Methodology Overview for the Berkshire Local Nature Recovery Strategy



1. Summary

Royal Borough of Windsor and Maidenhead (RBWM) are the Responsible Authority (RA) for the development of Berkshire's Local Nature Recovery Strategy (LNRS). They commissioned Thames Valley Environmental Records Centre (TVERC) to design a process for prioritising and mapping habitat measures for Berkshire's LNRS and to detail the methodology behind its development. RBWM developed a list of Priorities and Potential Measures using existing strategies, an expert group of individuals and organisations and stakeholder workshop inputs. Those measures which were mappable were used to develop and populate the Local Habitat Map.

RBWM opted for a Systematic Conservation Planning (SCP) approach to determine the areas in the county which would most effectively contribute to the LNRS and its aims of habitat creation or enhancement. Following the statutory guidance for LNRS published by DEFRA[1] and including the most up-to-date datasets available[2], a process was developed based around the SCP software Marxan[3]. Based on data, existing local conservation plans and consultation feedback from individuals, local interest groups, and professionals, this approach incorporated data and based targets on areas, habitats, and sites deemed by Berkshire's prioritisation group to be relevant and important to the LNRS.

After analysing and mapping each resulting Marxan scenario output, the output was presented to the Data Prioritisation Group[4]. Using this, the group then had the opportunity to set new targets for each habitat type or conservation feature, propose new conservation features, or remove redundant ones. At this point, additional features were added to assist with creating a better-connected solution. This process was undertaken numerous times, and using this input from the Data Prioritisation Group and the final version of the Berkshire LNRS nature recovery network covers 37% of the county. This figure accounts for various factors including the areas where conservation and restoration work is currently being undertaken or planned, urban areas, high grade agricultural land, and habitat type.

This report includes the methodology for generating the list of priorities and measures, the methodology for the creation of the Local Habitat Map through Systematic Conservation Planning, a breakdown of sites and areas that contributed to the process, information about the stakeholder engagement process and Data Prioritisation Group, and a list of data sources.

[1] Published here: https://www.gov.uk/government/publications/local-nature-recovery-strategy-what-to-include

[2] Appendix 1

[3] https://marxansolutions.org/software/

[4] See Appendix 4 for a list of organisations included and consulted as part of the Data Prioritisation Group

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Glossary

- **Conservation feature**: A mappable dataset against which Marxan's targets are set. Conservation Features can vary in content, covering any mappable feature like species or habitats and are the basis of the LNRS's measures and priorities.
- **Cost**: The cost of selecting a planning unit in Marxan's solution, with a higher cost being overall less desirable in most situations. The base cost of each planning accounts is its spatial area in square metres. Modifications to the cost are based on the presence of high-grade agricultural soils and the presence of existing or planned conservation work. These costs are internal to Marxan and do not represent a fiscal or natural capital cost.
- **Local Habitat Map:** An interactive map for stakeholders to understand the areas which are, or which could become, of particular importance for biodiversity and the natural environment to target nature recovery action.
- **Marxan:** Software used to undertake Systematic Conservation Planning (SCP) analyses to support conservation & planning decisions.
- **Marxan scenario**: A completed series of calculations from Marxan involving a number of 'runs' (typically 1,000) with each 'run' consisting of a variable number of iterations (typically 30-60 million depending on input data). A single scenario will identify the run with the 'best solution' (a run with the lowest final score and cost calculated from the total summed cost of all planning units, boundary length modifiers, and any penalties taken) on completion.
- **Measure**: Specific practical actions to achieve priorities. They can benefit a particular species or habitat or provide wider environmental benefits (nature-based solutions).
- **Planning units**: A base layer of 5ha hexagons (adjusted to urban & designated site boundaries) which contain the areas of conservation features in the analysis area. Marxan selects Planning Units based on their cost, location, size, and the areas of conservation features they contain.
- **Priority**: The end results that the strategy is seeking to achieve.
- **Score**: An internal metric by which Marxan chooses the 'best' solution. The score incorporates information on the targets, cost, and spatial distribution, among other factors.

- **Systematic Conservation Planning (SCP)**: A methodology and process used to quantitatively identify areas for conservation work and planning based on environmental, socio-political, and economic factors and is used to support conservation & planning decisions.
- **Target**: A quantitative objective for each conservation feature which is set by the LNRS team and which Marxan uses to create its mapped output (meet in its best solution). These targets are represented in Marxan's inputs as decimal proportions of the total possible area of each conservation feature (e.g. If 25% of all possible grassland opportunities are desired in the solution, the target for the grassland opportunities feature would be set to 0.25).

- **Acronyms**:
    - **ALC:** Soils in the UK are given grades under the Agricultural Land Classification (ALC) which designate their current productivity potential. From Grade 1 soil which is 'excellent quality' for a wide range of agricultural and horticultural uses, down to Grade 5 soil which is 'very poor' for agriculture. Within this methodology, ALC grades 1 and 2 are commonly grouped together as areas preferred for agriculture whilst ALC grades 3 and below are grouped together as areas preferred for other environmental work or habitat creation.[5]
    - **RA**: (Responsible Authority) - The Local Authority for each LNRS area that leads on the preparation of the LNRS. In Berkshire this is the Royal Borough of Windsor and Maidenhead.
    - **SA**: (Supporting Authority) - All Local Planning Authorities, including National Park Authorities, in an LNRS region, that are not the Responsible Authority. Supporting Authorities have an important role to play in their LNRS: working closely with the Responsible Authority, provide local data and periodically review and agree draft of the LNRS. For Berkshire these are: Bracknell Forest Borough Council, Reading Borough Council, Slough Borough Council, West Berkshire District Council, Wokingham Borough Council and Natural England.
    - **Outputs:**
        - **APIB**: One of three main layers created following Defra guidelines for the LNRS, the *Areas of Potential Importance for Biodiversity* (APIB) layer holds the geospatial data of areas of known current importance including nationally and locally designated sites such as SSSI and LWS, as well as irreplaceable habitats such as ancient woodland.
        - **ACB:** One of three main layers created following Defra guidelines for the LNRS, the *Areas that Could become important for Biodiversity* (ACB) layer holds the remainder of the LNRS network outside the APIB, comprised of the mapped biodiversity priorities for habitat creation, enhancement, and restoration.
        - **PM:** One of three main layers created following Defra guidelines for the LNRS, the *Potential Measures* (PM) layer (throughout this document referred to as 'measures') holds the details of each of the biodiversity priorities and measures selected by the Responsible Authority for representation within the LNRS.

[5] See: https://www.gov.uk/government/publications/agricultural-land-assess-proposals-for-development/guide-to-assessing-development-proposals-on-agricultural-land#about-alc-grades

3. Introduction

Two of the most important and actionable aspects of the LNRS are the List of Priorities and Potential Measures and the Local Habitat Map. The List of Priorities and Potential Measures represent the county's overarching aims for nature recovery, and specific actions needed to achieve these aims. This document details how these Priorities and Potential Measures were decided, and how these were used to generate the Local Habitat Map.

The Local Habitat Map holds the geospatial information on where in the county and in the identified LNRS network the prioritised habitat actions may be taken in order to contribute towards local and county-wide environmental goals. While not every aspect of Berkshire's environment can be accounted for in the LNRS, it provides a prioritised overview of Berkshire's habitat potential, and the sometimes-multiple potential measures allow for a level of flexibility in on-the-ground actions. However, in order to create the priorities and measures for nature recovery, and map where these could occur, a process was needed to assist in establishing this knowledge base. Details of this process can be found in the following sections.

The Berkshire Data Prioritisation Group

The Data Prioritisation Group was created in late 2023 and consisted of a variety of individuals offering expertise in different specialisms related to the natural environment. This team brought valuable knowledge and experience to the LNRS team that would assist in defining the most important nature recovery priorities for Berkshire and help detail the measures needed to achieve these priorities. The skills set in the group included academic researchers, experts in planning and GIS, a Systematic Conservation Planning modeller, ecologists, and forestry and water experts. Alongside the Responsible Authority for the Berkshire LNRS (Royal Borough of Windsor and Maidenhead), the organisations are listed in Appendix 4.

Meetings occurred fortnightly from mid-January 2024 through to October 2024 on Microsoft teams. Meeting notes were taken and/or meetings were recorded. Weekly meetings followed from March 2025 till June 2025 to decide on what changes were needed to the evolving strategy based on the outputs from the Berkshire LNRS Public Consultation.

Stakeholder Engagement

The Berkshire LNRS Stakeholder Engagement workshops produced a lot of data related to identifying measures to recover nature, which contributed to generating a final set of Priorities and Measures for the Berkshire LNRS.

To view the full set of draft measures collated at the workshops and to understand how these were refined to create a final set of measures, please see the 'Overview of Measures from stakeholders, and shortlisting process' document on the website in the 'Methodology Documents for List of Priorities and Measures and Local Habitat Map' section.

To view more information regarding the content and output of the workshops, please see each of the 9 main Stakeholder Engagement Workshop Outputs documents (relating to the workshops for West Berks, RBWM, Bracknell, Reading, Wokingham, Slough, East Berks Farmers/Landowners, West Berks Farmers and Landowners, and Central Berks Farmers and Landowners). These documents can be accessed on the website in the 'Information from Community Workshops' and 'Information from Farmer/Landowner Workshops' sections respectively.

