Technical Appendix A – Data, Evidence and Methodology

Gloucestershire Local Nature Recovery Strategy

glos nature
GLOUCESTERSHIRE LOCAL NATURE PARTNERSHIP

Gloucestershire
COUNTY COUNCIL

Contents

1. Strategy development process

Gloucestershire County Council led on public and community engagement for the purpose of developing the Local Nature Recovery Strategy, and commissioned Gloucestershire Local Nature Partnership to coordinate gathering input from local organisations and experts. Both Gloucestershire County Council and the Local Nature Partnership worked in partnership to gather and embed community input into the strategy.

Convening technical groups

Key elements of the strategy development, engagement, information gathering and analysis process included convening the following groups:

The Local Nature Recovery Strategy technical steering group

Representation came from Gloucestershire County Council, Gloucestershire Wildlife Trust, Cotswolds National Landscape Board, WWT, National Trust, Natural England, Environment Agency, Forestry Commission, Cotswold District Council, Stroud District Council, Gloucestershire Local Nature Partnership and Gloucestershire Nature and Climate Fund. Gloucestershire Wildlife Trust and Cotswolds National Landscape Board provided additional detailed expert input and advice. A small governance group for general oversight involved Gloucestershire County Council, Gloucestershire Local Nature Partnership, Gloucestershire Wildlife Trust, and Stroud District Council representing the supporting authorities of Gloucestershire's district councils.

The Nature Recovery working group of Gloucestershire Local Nature Partnership

The group included many nature conservation organisations and local authority planners and ecologists. The Nature Recovery working group contributed detailed information and perspective that combined to develop the key messages, priorities and potential measures of this strategy. These contributions of information aimed to help the Local Nature Recovery Strategy align with and build on the Nature Recovery Plans of the Cotswolds, Malvern Hills and Wye Valley National Landscapes, the Cotswold Water Park Nature Recovery Plan, and strategies and management plans of many nature-related organisations in Gloucestershire.

Different meeting sessions involved different partner organisations for different themes, including for example, species, or wetland and water habitats. Many partner organisations also contributed information and improvements through individual emails and meetings. Draft biodiversity priorities and measures were created in an online Google doc visible to working group partners, as a way of iteratively amending, developing and improving the content of the priorities and potential measures.

Input from the Nature Recovery working group was key in deciding to set separate Biodiversity Priorities for different types of water or wetland habitat, as these all have very different management needs. Many members of this working group or their specialist colleagues helped to write, draft or edit different Potential Measures, according to their specialisms.

A species task and finish group

The group comprised representatives from Gloucestershire Centre for Environmental Records and ecology experts in Gloucestershire. The group was convened to develop a long list of rare and threatened species in Gloucestershire, and to shortlist priority individual species and species groups for specific species priorities and potential measures. The long list of rare and threatened species were also grouped in relation to the habitat priorities and measures that can contribute to their conservation and recovery.

The species task and finish group included experts from Cotswolds National Landscape, Butterfly Conservation, Natural England, Gloucestershire County Council, Environment Agency, Gloucestershire Naturalists Society and independent ecologists. A wider set of county recorders and specialists from Gloucestershire Naturalists Society and other members of the Nature Recovery working group helped to refine the long-list and short-list development and information. Gloucestershire Centre for Environmental Records (GCER) played a key role in coordinating and managing this information and process.

The species task and finish group also helped to emphasise the importance of the value of mixed, mosaic and edge habitats including scrub, which is one of the key messages and biodiversity priorities, with a range of relevant Potential Measures including **Measure 033: Ecotones and edges**. Likewise, the importance of retaining dead wood habitat for a range of species was emphasised by this group, leading to Potential Measures such as:

- **Measure 107:** Dead wood
- **Measure 034:** Safeguard and establish ancient and veteran trees
- **Measure 086:** Strengthen violet click beetle population
- **Measure 036:** Ash dieback response
- **Measure 108:** Veteran ash pollards

The main partner organisations involved in the development of the strategy included:

- Gloucestershire Wildlife Trust
- WWT
- National Trust
- Forestry Commission
- FWAG south west
- Cotswolds National Landscape Board
- Wye Valley National Landscape
- Stroud Valleys Project
- Woodland Trust
- Gloucestershire County Council
- Forest of Dean District Council
- Cheltenham Borough Council
- Stroud District Council
- Cotswold District Council
- Tewkesbury Borough Council
- Gloucester City Council
- CPRE Gloucestershire
- Newt Conservation Partnership
- Environment Agency
- Natural England
- University of Gloucestershire CCRI
- Gloucestershire Naturalists Society
- Cotswold Lakes Trust
- Butterfly Conservation
- Malvern Hills National Landscape
- Severn Estuary Partnership
- Association of Severn Estuary Relevant Authorities

Public Engagement

The public, including farmers and landowners who would likely be impacted by the strategy, were engaged with to gather an understanding of what they feel are the priorities for nature in the county, and where nature recovery efforts should be focused. It also helped with developing an understanding in the challenges faced by groups when it comes to contributing to nature recovery, or knowing how to.

