key findings by BCA

BCA	Summary of key conclusions
River corridors	For Norwich City's River Corridors BCA, specific opportunities lie in better coordinating management between sites to restore and create wetlands and floodplains along the rivers Wensum and Yare. This includes opening up woodland canopies, maintaining water levels, creating or restoring ditches/ponds/drains, and, where possible, reverting agricultural land to semi-natural wetland habitat. Specific sites where these opportunities lie in Norwich City include Sweetbriar Marshes, Train Wood, Anderson Meadow, and the Cathedral Precinct.
Wooded Ridge	The Wooded Ridge BCA presents chances to improve habitat quality and address the threats that arise from a lack of diverse tree age structure and the loss of glades and transitional edge habitats. These can be avoided through management practices that mimic natural processes, such as opening the canopy, coppicing, haloing, and selective thinning of vegetation. Aside from improving woodland, there is scope to expand woodland - locations in proximity to woodland sites should be investigated for expanding tree canopy cover, including Tuckswood Hall Road and Harford Tip.
Heathland	For the Heathland BCA, priority should be to maintain the favourable condition of the Mousehold Heath complex while identifying potential areas to connect/extend heathland long-term via restored or created acid grasslands on suitable acidic soils, including sites around Sweetbriar Marshes, Sloughbottom Park and Eaton. Feasibility reviews should be conducted for both donor plants and receiver sites. There is also a strong possibility that plant species of the past, many of which are rare and protected today, could be returned to life by re-excavating ghost ponds and exposing the historic seedbank.
Historic Habitats	Regions with greater historical continuity (e.g. parts of the Wooded ridge containing Lion Wood/Mousehold Heath, historic parklands and churchyards) displayed higher biodiversity values than even some present-day designated sites, highlighting the ecological value inherent to minimally disturbed legacy ecosystems. For the Historic Habitats BCA, the priority is to maintain important historic sites, habitats, and species niches. Grassland should be managed, where possible, with a shift to a 'conservation cut' and focus should be protecting mature and veteran trees, and the species that depend on them (e.g. bats). Installing bat-friendly lighting across the city would reduce wildlife disturbances and mortality.
Community and Active Spaces	For both the Historic Habitats and Community and Active Spaces BCAs there are opportunities to expand wildlife refuges, through a coordinated approach of apportioning at least 10% of open green spaces to biodiversity creating wildlife ponds, tiny forests, pollinator areas, orchards, community gardens etc. This includes historic sites such as churchyards and gardens but more specifically the larger parks, golf course, and playing fields.
Green Streets	For the Green Streets BCA, opportunities lie in adjusting road verge maintenance regimes to help connectivity. Green and brown roofs on buildings present an opportunity to integrate nature into urban infrastructure, benefiting pollinators and bird life along with engaging residents in wildlife-friendly practices, such as creating habitat using tubs, baskets, pots, and walls.

12.2 Overall conclusions

330. As a result of bringing together existing data and information on biodiversity in Norwich, it was concluded that gaps in the evidence base exist, which have a limited to moderate impact on the overall baseline. As part of Norwich Biodiversity Baseline Study Annex 1 Survey and Monitoring Framework produced as part of this study, recommendations have been made on how these gaps can be addressed and how long-term survey and monitoring to assess changes in biodiversity and monitor conservation success can be established.

331. Finally, this study is a baseline and does not have an action plan as one of the outputs. As such, delivery requires further decisions to be made by Norwich CC and other stakeholders to review these opportunities, through the appropriate considerations of, for example, feasibility studies, cost-benefit analysis, policy prioritisation, and resourcing implications.