To learn more about the consultation process, view the full Public Consultation Report for the Berkshire Local Nature Recovery Strategy on the website in the 'Public Consultation' section.

4. Methods

After workshops were conducted, the Data Prioritisation Group drafted an initial longlist of priorities for nature recovery in Berkshire by collating relevant species and habitat specific information from a variety of information sources. These priorities considered the extent and distribution of species and habitats across the county and identified those species and habitats that were deemed to be threatened and in need of additional support. Some of these would go forward to be the focus of the LNRS. The sources of information used to draft the longlist included content from the workshops and existing nature recovery documents within Berkshire (such as National Environment Objectives, National Landscapes Recovery Strategies and existing Biodiversity Action Plans). A full list of the documents referenced can be found in Appendix 1.

1. **Data collated from Stakeholder Engagement Workshops**

   The raw data collected during the workshops was sorted into similar themes, then shortlisted by the Data Prioritisation Group. See the full lists of these and how these were refined in the 'Overview of Measures from stakeholders, and shortlisting process' document. This document can be accessed on the website in the 'Methodology Documents for List of Priorities and Measures and Local Habitat Map' section.

2. **Habitat knowledge from the Data Prioritisation Group**

   Based on their knowledge of Berkshire's biodiversity and landscapes, the Data Prioritisation Group agreed which key habitats would be reflected in the Priorities, and these were grouped as follows:

Table 1: Main habitats of Berkshire as a starting point for the initial List of Priorities and Measures, as defined by the Data Prioritisation Group.

General Agriculture and wider countryside	Including field margins, hedgerows, grassland, traditional orchards, scrub, veteran trees and ponds.
Wood related habitats	Including ancient woodlands, plantations on ancient woodlands, sites, native broad-leaved woodland, wood pasture, wet woodland, veteran trees and deadwood.
Chalk related habitats	Including chalk downland and chalk pits.
Urban related habitats	Including urban trees, public open spaces, open mosaic habitats, brownfield sites, private green spaces and graveyards.
Wet habitats	Including lowland meadow, floodplain grazing marsh, mesotropic/eutrophic/oligotrophic standing water, fens, wetland, gravel pits, rivers, reedbeds, swamps, wet meadows and chalk rivers.
Heath related habitats	Including scrub and acid grassland.
Urban habitats	Including trees, public open spaces, open mosaic habitats / brownfield sites, private green-spaces, and graveyards.

Generating Priorities

The Data Prioritisation Group used the best available evidence detailing the extent and distribution of habitats. An initial list of key priorities that would support the recovery of nature in the strategy area was drafted. These are detailed below.

- Improve the quality of general agriculture and the wider countryside.
- Improve the condition of woodland
- Improve the condition of wood pasture parkland
- Improve connectivity of wood pasture
- Increase extent of woodland

- Increase the extent of wet woodland to increase patch size and connectivity
- Buffer and connect ancient woodland in Berkshire to protect from external pressures and fragmentation
- Improve the quality of chalk habitats
- Improve the quality of urban biodiversity
- Increase UK ward canopy cover to 30% in urban areas to mitigate impacts of climate change and increase connectivity of greenspaces
- Increase the extent and improve the quality of Wetlands and Floodplain
- Obtain good chalk stream management - extend sparkling streams initiatives
- Increase the extent and improve the quality of Heath

Finalising the List of Priorities

As part of the the stakeholder engagement workshops (and included in the survey), one particular activity focused on ranking habitats. The habitats and groupings used were those that the Data Prioritisation Group had selected, at the point of workshop preparation, as those that best represent Berkshire's habitat types. During workshops, participants either ranked habitats in order of what they perceived to be the most important habitats in Berkshire or chose a particular habitat that they felt most strongly about enhancing or extending. Those completing the survey were also asked to rank habitats in order of their perceived importance.

The resulting list of prioritised habitats (from workshops and survey) can be seen below.

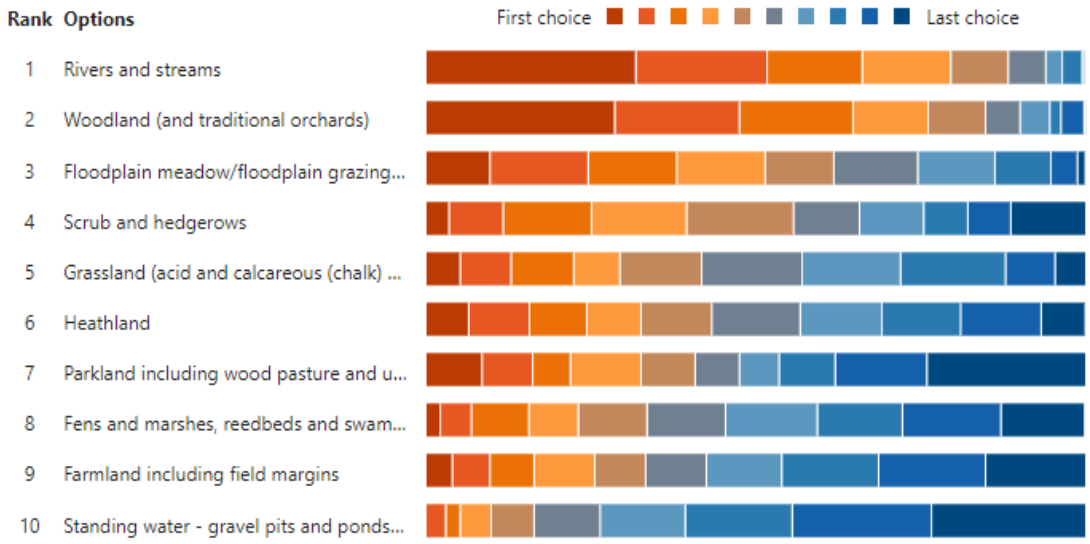


Figure 1: The habitats that were ranked as most important by stakeholders during engagement workshops. Rivers and streams were most commonly given first choice as most important.

An activity and question relating to this habitat prioritisation theme was also included in the workshop and survey and asked participants to identify if they believed any important habitats from the current list of Berkshire's habitat types were missing. The list of extra habitats that were identified from this exercise is detailed below. These habitats were then considered for inclusion in the list of priorities by the Data Prioritisation Group, and a number (listed below) were added to the final List of Priorities and Measures. At this stage, there were some further additions and edits to list of priorities during refinement of the potential measures.

-Graveyards
-Groundwater
-Gardens (rewritten as private greenspace)
-Urban trees
-Dead wood
-Gravel pits

Generating Potential Measures

As mentioned in the section above, the measures suggested initially came from existing strategies and documents, from stakeholder workshops/survey and from the expertise available within the Data Prioritisation Group. The measures suggested from the survey and stakeholder workshops underwent a prioritisation exercise within the Data Prioritisation Group, which followed a methodology previously agreed by the group. The group initially collated the measures into categories of a similar theme, and the frequency that each theme was mentioned was recorded. The themed measures were first longlisted. Those which were outside the scope of the LNRS were excluded. The longlist of potential measures was then shortlisted. Potential measures which matched or were similar to a potential measure that was recorded on the initial longlist created by the Data Prioritisation Group were disregarded as they were deemed to be a duplication.. To view a full list of these workshop generated measures, and to understand how the measures were refined please see the 'Overview of Measures from stakeholders, and shortlisting process' document. This document can be accessed on the main website in the 'Methodology Documents for List of Priorities and Measures and Local Habitat Map' section.

The remainder of stakeholder generated measures were shortlisted by scoring each potential measure against a set of criteria. These were:

-Does the potential measure contribute to national objectives? (Include)
-Does the potential measure address a pressure or opportunity identified in the strategy area? (Include)
-Does the potential measure relate to a co-benefit rather than a habitat or species? (Exclude)

-Does the potential measure relate to a specific site? (Exclude)
-Is the potential measure already included in the expert generated list of priorities and measures (Exclude)

Measures which detailed specific species were kept in a separate category. Measures which detailed specific locations were also collected separately. See more information regarding Species Specific Measures on the website in the 'Species Priorities List Methodology Document' in the 'Methodology and information regarding Species Priorities List' section.

Further Organisational input

Species and habitat interest groups such as Canal and Rivers Trust, Freshwater Habitats Trust, Thames Basin Heaths Partnership reviewed and edited the draft list of Priorities and Measures.

Creating the Local Habitat Map

The next step was to map the list of Priorities and Measures onto Berkshire's Local Habitat Map. This is detailed in the section below and involved using Systematic Conservation Planning to help identify where to map the Priorities and Measures. As part ofthis process, the first task undertaken by the Data Prioritisation Group was to decide which of the collated Measures were mappable. Those which had appropriate data sets that could represent that measure were selected.