Farmer, landowner and land manager engagement

Early engagement sessions to understand the needs and ideas of farmers, landowners and land managers were held in autumn 2023, in partnership with National Farmers Union, Country Land and Business Association and Farming & Wildlife Advisory Group. An information stand at the Royal Three Counties Show in Malvern in June 2024 provided another opportunity to discuss potential opportunity areas for habitat management and creation, and priority ideas, with farmers, landowners and land managers. Some of the key input from this engagement with farmers and landowners which has influenced the direction of this strategy includes:

- aiming to make this strategy as useful as possible in relation to agri-environment funding opportunities.

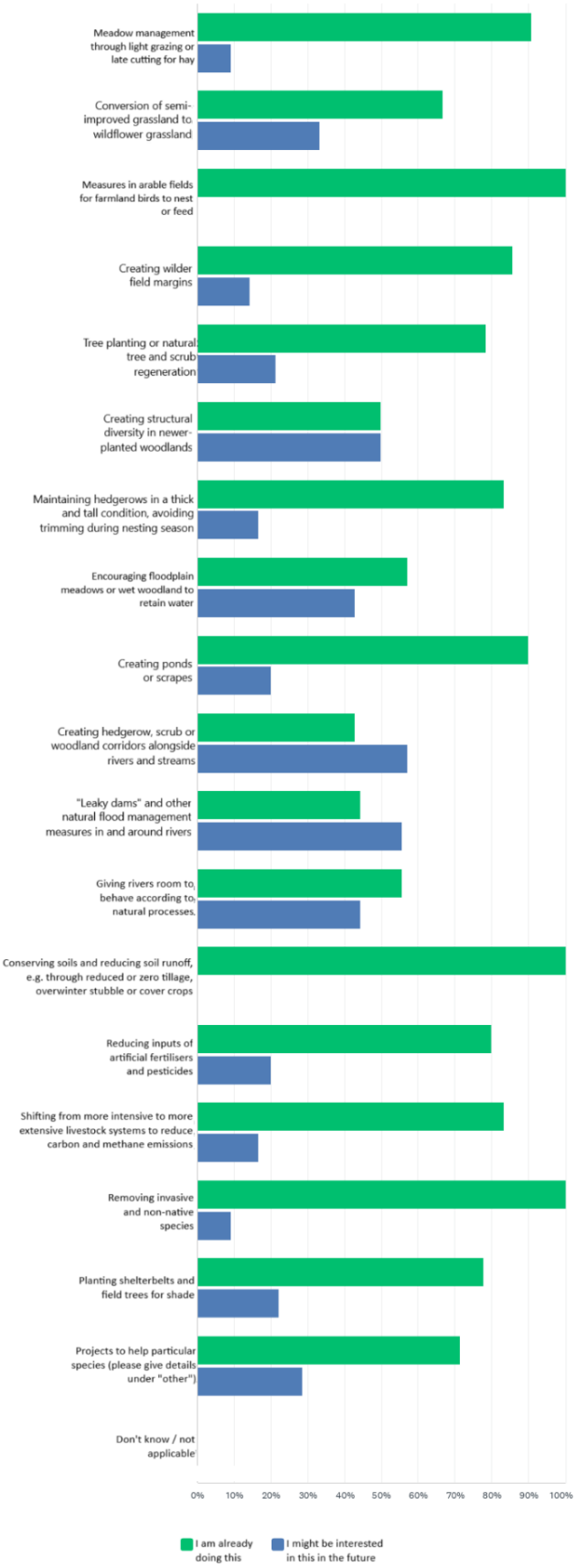
- the need for the Local Nature Recovery Strategy to support the ongoing management of good quality habitat, where landowners have already invested in habitat creation and maintenance. Biodiversity net gain is not designed to reward the maintenance of this previous work and investment. People want to farm ecologically, but need viable incentives too. In response, we have many Potential Measures in relation to Managing existing good quality habitat well, and this is the first of the key messages of the strategy.