Section 13: Definitions table

Table 12: Definitions table

Term	Definition
Ad hoc records	Where a species is recorded in an impromptu manner, rather than following a structured sampling or monitoring protocol.
Ancient Tree	A tree that has surpassed the typical lifespan of its species. This lifespan varies from species to species ranging from 150 years old for Birch to 800 or more for Yew. These trees are in the third and final stage of its life, and are highly significant in both ecological and cultural terms. (Woodland Trust, 2023)
Ancient Tree Inventory	A Woodland Trust scheme to document and preserve trees in the UK that are defined as Ancient. Volunteers are encouraged to submit sightings of old trees which are then assessed and verified by an expert.
Ancient Woodland Indicator Species	The majority of Ancient Woodland Indicator Species lists are based on vascular plants including flowering plants, native conifers and ferns. These species are referred to as Ancient Woodland Vascular Plants (AWVP) and their abundance, measured by AWVP scores, is frequently considered in conservation efforts. Indicator species lists have also been developed for some areas using Bryophytes (mosses) and epiphytic lichens (those which grow on trees).
Ancient Woodland Inventory	An inventory that documents Ancient Woodland sites in England. Ancient Woodland is identified from old maps, name and boundary information, ground survey and aerial photography.
Area of Outstanding Natural Beauty (AONB)	Land protected by the Countryside and Rights of Way Act 2000 (CROW Act). It aims to protect the land to preserve and enhance its natural beauty.
Asset map	A map which collates all sites of biodiversity value for the city, including designated sites, locally important sites, parks and open spaces, access routes with biodiversity value and significant mature trees.
Axiophytes	Species, often termed "worthy plants," that constitute as indicators of ecologically significant habitats, aiding in the determination of conservation priorities. They are selected based on criteria such as their predominant association with conservation habitats, uncommon occurrence (recorded in less than 25% of tetrads), historical decline, moderate rarity, ease of identification, and representation of diverse habitats (Norfolk Flora Group, 2023).
B-lines	A series of ‘insect pathways’ running throughout Great Britain. These pathways are created to connect existing wildlife areas and enable the

	migration and dispersal of key insect species across fragmented landscapes (Buglife 2023b).
Biodiversity Action Plans (BAPs)	The UKBAP was published in 1994 in response to the Convention on Biological Diversity. Local BAPs were produced to provide a local response to the national plan. BAP was superseded by Priority Species and Habitats in 2012.
British Geological Survey (BGS)	A partly publicly funded body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research.
Biodiversity	The variety of plant and animal life on Earth or in a particular habitat. A high level of biodiversity is considered to be important and beneficial for maintaining and supporting ecosystems.
Biodiversity Character Areas	Using National Character Areas as a basis, these are thematic character areas with consistent attributes. They were created to profile Norwich's biodiversity value into spatially contiguous, locally distinctive, and thematically consistent areas, based on natural features and delivering on a common set of needs.
Biodiversity Duty	Strengthened by the Environment Act 2021, this states that public authorities must: • Consider what they can do to conserve and enhance biodiversity. • Agree policies and specific objectives based on their consideration. • Act to deliver their policies and achieve their objectives.
Biodiversity hotspots	An area characterised by a high level of biodiversity.
Biodiversity Net Gain	An approach that aims to leave the natural environment in a measurably better state then it was before it was developed (DEFRA, 2023e).
Biota	Refers to the full array of living things that exist within a specific ecosystem or habitat; it encompasses the flora and fauna within an area, from large animals down to microscopic bacteria and archaea.
Bryophyte	Are small, non-vascular land plants such as mosses, liverworts, and hornworts that reproduce via spores and depend on moisture to survive.
Characteristic	Species that either exemplify or are expected to be present within a Biodiversity Character Area.
Charismatic	Species that have popular appeal, often used to gain public support of environmental goals. These are generally large recognisable species and comparatively well-recorded.

Citations	A document for each protected site, usually detailing a description of the site and the reason for its designation.
Data currency	How current the data is relative to the time it was created or last updated. Having data with good currency means it accurately reflects the most recent state of what it describes.
Data resolution	The precision and accuracy of spatial information associated with the record. For example, a low resolution record may consist of four-figure grid reference which indicates the species has been recorded somewhere within a 1km x 1km square. In contrast a high resolution record, may provide a ten-figure grid reference which indicates the species has been recorded somewhere within a 1m x 1m square.
Diamicton	A sediment, originating from terrestrial rocks, that is unsorted to poorly sorted and contains particles ranging in size from clay to boulders, suspended in an unconsolidated matrix of mud or sand. Often associated with glaciation.
District Level Licencing	Replaces previous mitigation licences required for development affecting Great Crested Newts (GCN). Planning applications do not now need to include the need for surveys of GCN or plans to carry out mitigation work to move newts to safety. Instead, Natural England measures the impact of the proposed development on GCN, assesses the cost of compensating for the impact through new or improved ponds for GCN, and issues an IACPC (Impact Assessment and Conservation Payment Certificate) to the developer if the development is suitable for DLL.
Dry valley landform	A valley which has developed on permeable rock such as chalk or limestone that does not regularly have surface water flow.
European Protected Species	Species listed on Schedules 2 and 5 of the Conservation of Habitats and Species Regulations 2010.
Fluvial	Sediments that have been deposited by a river or stream.
GCN Strategic Opportunity Areas	Using GCN data modelling, Natural England have produced GCN Strategic Opportunity Areas which predicts suitable habitat areas to target for compensation ponds.
GCN Risk Zones	Using GCN data modelling, Natural England have produced GCN risk zones showing where GCN are likely to live and so where development is discouraged.
Genus	A group of closely related species exhibiting similar characteristics and are categorised based on similarities in their anatomy, genetics and evolutionary history. E.g. Pipistrelle bat species (*Pipistrellus sp*.)