Systematic Conservation Planning

Systematic Conservation Planning (SCP) is a quantitative methodology using computer modelling software to identify areas of land to target for nature recovery action. When compared to other approaches for identifying opportunities for nature recovery, the Responsible Authority, RBWM, decided that SCP would be good option as it could effectively accommodate the multiple, sometimes conflicting, interests that would ultimately influence where nature recovery activity could occur on the ground. It involves an iterative process whereby multiple mapping outputs are created and scrutinised and the data inputs modified before reaching a final draft. Each output is rigorously evaluated against the required objective to create Berkshire's Local Habitat Map which would identify where to target support for threatened species and habitats. Modifications were made to the data inputs for the SCP computer software if required and the modelling process was re-run multiple times to evolve the mapping output . The group were introduced to the Systematic Conservation Planning process by Professor Bob Smith of the Durrell Institute of Conservation Ecology, at the University of Kent. The modelling software was called Marxan. Two sessions were delivered by Professor Bob Smith to

Thames Valley Environmental Records Centre (TVERC), RBWM and Natural England. TVERC were asked by the RA, with the agreement of the Steering Group, to lead on the SCP work stream to generate the ACB Layer (Opportunities for nature recovery) for Berkshire's Local Habit Map.

TVERC used a modified version of the SCP process[6] which had 5 basic steps:

1. **Identify and involve stakeholders** – a total of 15 public engagement workshops were held by RBWM across the county early in the process which, alongside surveys and interactive maps, were used to gather information from residents on their views of habitats to prioritise and proposals for nature recovery, among other queries.[7]
2. **Compile data** – data used was submitted by local authorities, landowners and general public, or other organisations specifically for use within the LNRS process and for publication; held by TVERC; or available through Open Government Licence.
3. **Identify conservation goals** – based on current and previous local conservation plans, the pilot LNRS, and professional and local knowledge, a list of Priorities and associated Measures were created. Any Measures that were both mappable and had available mappable data were used in the Marxan process to develop the LNRS habitat map.
4. **Set conservation objectives** – Any mappable measures able to be included in the Marxan process were given explicit, quantitative targets (e.g. x% of possible or existing habitat to be included in the final solution). While these targets are less practical for on-the-ground conservation efforts, they enable Marxan to operate correctly and identify the optimal solution based on various input factors.
5. **Review selected conservation areas** – Each subsequent Marxan solution was analysed and mapped, then brought to the Data Prioritisation Group. The group took into account both the quantitative results (whether targets should be changed to increase or decrease the representation of a certain Conservation Feature in the county, especially if Marxan had exceeded the target) and the qualitative results (whether the resulting map resembled a robust nature network or if the inputs needed fine-tuning when it lacked connectivity). The priorities and potential measures are also evaluated to determine whether their inclusion or exclusion is meeting the aims of the LNRS.

[6] Detailed on Marxan's website: https://marxansolutions.org/a-framework-for-systematic-conservation-planning/ or for more detailed information see *Margules, C. R., and Pressey, R. L. (2000). Systematic conservation planning. Nature, 405(6783), 243–253. https://www.nature.com/articles/35012251*

[7] Information gathered from these surveys have been published on RBWM's LNRS project page: https://rbwmtogether.rbwm.gov.uk/berkshire-local-nature-recovery-strategy

6. **Repeat** – Once targets and conservation features were decided, more data was acquired and the process rerun. The process or sections of it were also repeated following public consultation comments and feedback.

Using Marxan, a software designed to use a Systematic Conservation Planning approach to analysing habitat data, areas to target work through the LNRS were identified over a series of multi-iterative scenarios. [8] calculations aim to reach a spatial solution with the lowest score & cost and which meets the targets. The analyses are based on 5ha hexagonal planning units within which is detailed: the spatial area of conservation features present within, the cost of selecting the planning unit (based on area, then increased by 2-4x if the underlying soil was classified under the Agricultural Land Classification as either grade 1 or 2 soil, or decreased by 0.25x if existing or planned conservation works were present), whether the planning unit is available for selection (planning units which contained buildings or similar urban features were excluded, and some planning units were pre-selected due to their high existing value so the solution could build out from around them), and the placement of the planning unit relative to other units in the county.[9]

To better represent habitats in the county and in order to properly format the software inputs, specific targets had to be set for each habitat type or conservation feature being considered for Berkshire's LNRS. These conservation features include both existing habitats and habitat opportunities, as well as additional features to encourage a county-wide network solution. These additional features included individual targets for each unitary and a mock-up of a Nature Recovery Network (NRN) based on flood zones and Biodiversity Opportunity Areas (BOAs). These targets are specific to each feature and were decided and eventually finalised through discussion after the presentation of multiple Marxan reruns within the LNRS Prioritisation Group, a group of professionals and experts with knowledge of Berkshire's habitats, species, and geography. The targets range from 15% to 95% depending on total habitat area, overlaps with other habitats, and total representation in the county, among other factors.

A target of 15% of each unitary's area was set for the SCP process to identify in the final solution. This relatively low target was chosen to ensure at least a sixth of each unitary would be present in the LNRS' solution and to encourage uniformity of the network within the county. Likely due to the high concentration of urban structures compared to other unitaries, 15% of Reading and Slough are present in the solution, whereas the other 4

[9] Process presented in more detail in Methodology section

unitaries are represented between 27-42%. Overall, the targets for unitaries, river and nature recovery networks, and existing and potential habitats were chosen with county-wide coverage and comprehensive habitat representation in mind.

Built off multiple instances of this iterative SCP process into which feedback from the Data Prioritisation Group was fed, the current version of the LNRS network covers 37% of the county while accounting for various factors including areas where conservation and restoration work is currently being undertaken or planned, urban areas, high grade agricultural land, and habitat type. This solution will hopefully aid in uplifting habitat types with less representation than others as well as identify areas to improve the condition of habitats that are present throughout the county.

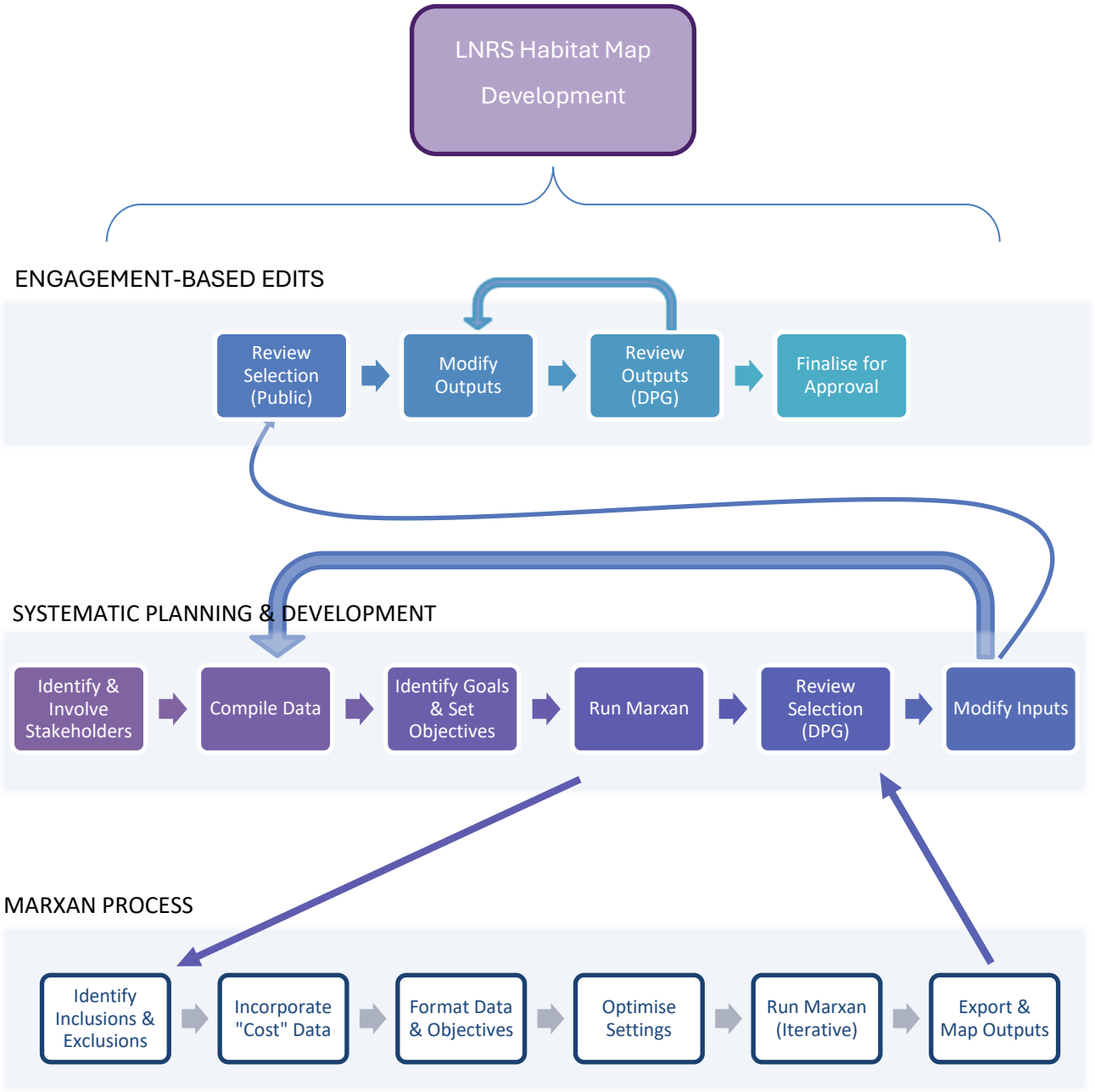


Figure 2: Flowchart showing a broad overview of the steps taken during the development of the LNRS habitat map, with foundations elements used to build up to a baseline at the bottom of the chart, and smaller modifications to existing outputs closer to the top of the chart. "DPG" within this chart refers to the Berkshire LNRS Data Prioritisation Group (See Appendix 4 for involvement details).