- emphasising that soil data, as well as ecological surveys and archaeology and landscape advice, is important in determining the best options for land management. This input helped us create the important caveat to say that the general advice of the Local Nature Recovery Strategy should be supplemented by on the ground surveys and soil tests before determining management options.

- the need to develop partnership projects with multiple landowner consensus and involvement of other agencies such as Environment Agency or Internal Drainage Boards, for landscape scale nature recovery, such as enabling more flood meadows along the Severn Estuary. This was just one of the discussions that highlighted the potential that can come from working as farmer groups or clusters.

- An online survey for farmers, landowners and land managers provided an alternative way to gain input. The survey was completed by 15 farmers, landowners and land managers and helped to show the wide range of actions for nature recovery that farmers are already taking around Gloucestershire, as well as interest in taking new actions. See diagram overleaf.

Q6 What are you already doing on your farm - or what would you potentially like to do in the future - to help nature, improve or create habitats, or for other environmental benefits? The options below are only a short list - there are many other options, so please do describe these under "other". This will help inform the creation of a deliverable Local Nature Recovery Strategy.



Public and community engagement

Gloucestershire County Council worked with independent community facilitators Holding the Space, and Gloucestershire Local Nature Partnership, to run four in-person sessions geographically distributed around the county in Gloucester, Northleach, Cinderford and Stroud, and two online sessions, during March and April 2024, to help influence and input into the Local Nature Recovery Strategy. Gloucestershire County Council developed a comprehensive stakeholder engagement contact list, including harder to reach audiences, who were invited to these public and community engagement sessions. A range of Local Nature Partnership organisations from around Gloucestershire provided expert support in different workshops, to help give context and inspiration. Gloucestershire County Council then ran a public survey during June and July 2024 to share ideas and gain feedback on priority habitats and species.

Key themes from public and community engagement that influenced the development of this strategy can be seen in the report about Community Input into Gloucestershire Local Nature Recovery Strategy[1], and included:

- Relationship with water - participants expressed the need to improve water quality, restore water courses to health, implement natural flood management measures and reintroduce beavers to help slow the flow of water through the catchment. Potential Measures have been written covering all of these.

- Farming and nature - participants felt that farming is essential to how nature is recovered and protected in Gloucestershire. They expressed the need to financially incentivise nature-friendly farming and expressed concerns about excess pollution from agricultural sources.

- Community, urban and access - participants wanted to see more biodiversity in urban areas, to create wildlife corridors and habitat but also for community benefits, mental and physical health benefits, nature connection and more equitable access to nature. In response, a key message and Biodiversity Priority about Biodiversity in our developments and settlements was added, including a range of related Potential Measures.

- Climate - participants wanted the strategy to be developed in the context of future scenarios for floods, drought, changes in season length and extreme weather, as well as looking for opportunities for carbon sequestration.

- Development and planning - Participants were concerned about the impact of new developments on nature, with suggestions including swift bricks in buildings and ensuring sustainable drainage systems are incorporated. There are Potential Measures covering both of these and a range of aspects for incorporating Green Infrastructure standards, wildlife corridors and other nature related aspects into new developments.

- Messiness, connectivity and corridors - There was wide recognition that for nature to thrive, edges, variety and connection are essential. The importance of nature corridors and connecting different habitats was keenly felt. Participants wanted a mindset shift to reclaim and celebrate messiness over straight lines, variety over monoculture and the 'wild' over the manicured. This helped to ensure that the wording of a variety of Potential Measures reflects this.

[1] Report on Community input into Gloucestershire Local Nature Recovery Strategy - https://www.gloucestershirenature.org.uk/_files/ugd/5c4a64_7a965c0b0cfb45cb83fcf8e1293dd56a.pdf

- Engagement, education and narrative - Participants emphasised the importance of engagement, information-sharing, buy-in, training and community involvement, to help deliver the Local Nature Recovery Strategy.

- Process, implementation and national picture - Participants want to continue to see national and local legislation and resources, regulation and enforcement, to support nature recovery. There was a desire for the delivery of this strategy to have adequate funding. There was interest in this strategy feeding into a wider land use framework for Gloucestershire.