Geodiversity	The variety of rocks, fossils, minerals, natural processes, landforms, and soils that underlie and determine the character of our landscape and environment.
Geospatial data analysis	Collection, combination and visualisation of various types of geospatial data.
Ghost pond	A body of water that once existed but is now absent from the landscape. These ponds are often documented on OS 1st edition maps and have typically been filled in or overgrown over the years. They represent ideal sites for pond restoration efforts, as they retain an historical seedbank that, once exposed by sediment removal, allows natural regeneration to occur.
Glacio-fluvial outwash plain	A landform created by the action of glacial meltwater. They are expansive, generally flat areas.
Green Infrastructure	A network of multi-functional green and blue spaces and other natural features, urban and rural, which can deliver a wide range of environmental, economic, health and wellbeing benefits for nature, climate, local and wider communities and prosperity.
Habitat Condition	An assessment of the state of a habitat by measuring variation in the quality of habitat parcels of the same habitat type. This is often linked to past and present management and land use.
Historic Landscape Character Areas	A method of identifying and interpretating the diverse historical features within an area that goes beyond individual heritage assets to understand the entire landscape. It involves identifying geographically distinct areas with unique historic environment characteristics.
Historical extent	The past geographical range or boundary where a particular feature or habitat existed before any alterations or changes occurred. Restoration of such habitats in a location where they were previously located is typically more successful due to the presence of historic seedbanks or remnant features of the original habitat.
Index of Multiple Deprivation (IMD)	A measure used by the UK government to assess relative levels of deprivation across small geographic areas called Output Areas. The IMD ranks every Output Area in England from 1 (most deprived) to 10 (least deprived) based on income, employment, education, health, crime, barriers to housing and services, and living environment.
Indicator species	An organism whose presence, absence or abundance reflects a specific environmental condition.
Invasive non-native species	Species, often found in riparian or aquatic environments, that have been introduced into rural areas either deliberately or accidentally. These species typically exhibit generalist behaviour, thriving in a range of soil qualities or preying on a whole suite of prey. The concern lies not solely in their non-native status, but rather in their invasive nature, easily spreading through water, grazing animals or human activities.

Landscape scale	Working collaboratively, at a large scale, to deliver more benefits for the environment and people.
Lawton Principles	A result of the 2010 'Making Space for Nature' report by Sir John Lawton which recommended the principles of making wildlife sites bigger, better, and more joined up to help rebuild nature to reverse biodiversity declines, preserve ecosystem services and adapt to climate change (Lawton, 2010).
Local Nature Recovery Strategy	A local nature recovery strategy is a strategic plan developed by local authorities, communities and partner organisations to identify opportunities and priorities for restoring and connecting nature across a defined geographical area (DEFRA, 2023f)
Metapopulation	Distinct groups of a single species that are geographically separated but connected by movement or dispersal between the groups.
National Character Area	A description of the ecological, cultural, and landscape attributes that define the local natural character of a specific geographical area in England (Natural England, 2014)
Nationally Rare	Species that have been recorded in 15 or fewer hectads across Britain, this accounts for 0.5% of Britain's 10km grid square network. As such, nationally rare species have highly restricted ranges and small surviving populations making them extremely vulnerable to extinction.
Nationally Scarce	While not as limited in distribution as nationally rare, these are species that are found in between 0.5 and 3% of Britain's 10km grid square network. Nationally scarce species fall into one of two subcategories - "Notable A" and "Notable B" - depending on their frequency of occurrence: • Notable A: species recorded in 16 to 30 hectads • Notable B: species recorded in 31 and 100 hectads. A status of Local is also sometimes used, referring to species found in between 101 and 300 hectads.
Nature Recovery Networks	An initiative to enhance and restore biodiversity across the country by creating a connected network of habitats that support wildlife and ecosystems (DEFRA & Natural England, 2022).
Nature Network Value Cold Spot	A term derived through work for the LNRS to assign values to broad habitats based on their general nature-friendliness and value to connectivity. 'Colds spots' represent statistically significant areas of low connectivity and permeability to nature.
Nearest neighbour analysis	A method used to assess connectivity within a landscape. It measures the spread or distribution of something (e.g. sites or habitats) over a geographical space.