Breakdown of development flow:

- The central row "Systematic Planning & Development" largely refers to TVERC's modified version of the SCP process described earlier in the introduction. Before developing the methodology, RBWM's team strove to identify and involve as many stakeholders and members of the public as possible before beginning development.
- Once stakeholders were identified and the Data Prioritisation Group was formed, TVERC compiled and created datasets to be used during the process. The Data Prioritisation group and RBWM decided on the draft set of conservation goals and objectives while TVERC worked with the University of Reading to tailor the Marxan process to the needs of the LNRS.
- In order to create useful outputs from the collected data and conservation objectives in Marxan, a series of much more granular and technical steps were taken (described below in the Methodology) but broadly consisted of:
    - Creating an initial base layer of polygons (Planning Units) to build the solution upwards from (one-time step)
    - Building data layers to automatically include in & exclude from the prioritised solution (such as including designated sites and excluding urban centres)
    - Incorporating "cost" data which gave each polygon a positive or negative "cost" within the mathematical Marxan process, many of which were drawn from the initial public consultation.
    - The input data and goals & objectives were then formatted in such a way that Marxan could interpret them correctly
    - A series of 'dry runs' were performed within Marxan using this data in order to set the program settings with a higher degree of precision. These settings include aspects such as number of iterations, number of runs, and degree of connectivity.
    - Once the settings were optimised, Marxan was run with all the inputs created in earlier steps.
    - After Marxan determined the 'best' solution given the inputs and data, this output was exported to ArcGIS Pro where the data could be transformed and visualised as a map to be presented to the Data Prioritisation Group.
- The Data Prioritisation Group would meet to review the current mapped solution and propose modifications, additions, or removals to then use to repeat the process. This first section was repeated many times over the course of several months before the group approved it for public consultation.
- The draft LNRS habitat map with all measures layers was published online with an open invitation for comments.
- Following the consultation the comments were consolidated and a series of actions to take on the map were decided on with additional input from the Data Prioritisation Group. These modifications were made directly to the LNRS habitat map as it was published during consultation to ensure no major changes were made between the draft and finalised version, as could have happened if Marxan had been re-introduced at this stage.
- The Data Prioritisation Group gave their input and suggested changes as edits were made to the habitat map layers until the layers were finalised and approved for publication.

Software used

ArcGIS Pro 3.2.2

ArcMarxan Toolbox 2.0.2[10], originally built for use in ArcMap 10.2 but converted & edited for use in ArcPro version 3.

ArcPro and Toolboxes used within ArcPro were used to prepare input files for Marxan and to map and analyse solution results.

RStudio 2022.07.2

R Packages: caroline 0.9.2, devtools 2.4.5, marxanr 0.1.0 (development version), dplyr 1.1.2, ggplot2 2.3.3, sf 1.0-13, tidyverse 1.3.1, readr 2.1.4, reader 1.0.6, stringr 1.5.0, raster 3.6-26

RStudio was used to optimise Marxan's input values, run Marxan, and analyse solution results.

Marxan 4.0.6

Marxan was run from within RStudio using the R package marxanr version 0.1.0, as using R allowed further analyses and adjustments to be done in loops without restarting Marxan manually.

Methodology

To create a base of planning units (PLUs) off of which to run Marxan, a 5ha hexagonal grid was built in ArcPro using the Generate Tessellation tool. The grid was then clipped to the county boundary. Early in the prioritisation process, it was decided that the county should not be buffered due to the lack of consistent habitat data across all input datasets over the county border. Additionally, important habitats which span multiple counties will likely be mapped in those counties and therefore accounted for.

In order to create the planning unit boundaries, the tessellation grid was then Unioned with a layer of designated sites (LWS, LNR, NNR, Ramsar, SSSI, SAC, SPA) and a layer of urban areas (created by removing any green infrastructure sites from the Ordnance Survey's Open Built Up Areas layer). These adjusted hexagonal planning units will be used as the base for all habitat calculations.[11]

Each planning unit was then given an ID, a cost, and a status, for use in Marxan, described as:

> The ID is a consecutive series of numbers covering the entire planning unit layer which will be used internally within Marxan to relate information between input files.
>
> The cost was calculated by taking the area in square metres of the planning unit (and to ensure there are no 0 cost planning units, giving a base cost of 1 to anything less than 1sqm), then either increasing or decreasing the base cost depending on overlapping layers. Any planning units which contained any amount of ALC grade 1 or 2 soils had their cost increased by a factor of 4 or 2, respectively. Any

[10] Accessed here: https://www.aproposinfosystems.com/en/solutions/arcgis-plugins/arcmarxan-toolbox/

[11] See Appendix 3 for a close-up view of planning units present in the solution. Planning units start as a 5ha hexagonal base but may be modified by their proximity to urban areas & designated sites.

planning units which contained any area where conservation work is currently planned or being undertaken (see Appendix 1 for a full list of datasets used) had their cost decreased by 25%.

Lastly, the status of each planning unit was set. By default, each planning unit has a status of 0 (available for Marxan to select). Any planning units which contained the designated sites layer were given a status of 2 (automatically selected for Marxan's solutions) and any planning units which contained buildings or other urban areas from the OS Built Up Areas layer were given a status of 3 (automatically excluded from Marxan's solutions).

In order to map the priorities and measures for the county, a series of habitat layers were acquired or created. (See Appendix 2 for methodology behind the creation of each conservation feature layer where applicable.) The mappable features used or created were:

- Existing habitats for preservation or restoration:
    - Lowland Calcareous Grassland (LCG)
    - Traditional Orchards (TRO)
    - Lowland Fen & Reedbeds (LFN, RBD)
    - Lowland Acid Grassland & Lowland Heathland (LAG, LHL)
    - Wood Pasture & Parkland (with a 1km buffer) (WPP)
    - Unmanaged Woodland
    - PAWS (Plantations on Ancient Woodland Sites)
    - Rivers & other surface water bodies (25m buffer intersecting with any planning units, and further rivers & running water given 25m buffers))
    - Chalk streams and rivers
- Habitat opportunities for creation, defragmentation, or connection:
    - Ancient Woodland (AW)
    - Floodplain Grazing Marsh on arable soils (FPGM)
    - Lowland Acid Grassland & Lowland Heathland (LAG, LHL) (opportunities for defragmentation, wider landscape opportunities, and opportunities on coniferous or mostly-coniferous plantations)
    - Lowland Calcareous Grassland (LCG)
    - Traditional Orchards (TRO)
    - Lowland Fen & Reedbeds (LFN, RBD)
    - Pond Opportunities
    - Hedgerow Creation & Enhancement Opportunities
    - Wildflower Grassland (especially targeting existing poor quality grassland)
    - Wet Woodland
- Additional features:
    - Ridgway/Drove Road Corridor Connections
    - Mock NRN (BOAs & Flood Zone 3)
    - Unitaries
    - National Landscapes

These 26 layers of existing habitats and habitat opportunities were used as conservation features in the Marxan inputs, and while they contribute to the LNRS measures they may not match by name. The published version of the LNRS contains 23 mapped measures as some of the original 26 were modified or combined. Additional

conservation features which did not have corresponding priorities or measures were also included in the Marxan analysis, including a temporary Nature Recovery Network (a combination of Berkshire's BOAs and Flood Zone 3), Chilterns & North Wessex Downs National Landscapes, and the 6 unitary boundaries. To calculate how much of each conservation feature was present in each planning unit, the layers in ArcPro were given a name field with a unique alphanumeric ID and then converted into rasters using the Polygon to Raster tool, then the Tabulate Area tool was run between each new raster and the base planning unit layer. The resulting matrices were joined with the planning unit layer and it was exported as a master planning unit matrix to remove any 'null' values.

Using the master planning unit matrix with all conservation feature areas included, the Marxan input data files were created using the ArcMarxan toolbox – the boundary file, feature files, and planning unit file.

The boundary file contains data on the boundary lengths of each planning unit and is used within Marxan to identify planning units which share boundaries or are isolated, and to compare that information back to Marxan's input values such as the Boundary Length Modifier. It contains 2 ID columns and a boundary value in metres.

The planning unit file contains the ID, cost, and status of each planning unit and acts as a key between the other Marxan input files for the analysis.

The first of two feature files contains a Marxan-allocated feature ID, planning unit ID, and area of feature coverage in square metres. The second contains the feature ID, the alphanumeric name of the feature from the master planning unit matrix, and 2 editable columns – SPF and prop. The prop column represents the proportion of each feature to be targeted in the solution (e.g. a target of 15% of the Chilterns National Landscape is written as 0.15 for ID 1). The SPF column indicates the cost penalty Marxan will accrue if its chosen solution does not meet a conservation feature's target.