Other consultees

Other organisations or bodies consulted as part of the development process included:

- Natural England, Forestry Commission and Environment Agency advisors for Local Nature Recovery Strategy played a key role in expert advice on overall format, woodland habitat priorities and potential measures, and water and wetland priorities and potential measures.
- District Councils as supporting authorities for the Local Nature Recovery Strategy: Relevant planning and ecology staff from district councils had separate meetings with the Local Nature Partnership manager in June - August 2024 to focus on the context for their district and alignment and input from district-level plans, priorities and aspirations. A meeting of the Climate officers group from each district council in June 2024 helped to input climate change related aspects of this strategy.

- Neighbouring counties: There were regular meetings to share information with Local Nature Recovery Strategy coordinators in West of England, Wiltshire, Oxfordshire, Worcestershire and Herefordshire, along with information sharing sessions for South West and Midlands Local Nature Recovery Strategy responsible authorities.

2. Priority Species List process

The guidance *Species Recovery within Local Nature Recovery Strategies, Advice for Responsible Authorities, August 2023*, asked Local Nature Recovery Strategies to create a list of rare and threatened species in Gloucestershire, and then to identify species or groups of species which would need additional actions beyond the habitat Potential Measures, for specific species Potential Measures.

To create the Gloucestershire Priority Species List, the start point was species Red List data from *NERR124 Edition 1. OIF D5 Conservation status of our native species Data Sheet 2022*, using the criteria of species which have been assigned to Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) categories in approved GB IUCN Red Lists. GCER staff also included extinct and regionally extinct species and near threatened species, though this was not indicated in the original advice document. This list was then used to search the GCER Gloucestershire database to create a specific Gloucestershire list.

This spreadsheet was the main focus of discussion at a meeting in October 2023 combining the Nature Recovery working group with a range of county species experts including county recorders, Gloucestershire Naturalists Society members, Gloucestershire Centre for Environmental Records, Butterfly Conservation and British Trust for Ornithology. Following the consultation meeting, a LNRS Species Task and Finish group was created.

At the first meeting of the LNRS Species task and finish group it was decided to extend the list to all Biodiversity Action Plan (BAP) 2007, England Natural Environment Rural Communities Act (NERC), Schedule 41 and Birds of Conservation Concern (BOCC) Red and Amber list species. The new list was generated using the Joint Nature Conservation Committee (JNCC) taxon designations 20230404 spreadsheet using BAP/NERC and Red and Amber list bird species as criteria. This new list was again used to search the GCER Gloucestershire database to create a specific Gloucestershire list.

The list was divided by taxa and a member of the task and finish group was assigned at least one taxon. The taxon lead shared the initial list with the appropriate county recorders and other organisations for their opinions and additions to the list. Consulted organisations included Gloucestershire Naturalists Society, Cotswold National Landscape, Environment Agency, RSPB, Butterfly Conservation, Buglife, Peoples Trust for Endangered Species, British and Irish Conchological Society as well as national recording schemes. Taxon leads also used literature relating to the species within Gloucestershire to determine if the species was noted as threatened or iconic in Gloucestershire. Many taxa were underrepresented on the list, such as fungi, lichens and invertebrates so a large number of these species were added via consultation with local and national experts.

There are 580 rare and threatened species in Gloucestershire on the 2025 Gloucestershire Priority Species List. The following justifications for inclusions were used:

- On the OIF D5 Conservation status of our native species Data Sheet 2022 as Vulnerable, Endangered, or Critically Endangered, Extinct and Regionally Extinct species and Near Threatened species
- BAP 2007, England NERC S.41 and Bird Red and Amber list species
- County expert recommended the inclusion
- Conservation organisation or national recording scheme recommended the inclusion

Justification for exclusion:

- Deemed to be an escapee, vagrant or invasive non-native species
- County expert recommended the exclusion
- Conservation organisation or national recording scheme recommended the exclusion

Grouping the Priority Species List into habitat groups

Where possible the species were put into habitat groups that require similar management measures. Each species can be in multiple groups as it was important to consider each life stage, including breeding and overwintering requirement. The management needs of these species were considered when the Potential Measures for the habitats were written.

For species or assemblages that require extra management actions beyond those that appear in the habitat measures, Species Potential Measures were developed, with the help of the LNRS species task and finish group, most of which have a mapped zone for where these actions should be focused.

To support the creation of the habitat groups for species, each species on the Priority Species list was assigned at least one UKHabs code, with up to five codes per species to account for various needs related to breeding, migration, wintering, and different life stages. This process was carried out by the taxon leads and county experts, in collaboration with the taxon lead. Invertebrate taxon leads also utilised Buglife's pantheon software to assign habitats.