Periglacial	Where the landscape has been modified by freezing and thawing processes, often at the edges of past glaciers.
Permeability	The degree to which a landscape facilitates the movement and dispersal of species. A more permeable landscape allows for better connectivity between habitats for species dispersal and connectivity. The most permeable landscapes are those that are the most natural, whilst the least permeable landscapes are those with artificial hard surfaces or habitats of poor biodiversity value, such as amenity grasslands.
Phase 1 survey	A Phase 1 habitat survey is generally the first survey undertaken at a site and is often akin to a site assessment.
Positive Conservation Management	Appropriate ongoing habitat management and monitoring activities taken to sustain, benefit or improve the ecological objectives of the local site as informed by the Single Data List. The Single Data List is a set of government mandated indicators used to monitor progress and track environmental priorities across the UK, including sites in positive management. (DEFRA, 2012).
Prioritisation matrix	A tool to help prioritise tasks or goals (here, biodiversity opportunities) based on two factors—importance and timescales for implementation.
Priority habitats (Habitats of Principal Importance)	Habitats listed under section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act.
Priority Species	Species listed under section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act.
Recorder effort	The frequency of visits to a site for the purpose of biological recording. This effort may vary across different areas with potential bias towards recording at more aesthetically pleasing or ecologically interesting sites, perhaps with more 'interesting' species to see. The level of recorder effort can influence the recorded biodiversity of a site, with frequently visited locations appearing more biodiverse than those that are infrequently visited, even if the actual biodiversity is not necessarily higher.
Registered Parks and Gardens	Historic England's authoritative record of Parks, gardens and other planned open spaces across England that are designated as being of national importance based on their special historic significance. The 'Register of Parks and Gardens of Special Historic Interest in England', established in 1983 (Historic England, 2023).
Remotely sensed habitat data	Habitat mapping created using algorithms to analyse various types of satellite imagery combined with some field data and OS MasterMap boundaries. The algorithm classifies each map pixel based on the likely presence of a habitat using a set of rules. This process generates a habitat probability map for the area.

Ruderal	A plant that thrives in man-made environments, often characterised by disrupted soil and disturbed conditions. They are adapted to colonise areas with high levels of human activity such as human dwellings, agriculture and waste ground.
Saprophytic	An organism that lives on dead organic matter.
Semi-natural habitat	A habitat that has been altered by human activities, but retains elements of its natural composition and structure, including species that occur naturally in the area.
Species	A level of biological classification comprising related organisms that share common characteristics and are capable of producing fertile offspring e.g. Common Pipistrelle (*Pipistrellus pipistrellus*).
Species assemblage	A group of species existing together in a particular habitat.
Species of Conservation Concern	Species that are rare, threatened or protected by law.
Species richness	The number of different species represented in an ecological community, landscape or region.
Statutory designations	Where a site is protected by legislation established by government authorities due to its biodiversity and/or geodiversity value.
Sub Species	A rank below species, used for populations that live in different areas and vary in size, shape, or other physical characteristics, but that can successfully interbreed e.g. the Brent Goose, *Branta bernicla* has three subspecies: the Dark-bellied (*Branta bernicla bernicla*), the Pale-bellied (*Branta bernicla hrota*) and the Black Brent Goose (*Branta bernicla nigricans*).
Taxonomic groups	A cluster of organisms from the same or closely related taxonomic categories, which could be at levels like class, order or family, that are classified as a unit based on their evolutionary relationships and characteristics. e.g. birds, mammals, vascular plants, beetles etc.
Tree Preservation Order/ Trees in conservation areas	An order made by a local planning authority to protect specific trees, groups of trees or woodlands due to their amenity value. Such trees cannot be cut down, uprooted, lopped, damaged or destroyed without the authority's written consent. Trees in conservation areas (designated as such for their historic value) are similarly protected, requiring consent for work on the trees to proceed (DEFRA, 2014).
Topography	The detailed physical features and surface configuration of a particular area, including its natural and artificial elements such as hills, valleys, rivers, landforms, and human-made structures.
Unregistered Parks and Gardens	Locally important historic landscapes not found on the Historic England 'Register of Parks and Gardens of Special Historic Interest in England', established in 1983 (Historic England, 2023).

Urban assemblage	A collection of species found in an urban environment.
Veteran Tree	Trees that exhibit the deteriorating characteristics that come with being near or at the oldest stage of their lifespan, such as decay, cavities or dead wood. These features provide important ecological niches which make them especially important for wildlife.
Vice County	A geographical division of the British Isles used for the purposes of biological recording and other scientific data-gathering.

Section 14: References

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