Using the targets set in the Data Prioritisation Group meetings and a base spf of 1, a preliminary Marxan scenario with 1,000 runs would be completed to ensure all inputs were formatted correctly. Then, to ensure Marxan was producing the best possible solution with the given data, Marxan's main 3 operational inputs were optimised – the boundary length modifier (BLM), the feature penalty (SPF) and the number of iterations per scenario. A looping script in RStudio was used to run multiple scenarios with increasing values, and once the cost or score began to give diminishing returns, that value was used for further optimisation. Once all 3 values were optimised, a final Marxan scenario was run and the best solution mapped in ArcPro (Figure 1).

In order to map the solution, the 'best solution' output from Marxan was imported into ArcPro and joined with the master planning unit matrix layer. Any planning units in the matrix which had a value in the Solution column of 1 were selected by Marxan for the solution and were mapped for the final network. Nationally designated sites had initially been pre-selected in the solution to ensure the solution built outwards from them as existing areas in the county under good management or representing ongoing conservation work. However in the final LNRS solution, any areas which contained these nationally designated sites (NNR, Ramsar, SAC, SPA, or SSSI) were removed to comply with Defra guidance. These national sites are still included within the LNRS local habitat map as part of the APIB (Areas of Particular Importance for Biodiversity), alongside irreplaceable habitats and locally designated sites.

Following a series of meetings with the Berkshire Data Prioritisation Group, a series of changes to the base Marxan solution and original conservation features were agreed upon which added to, removed from, amended, or otherwise edited the included conservation features and network boundary. Most significantly

were the aggregation of several more specific grassland layers into a single feature, and improvements were made to both the Ancient Woodland enhancement and Hedgerow Creation features.

Further amendments were made based on public consultation, stakeholder, and other professional or expert comments. These amendments were comprised of 97 modifications to the base Marxan network boundary (and subsequent extensions of conservation feature extents), 6 were removals from the overall network boundary to better align with on-the-ground features, and 17 edits were used to improve the accuracy of individual measures and their extents. The Oxfordshire LNRS team supplied their in-progress network during this review process, which was used by the Data Prioritisation Group with knowledge of the area to examine the area along the shared county border and fill some small gaps in the network to increase connectivity.

The final Berkshire LNRS network boundary is based upon the latest Marxan output which met all conservation feature targets decided upon by the Data Prioritisation Group. To this was added the entirety of the river network within Berkshire based on Ordnance Survey and Water Framework Directive datasets, in order to create a more joined-up network across the county. The amendments based on comments and consultation listed above were then added or removed to the network boundary to produce the final product which covers a total of 37% of Berkshire's land and water area and represents 23 mapped conservation features and potential measures.

4. Results

Breakdown of conservation feature areas, boundaries, and inclusions

Conservation Feature	ID	Area in county (ha)	Area selected for network (ha)	% of available feature in solution	% of county area included in network
Create and Enhance Hedgerows	**1**	4,991	2,864	57%	2.3%
Enhance Drove Road Corridors	**2**	847	798	94%	0.6%
Restore Grassland	**3**	24,192	7,752	32%	6.1%
Create Traditional Orchards	**4**	9,297	3,872	42%	3.1%
Restore Traditional Orchards	**5**	186	156	84%	0.1%
Create Wildflower Grassland	**6**	27,769	9,306	34%	7.4%
Manage Woodlands	**7**	10,598	5,383	51%	4.3%
Veteranize Trees	**8**	59,576	19,519	33%	15.4%
Buffer Ancient Woodland	**9**	6,579	2,494	38%	2.0%
Restore Ancient Woodland	**10**	1,926	1,403	73%	1.1%
Create Wet Woodland	**11**	17,148	7,577	44%	6.0%
Manage Existing Calcareous Grassland	**12**	491	289	59%	0.2%
Restore Calcareous Grassland	**13**	2,844	1,708	60%	1.4%
Create Calcareous Grassland	**14**	7,038	3,164	45%	2.5%

Buffer Watercourses	**15**	3,953	3,655	92%	2.9%
Convert Arable to Floodplain Meadow	**16**	571	571	100%	0.5%
Restore Fens	**17**	3,237	2,520	78%	2.0%
Create Ponds	**18**	39,960	14,465	36%	11.4%
Restore Rivers	**19**	557	482	87%	0.4%
Restore Chalk Streams	**20**	44	27	61%	0.0%
Restore Heathland	**21**	1,119	396	35%	0.3%
Create Heathland	**22**	3,035	1,584	52%	1.3%
Create Acid Grassland	**23**	1,959	1,262	64%	1.0%
Conservation Feature	**ID**	**Area in county (ha)**	**Area selected for network (ha)**	**% of available feature in solution**	**% of county area included in network**
Chilterns Nat'l Landscape	–	22	6	27%	0%
North Wessex Downs Nat'l Landscape	–	52,060	20,100	39%	15.9%
Bracknell	–	10,938	4,705	43%	3.7%
Reading	–	4,039	651	16%	0.5%
Slough	–	3,254	715	22%	0.6%
West Berkshire	–	70,419	28,021	40%	22.2%
Windsor & Maidenhead	–	19,841	6,675	34%	5.3%
Wokingham	–	17,897	5,738	32%	4.5%
APIB Area	–	16,614	–	–	13.1%
ACB Area	–	29,903	–	–	23.7%
Total Network Area (APIB & ACB)	–	**46,517**	–	–	**37%**
Berkshire County Boundary	–	**126,388**	**46,517**	**37%**	–

Table 2. Input & solution conservation feature areas in hectares & % of conservation features in Berkshire. All calculations are made based on a full network area of APIB and ACB combined. Conservation Features referred to as 'restore' or 'enhance' are aimed at existing habitats within the county, whereas 'create' or 'buffer' Features are aimed at expanding or creating suitable habitats within the county. The PM ID column can be used to refer to the corresponding Conservation Features in other published materials for the Berkshire LNRS. See Appendix 5 for original Marxan-based targets & areas included.

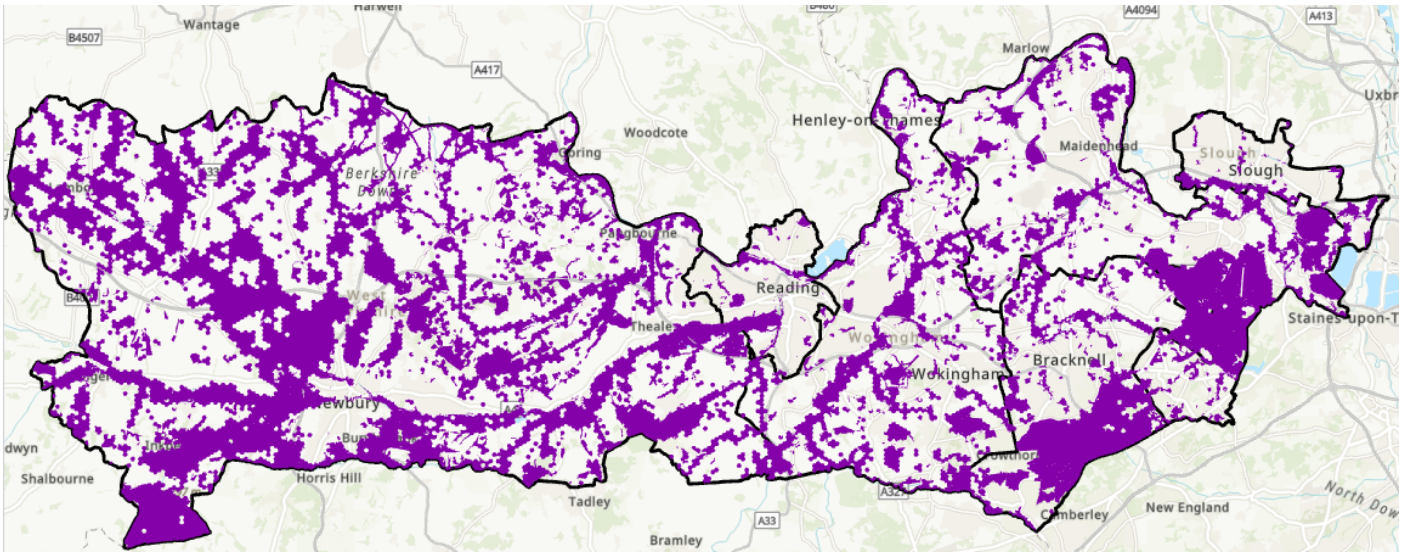


Figure 3. Mapped version of Marxan's best solution after refining inputs and conservation feature targets. Areas in purple were either selected for the solution or were automatically included as designated sites.

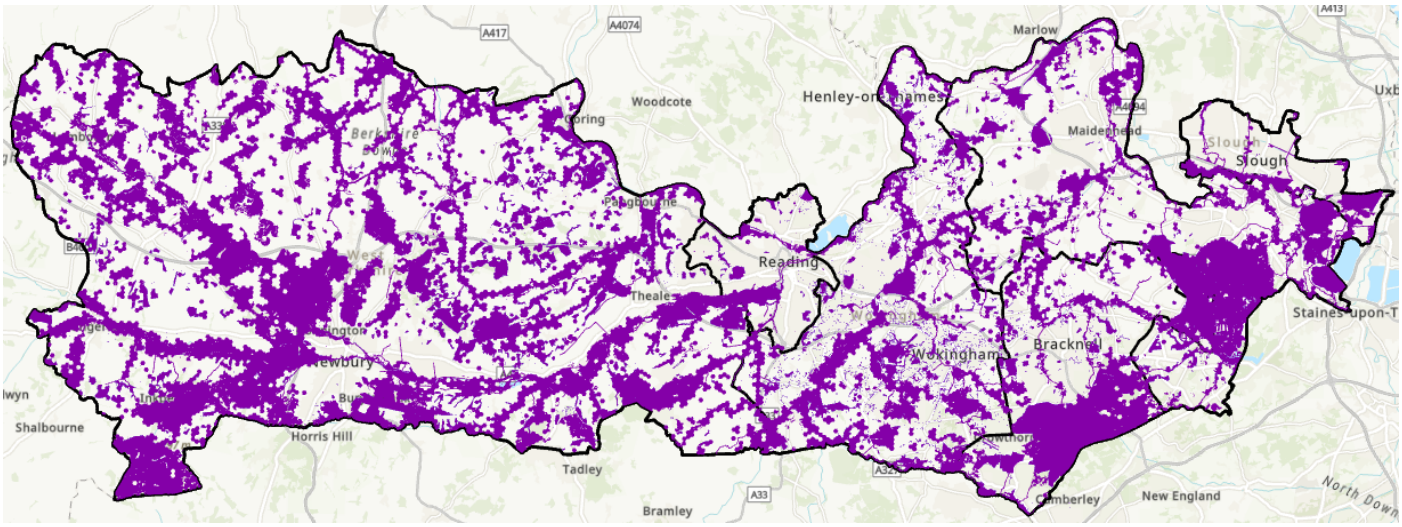


Figure 4. Current LNRS mapped habitat network after committing consultation- and prioritisation-based modifications. This visualisation includes both the APIB and ACB aspects of the prioritised habitat network.

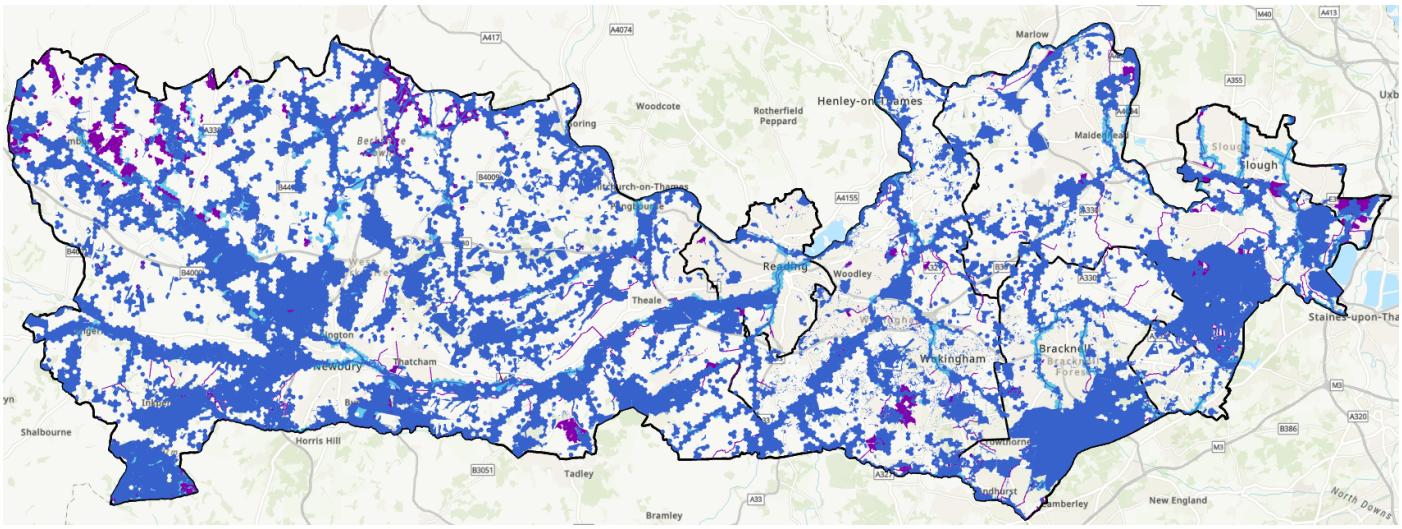


Figure 5. Comparison of the LNRS mapped habitat network pre- and post-consultation. Areas in dark blue were part of both the draft and current versions of the habitat map, areas in purple are only part of the current version and were added post-consultation (as seen in Figure 3), and areas in light blue were only part of the draft version and were removed post-consultation.

5. About TVERC

Thames Valley Environmental Records Centre (TVERC) are a not-for-profit organisation covering Berkshire and Oxfordshire. We are run by a partnership and are one of a national network of local records centres. We are a member of the Association of Local Records Centres (ALERC) and the National Biodiversity Network (NBN). Our funding partners include all the local authorities in Oxfordshire & Berkshire plus the Environment Agency. We also work closely with the Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust.

Our records

We hold over 4.8 million records of flora and fauna in Berkshire and Oxfordshire plus information about Local Wildlife and Geological Sites, NERC Act S41 Habitats of Principal Importance (previously called UK Biodiversity Action Plan (BAP) habitats) and Ecological Networks (Conservation Target Areas and Biodiversity Opportunity Areas). We collect this data from the general public, skilled volunteer /amateur recorders, professionals working for wildlife charities (BBOWT and RSPB), professionals working for government agencies (the Environment Agency & local authorities) and ecological consultants. This information is used: by planning authorities and developers to make informed decisions on the design and location of sustainable development to help farmers, landowners and conservation organisations manage land in the best way to enhance biodiversity by nature, partnerships to direct wildlife conservation work by teachers, students and scientists for education and scientific research. For more information, visit www.tverc.org

6. Appendices

Appendix 1: Data Sources

A list of datasets used at any point during the SCP process, presented alphabetically

Dataset	Year	Source	Data Use Within LNRS
ALC grade soils	2019	Natural England	Direct Contribution
Ancient & Veteran Tree Inventory ‡	2024	Woodland Trust	Direct Contribution
Arable Land ‡	2024	TVERC	Direct Contribution
AWE sites for habitat & biodiversity gain ‡	2024	AWE Nuclear Security Technologies	Indirect Contribution
BBOWT Nature Reserves ‡	2021	BBOWT	Indirect Contribution
Berkshire Proposed Local Wildlife Sites ‡	2024	TVERC	Indirect Contribution
BOAs ‡	2018	TVERC	Indirect Contribution
Bracknell Forest Council Sites ‡	2024	Bracknell Forest Council	Indirect Contribution
Chalk Rivers	2024	Natural England	Direct Contribution
Countryside Stewardship Scheme 2016 Management Areas	2024	Natural England	Indirect Contribution
Cranfield Soil Data ‡	2024	Cranfield University (NSRI)	Direct Contribution
English Woodland Grant Scheme ‡	2017	Forestry Commission	Indirect Contribution
Environmental Stewardship Scheme Agreements	2024	Natural England	Indirect Contribution
Farm & land owners Berks consultation feedback areas ‡	2024	RBWM	Indirect Contribution
Flood Zone 3	2024	Environment Agency	Direct Contribution
Green and Blue Infrastructure (England)	2024	Natural England	Direct Contribution
Important Plant Areas ‡	2024	PlantLife	Indirect Contribution
Land at Eastbury ‡	2024	IA&G Denton, Carter Jonas	Indirect Contribution
Landowner- or Council-submitted Areas without clear boundaries ‡	2024	Various	Indirect Contribution
LNR	2024	Natural England	Direct Contribution
LWS ‡	2024	TVERC	Direct Contribution
National Trust [Limited Access]	2023	National Trust	Indirect Contribution
National Trust [Open Access]	2024	National Trust	Indirect Contribution
National Trust Nature Recovery Areas	2024	National Trust	Indirect Contribution
Natural England Priority Habitat Inventory	2024	Natural England	Direct Contribution
NNR	2024	Natural England	Direct Contribution

OS Open Built Up Areas	2024	Ordnance Survey	Direct Contribution
OS Open Greenspace	2024	Ordnance Survey	Direct Contribution
OS Open Rivers	2025	Ordnance Survey	Direct Contribution
Potential sites for nature recovery	2024	University of Reading	Indirect Contribution
Ramsar	2024	Natural England	Direct Contribution
RBWM-owned Natural Environment Sites ‡	2024	RBWM	Indirect Contribution
River, Canal and Surface Water Transfer Water Bodies	2020	Environment Agency	Direct Contribution
RSPB Reserves ‡	2023	RSPB	Indirect Contribution
SAC	2024	Natural England	Direct Contribution
SANGs ‡	2020	TVERC	Indirect Contribution
SPA	2024	Natural England	Direct Contribution
SSSI	2024	Natural England	Direct Contribution
Suggested sites from Slough Borough Council ‡	2024	Slough Council	Indirect Contribution
Thames Path ‡	2024	OCC	Indirect Contribution
TVERC Habitats Database ‡	2024	TVERC	Direct Contribution
TVERC Species Database ‡	2024	TVERC	Direct Contribution
West Berks Council-owned land ‡	2024	West Berkshire Council	Indirect Contribution
West Berks Englefield NR Sites ‡	2024	WBC	Indirect Contribution
West Berks Roadside Nature Reserves ‡	2024	WBC	Indirect Contribution
Wokingham Borough Council Potential LNRS Sites ‡	2024	Wokingham	Indirect Contribution
Woodland Trust Sites ‡	2020	Woodland Trust	Indirect Contribution

Notes:

- Datasets marked with ‡ have been included in the LNRS mapping under a dedicated licence and reproduced, modified, or products derived from, with permission. Unless otherwise stated all other datasets listed have been included under an Open Government Licence (OGL).
- Direct Contributions refer to datasets which were foundational or contributed towards habitat or species measures, the APIB, or the network boundary.
- Indirect Contributions refer to datasets which contributed to the initial Marxan data inputs such as modifications to the cost or exclusion layers.

Appendix 2: Conservation Feature Layer Creation Detailed Methodology

A detailed methodology on the creation of habitat layers which contributed to Marxan's analyses and the mapped solution. If unlisted, the input layer was unchanged from the original source layer.

Existing habitats for preservation or restoration:

- **Lowland Calcareous Grassland (LCG)** – Existing habitats from TVERC's habitat inventory combined with the same from Natural England's Priority Habitats Inventory and merged into a single layer.
- **Traditional Orchards (TRO)** – Existing habitats from TVERC's habitat inventory combined with the same from Natural England's Priority Habitats Inventory and merged into a single layer.
- **Lowland Fen & Reedbeds (LFN, RBD)** – Existing habitats from TVERC's habitat inventory combined with the same from Natural England's Priority Habitats Inventory and merged into a single layer.
- **Lowland Acid Grassland & Lowland Heathland (LAG, LHL)** – Existing habitats from TVERC's habitat inventory combined with the same from Natural England's Priority Habitats Inventory and merged into a single layer.
- **Wood Pasture & Parkland (with a 1km buffer) (WPP)** – Existing habitats from TVERC's habitat inventory combined with the same from Natural England's Priority Habitats Inventory and merged into a single layer, then given a 1km buffer.
- **PAWS (Plantations on Ancient Woodland Sites)** – Any areas labelled 'Replanted Ancient Woodland' in Natural England's Ancient Woodland Inventory.
- **Rivers & other surface water bodies (25m buffer intersecting with any planning units)** – The Water Framework Directive's rivers layer was given a 25m buffer and then any planning units (5ha hexagons or otherwise changed due to overlaps with designated sites or urban areas) which overlapped with the buffered layer were selected and merged.
- **Chalk Streams & Rivers –** Any areas included in Natural England's chalk rivers dataset.

Habitat opportunities for creation, defragmentation, or connection:

- **Ancient Woodland (AW)** – Buffer of Existing & Replanted AW by 50m, merged with PAWS and a connection layer (Neighbour connections between areas of Existing AW across a Woodland cost surface, where the cost is less than 3000, buffered by 50m with non-woodland priority habitat removed. Any isolated polygons smaller than $10m^2$ were then removed.
- **Floodplain Grazing Marsh on arable soils (FPGM)** – Based on the methodology behind Natural England's Habitat Networks, built up from layers for Primary, Associated, Restorable, and Creation.
    - Primary layer from the existing habitat layer (combination of Natural England & TVERC's habitat inventories), Associated layer based on associated habitats Lowland Meadow, Lowland Fen, and Purple Moor Grass & Rush Pasture from TVERC's habitat inventory. Restorable and Creation layers are from the Natural England Habitats Network dataset.
    - All 4 of these layers were merged into a single PARC layer and buffered 250m. Any polygons over $10m^2$ were buffered 500m, any gaps smaller than $10m^2$ were removed, and then the layer was de-buffered by 250m.

        - Areas which may be unsuitable for the selected habitat that are now present in the buffered zone are removed based on the presence of potentially incompatible soil type, built-up areas or other existing primary habitats.
        - Any small polygons or slivers present in the layer are removed by applying a negative buffer of 10m, and then applying a positive buffer of 10m to all non-sliver polygons still present.
    - **Lowland Acid Grassland & Lowland Heathland (opportunities for defragmentation, wider landscape opportunities, and opportunities on coniferous or mostly-coniferous - plantations)** – Based on the methodology behind Natural England's Habitat Networks, built up from layers for Primary, Associated, Restorable, and Creation.
        - Primary layer from the existing habitat layer (combination of Natural England & TVERC's habitat inventories), Associated layer based on associated habitats Lowland Calcareous Grassland, Lowland Meadow, Lowland Fen, and Lowland Heathland from TVERC's habitat inventory. Restorable and Creation layers are from the Natural England Habitats Network dataset.
        - All 4 of these layers were merged into a single PARC layer and buffered 250m. Any polygons over $10m^2$ were buffered 500m, any gaps smaller than $10m^2$ were removed, and then the layer was de-buffered by 250m.
        - Areas which may be unsuitable for the selected habitat that are now present in the buffered zone are removed based on the presence of potentially incompatible soil type, built-up areas or other existing primary habitats.
        - Any small polygons or slivers present in the layer are removed by applying a negative buffer of 10m, and then applying a positive buffer of 10m to all non-sliver polygons still present.
    - **Lowland Calcareous Grassland**– Based on the methodology behind Natural England's Habitat Networks, built up from layers for Primary, Associated, Restorable, and Creation.
        - Primary layer from the existing habitat layer (combination of Natural England & TVERC's habitat inventories), Associated layer based on associated habitats Lowland Acid Grassland, Lowland Meadow, and Lowland Fen from TVERC's habitat inventory. Restorable and Creation layers are from the Natural England Habitats Network dataset.
        - All 4 of these layers were merged into a single PARC layer and buffered 250m. Any polygons over $10m^2$ were buffered 500m, any gaps smaller than $10m^2$ were removed, and then the layer was de-buffered by 250m.
        - Areas which may be unsuitable for the selected habitat that are now present in the buffered zone are removed based on the presence of potentially incompatible soil type, built-up areas or other existing primary habitats.
        - Any small polygons or slivers present in the layer are removed by applying a negative buffer of 10m, and then applying a positive buffer of 10m to all non-sliver polygons still present.
    - **Traditional Orchards**– Based on the methodology behind Natural England's Habitat Networks, built up from layers for Primary, Associated, Restorable, and Creation.
        - Primary layer from the existing habitat layer (combination of Natural England & TVERC's habitat inventories), Associated layer based on associated habitats Lowland Acid Grassland, Lowland Calcareous Grassland, Lowland Meadow, Lowland Fen, and Purple

Moor Grass & Rush Pasture from TVERC's habitat inventory. Restorable and Creation layers are from the Natural England Habitats Network dataset.

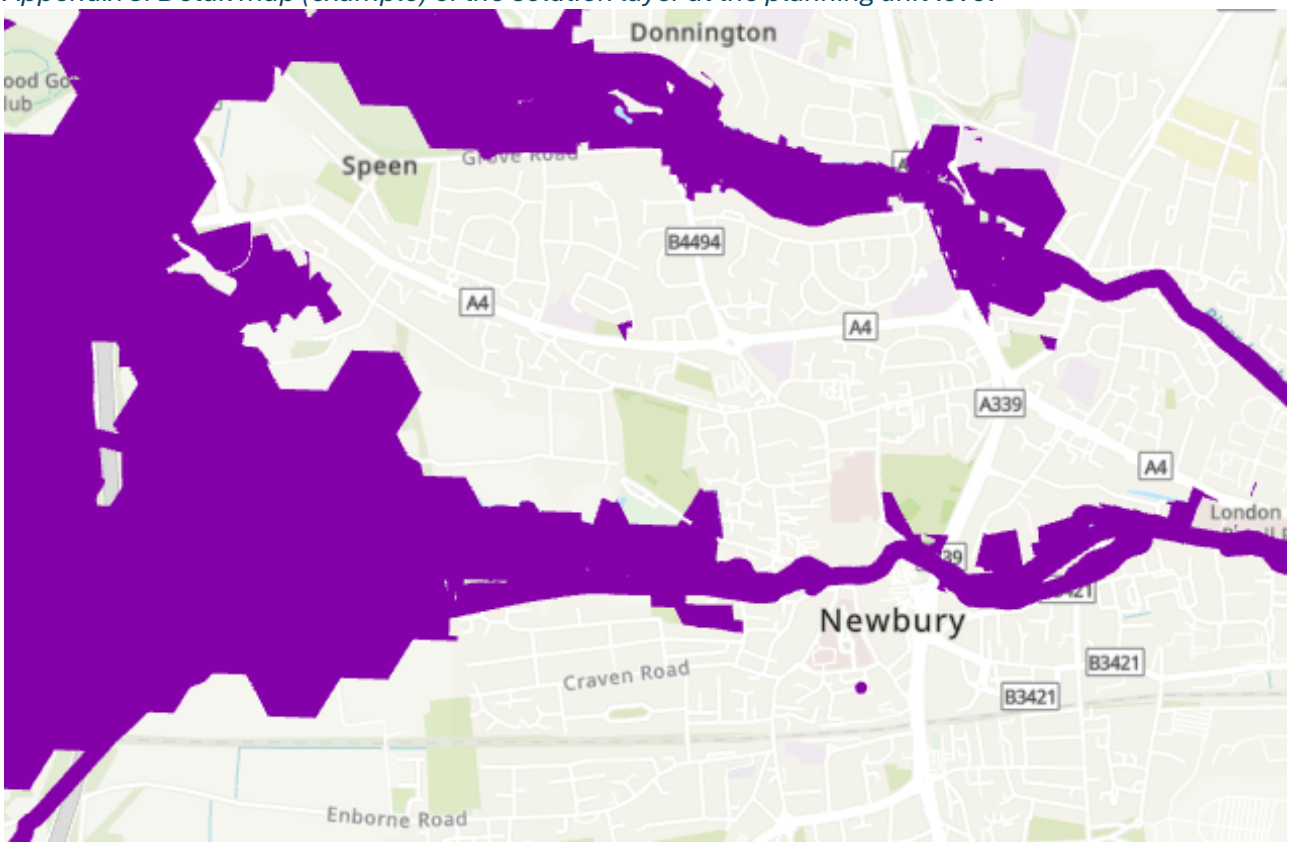
- All 4 of these layers were merged into a single PARC layer and buffered 250m. Any polygons over 10m^2 were buffered 500m, any gaps smaller than 10m^2 were removed, and then the layer was de-buffered by 250m.
- Areas which may be unsuitable for the selected habitat that are now present in the buffered zone are removed based on the presence of potentially incompatible soil type, built-up areas or other existing primary habitats.
- Any small polygons or slivers present in the layer are removed by applying a negative buffer of 10m, and then applying a positive buffer of 10m to all non-sliver polygons still present.

- **Lowland Fen & Reedbeds**– Based on the methodology behind Natural England's Habitat Networks, built up from layers for Primary, Associated, Restorable, and Creation.
  - Primary layer from the existing habitat layer (combination of Natural England & TVERC's habitat inventories), Associated layer based on associated habitats Lowland Acid Grassland, Lowland Calcareous Grassland, Lowland Meadow, and Lowland Heathland from TVERC's habitat inventory. Restorable and Creation layers are from the Natural England Habitats Network dataset.
  - All 4 of these layers were merged into a single PARC layer and buffered 250m. Any polygons over 10m^2 were buffered 500m, any gaps smaller than 10m^2 were removed, and then the layer was de-buffered by 250m.
  - Areas which may be unsuitable for the selected habitat that are now present in the buffered zone are removed based on the presence of potentially incompatible soil type, built-up areas or other existing primary habitats.
  - Any small polygons or slivers present in the layer are removed by applying a negative buffer of 10m, and then applying a positive buffer of 10m to all non-sliver polygons still present.
- **Pond Opportunities** – Areas between 250-500m from existing water habitats (lakes, ponds canals, rivers) excluding Wetland Mosaic areas
- **Wildflower Grassland Opportunities** – Created during consultation & development and built upon smaller, more specific grassland-based measures.
  - Any areas from the TVERC habitat inventory where UKHAB classification is modified grassland (g4), neutral grassland (g3 – not including more specific subcategories) or unspecified grassland (g only).
  - Combined with ALC grade 4 & 5 soils clipped by Calcareous Soil dominated hexes (Freely draining lime-rich loamy soils, Lime-rich loamy and clayey soils with impeded drainage, Shallow lime-rich soils over chalk or limestone).
  - Combined with ALC grade 3 soils with an aspect between 90 and 270 degrees (East to West through South) (Simplified 50m raster of aspect derived from OS Terrain 50 layer using ArcGIS Pro Surface Parameters tool) were also identified.
  - Further additions included areas geologically suitable for FPGM on slopes, as well as the Ordnance Survey's Green Infrastructure layer to include areas of amenity grassland.
  - Any areas currently overlapping with non-grassland habitat (including waterbodies and woodland) or Flood Zone 3 were removed.

Additional features:

- **Hedgerow Creation & Enhancement Opportunities** – Where woodlands are between 200 & 500m apart, a buffer 50m either side of the path between them, excluding areas that are within 100m of existing woodlands. Any isolated polygons smaller than $5m^2$ were then removed.
- **Ridgeway/Droveway Connections** – Built up from Ridgeway National Trail linear layer by selecting non-footpath rights of way (Bridleways, Restricted Byways & Byways Open to All Traffic) within 50m of the Ridgeway and progressively extending outwards by 50m from each iteration to select next round of ROWs. Extended as far as possible until no new ROWs selected. Some further reaches pruned back as they appeared to be extending too far, e.g. around to north of Didcot. Network buffered by 50m around all routes.
- **Mock NRN (BOAs & Flood Zone 3)** – A merged layer combining Berkshire's Biodiversity Opportunity Areas and Flood Zone 3.

Appendix 3: Detail map (example) of the solution layer at the planning unit level



Appendix 4: Berkshire Data Prioritisation Group Membership

The following are a list of organisations who made significant contributions to the development of Berkshire's LNRS through their participation in the Data Prioritisation Group from inception through to publication. The individuals involved brought invaluable knowledge and experience to the group from their various specialties and shaped the LNRS into its current iteration. In addition to representatives from the project team within Royal Borough of Windsor and Maidenhead as the Responsible Authority for the Berkshire LNRS and Thames Valley Environmental Records Centre (TVERC), the following organisations were also represented:

- University of Reading
- Imperial College, Silwood Campus
- Durrell Institute of Conservation and Ecology
- North Wessex Downs National Landscape*
- Berks, Bucks, and Oxon Wildlife Trust
- Forestry Commission
- Environment Agency
- Natural England
- Ecologists, GIS teams, and officers of planning policy from Berkshire's district councils
- Experts of local species

* 'AONBs' (Areas of Outstanding Natural Beauty) were rebranded to 'National Landscapes' in late 2023.

Appendix 5: Conservation Feature Targets and Areas During Development (Pre-Finalisation)

Conservation Feature	Area in county (ha)	Current % of county	Feature Target (%)	Area selected in solution (ha)	% of feature in solution (%)
ALC 4/5 on Calcareous & Arable Soils outside Flood Zone 3	66	0.1%	85%	56	85%
ALC 3 on South- facing Slopes	11,418	9.0%	20%	5,394	47%
CF AW	8,070	6.4%	40%	3,228	40%
CF FPGM on Arable Soils	1,174	0.9%	95%	1,116	95%
CF LAG & LHL	3,385	2.7%	90%	3,046	90%
CF LCG outside Flood Zone 3	2,845	2.3%	60%	1,707	60%
CF TRO	9,303	7.4%	30%	3,962	43%
CF WET (Fen, Reedbeds)	2,985	2.4%	80%	2,388	80%
CF Wet Woodland	17,336	13.7%	25%	7,298	42%
Existing LCG	490	0.4%	95%	465	95%
Existing TRO	149	0.1%	80%	119	80%
Existing WET (Fen, Reedbeds)	206	0.2%	95%	198	96%
Existing LAG & LHL	1,063	0.8%	95%	1,010	95%
Existing Priority Habitat on Neutral Arable Soils (250m buffer)	21,409	16.9%	20%	6,471	30%
Existing WPP (1km buffer)	60,729	48.0%	20%	20,607	34%
Unmanaged Woodland (via FC)	10,443	8.3%	40%	5,948	57%
Green Infrastructure	24,922	19.7%	45%	14,193	57%
Wider Landscape Opportunities for LAG & LHL	3,185	2.5%	90%	2,867	90%
Nutrient Neutrality Zones	22,133	17.5%	50%	11,067	50%
Opportunities for LAG & LHL on Coniferous or Mostly-Coniferous Plantations	1,825	1.4%	95%	1,734	95%
PAWS	1,927	1.5%	95%	1,831	95%
Pond Opportunities	39,735	31.4%	15%	15,244	38%
Poor Quality Grassland	23,415	18.5%	20%	6,620	28%
WFD Rivers, Canals, and Surface Water Bodies (25m buffer, planning units intersect)	12,647	10.0%	86%	10,693	85%

Conservation Feature	Area in county (ha)	Current % of county	Feature Target (%)	Area selected in solution (ha)	% of feature in solution (%)
Chilterns Nat'l Landscape	22	0.0%	15%	17	76%
North Wessex Downs Nat'l Landscape	52,060	41.2%	15%	21,224	41%
NRN (BOAs & Flood Zone 3)	44,027	34.8%	40%	26,398	60%
Bracknell	10,938	8.7%	15%	4,592	42%
Reading	4,039	3.2%	15%	605	15%
Slough	3,254	2.6%	15%	486	15%
West Berkshire	70,419	55.7%	15%	28,894	41%
Windsor & Maidenhead	19,841	15.7%	15%	6,358	32%
Wokingham	17,897	14.2%	15%	4,866	27%
Berkshire County Boundary	**126,389**	**100.0%**	**N/A**	**45,474**	**36%**

Appendix 5. Input & solution conservation feature areas in hectares & % of conservation features in Berkshire. CF here indicates conservation features for increasing connectivity and reducing fragmentation. Conservation features are sorted alphabetically with the exception of the county summary and additional features used to increase county-wide network coverage (National Landscapes, Mock NRN, and unitaries).