This resulted in a list for each key habitat, of the rare and threatened species in Gloucestershire that could benefit from actions to manage, restore and create that habitat. These habitat-specific species lists can be found in the Potential Measures documents available through the Local Habitat Map, as well as in the Priority Species List document.

Table 1 - Species assemblages

Group name	Habitat group or Species measure	Number of species in the group
Acid grass and heath	Habitat	38
Arable birds	Species measure	24
Arable species	Species measure	30
Ash reliant species	Species measure	12
Broadleaved Woodland	Habitat	148
Butterflies and moths with specific food plants on grassland	Species measure	11
Butterflies and moths with specific food plants on woodland	Species measure	13
Calcareous grasslands	Habitat	126
Coniferous Woodland	Habitat	8
Dead Wood	Species measure	45
Floodplain meadows	Habitat	26
Fly Orchid and White helleborine	Species measure	2
Fritillary butterfly species	Species measure	2
Gardens	Habitat	23
Heathland clearfell	Habitat	5
Hedgerows	Habitat	39
Individual	Individual Species measures	25

Group name	Habitat group or Species measure	Number of species in the group
Lowland Meadow	Habitat	13
Mosaic including scrub	Habitat	14
Mosses, liverworts and linked species	Species measure	14
Reedbeds	Habitat	8
River Severn Fish	Species measure	8
Rivers	Habitat	42
Saltmarsh	Habitat	12
Severn birds	Species measure	39
Traditional Orchard	Habitat	14
Urban greenspaces	Habitat	18
Wet Heath	Habitat	10
Wet Woodland	Habitat	15
Wetland	Habitat	88
Wood pasture and parkland	Habitat	40
Wye Valley Lime	Species measure	7

3. Mapping development process summary

The key start point for the Local Nature Recovery Strategy spatial element was Gloucestershire's Nature Recovery Network map[2], produced by Gloucestershire Wildlife Trust and Gloucestershire Centre for Environmental Records on behalf of Gloucestershire Local Nature Partnership. The Nature Recovery Network mapping formed the basis and start point for the scope and spatial breadth of many of the habitat Potential Measures.

The Nature Recovery Network mapping shows the prioritised distribution of opportunities for creating a more resilient network of habitats. Four categories of core habitat – existing good quality wildlife habitats including those in protected areas – are included:

- Open habitat (core habitats: priority habitats from the Natural Environment and Rural Communities (NERC) Act 2006 section 41: lowland meadows, lowland dry acid grassland, lowland calcareous grassland, lowland heathland);
- Woodland (core habitat: broadleaved mixed and yew woodland with the exception of mixed mainly conifer woodland);
- Freshwater wetland (core habitat: all open water and wetland habitats). This layer is treated as an overlay to the other categories;
- Traditional Orchards (due to their importance in Gloucestershire).

Opportunities for the four main habitat categories to be extended into larger and more joined-up networks is calculated using the concept of 'cost distance' connectivity - in other words, for a representative species, with a given dispersal ability (500m, 1km, 1.5km, 2km or 2.5km), typical of the habitat type, how easy is it for that species to move through different habitats or land use types. Some areas are more difficult than others to move through than others (i.e., they are less permeable and 'cost' more in ecological terms as they do not provide for the needs of the species in terms of what they need for survival [food, water, shelter, genetic exchange]). Scores for the cost distance connectivity of the different representative species groups, are then combined with a number of other opportunity scores and an assessment of constraints to habitat restoration or creation.

The network thus illustrates both the existing hot-spots of habitat, and also the potential benefits of improving the landscape permeability (reducing the 'cost') to create better networks both for biodiversity and ecosystem services.

National sources of habitat data used for the core habitat in the Nature Recovery Network:

- National Trust Habitats Phase 1 GB
- Wales Phase 1 Vegetation
- Natural England Traditional Orchards
- Natural Resources Wales Traditional Orchards

[2] Nature Recovery Network - https://naturalcapital.gcerdata.com/

- Natural England Priority Habitat Inventory
- National Forest Inventory England
- National Forest Estate sub-compartments
- Natural England Countryside Stewardship Scheme Management Options
- Natural England Environmental Stewardship Scheme Options
- UKCEH Land Cover Map 2019
- Natural England Ancient Woodland Inventory
- Natural Resources Wales Ancient Woodland Inventory
- Natural England Wood Pasture and Parkland Inventory*

Local sources of habitat data used for the core habitat in the Nature Recovery Network:

- Validated Combined Phase 1 2006 - 2018 v8 (GCER)
- Wye Valley Phase 1 –
- Herefordshire Phase 1
- Worcestershire Habitat Inventory – Gloucestershire buffer
- Gloucestershire City Green Spaces
- Stroud District Council Green Spaces
- Cotswold District Council Green spaces and open spaces
- Forest of Dean District Council Ownership
- GWT Habimap Data
- Farming and Wildlife Advisory Group habitat data
- NatureSpace Partnership Ponds
- Living Record Foresters Forest ponds
- GWT Elmore habitat data
- Countryside Stewardship Woodland Creation Edits (manual fine tuning of planted area)
- GWT Canal UKHab habitat survey parcels
- GWT Canal Phase 1 habitat data
- Cleeve Common Natural England Field Unit NVC mapping
- ARUP Phase 1 survey of A417 area

In the calculation of where habitat categories could be extended into larger and more joined-up networks, Grade 1 and 2 agricultural land prioritised for food production is coded to be less suitable for conversion to wildlife habitat. Heritage sites of scheduled ancient monuments and battlefields are coded as sites that can be protected within open and grassland habitats, but are constraints for woodland habitat creation.

For the Open and Woodland Nature Recovery Networks, the habitat creation opportunity zones were divided into 3 categories (High, Medium, Low), with the existing core habitat plus the **high priority opportunity** category comprising approximately 20% of the area of the opportunity layer, and the **medium priority opportunity** category comprising approximately the next 10% of area.

Within the Nature Recovery Network mapping methodology, urban areas are not separated out, except that they will be scored as less permeable to species movement in the cost distance analysis. Therefore, for example, where the Woodland Network is shown as a high or medium priority across an urban area, and maps Potential Measures for woodland creation or tree cover, it is prioritising effective locations for tree planting of any kind to occur to increase canopy cover and so contribute towards woodland connectivity across the landscape. Appropriate tree planting solutions (in gardens, public open space, along highways) can all be delivered within green infrastructure inside settlement boundaries and urban extensions.

There is more detail about the methodology of the Nature Recovery Network mapping in *Gloucestershire Nature Recovery Network Mapping Methodology version 4.1.*[3]

A range of other national and local data sources were used to map the focus for other specific habitats such as tufa or saltmarsh, and for measures in relation to settlements and species.

During the process we also mapped non-statutory, non-official Key Project Areas in relation to landscape-scale or significant nature recovery projects, including existing projects and ideas in development.

[3] Nature Recovery Network methodology - https://www.gloucestershirenature.org.uk/nature-recovery-network

4. Sources and methods for Potential Measures Map Layers

The below table sets out the data sources used to create each Potential Measure, and justification for their extent/mapped area. Where the Nature Recovery Network mapping is referred to, please see the full Nature Recovery Network methodology for full information.

It should be noted that there may be minor deviations from the below methodology as a result of the Public Consultation on the LNRS which ran from September – October 2025. Where respondents highlighted areas that were inaccurately mapped (such as open habitat measures mapped over woodland), these were altered accordingly, where evidence was provided. A full write up of the Public Consultation can be found in Appendix B – Public Consultation Report.

Source dates given below refer to the data that was available on that date, and not when the raw data was collected. Whilst some data sources used for the mapping come from more recent surveys and assessments, it is known that some data sources may not have been updated for a number of years (such as some Priority Habitat inventory data). This is recognised as a constraint and influences the caveat given to potential measures (to inform actions with up to date ecological surveys and soil sampling etc where appropriate).

Mapped Potential Measure	Sources and methods
001. Manage lowland calcareous grassland	Lowland calcareous grassland sites recorded in Natural England's Priority Habitat Inventory, updated where known with local habitat survey information including Gloucestershire Wildlife Trust's Phase 1 Habitat Survey, Gloucestershire Wildlife Trust's Habimap project UKHab surveys, and FWAG SouthWest surveys (June 2025). The final version of this layer is based on Gloucestershire's Nature Recovery Network Open Core Habitat layer features, checked against the calcareous geology features from the British Geological Society dataset. Note that initially the soils layer was used, but this produced inconsistencies with the location of grassland types, the geological layer was found to be more accurate as soil pH values are too locally variable to indicate vegetation community types reliably without underlying geology information.
002. Restore and create lowland calcareous grassland	Nature Recovery Network open habitat network zones for high and medium priority opportunities (see mapping summary section above) (June 2025), where this overlaps with the calcareous geology layer from the British Geological Society dataset. To simplify for loading speed, this layer is buffered by 1m and holes or pieces less than 0.25ha removed. Some sites where known opportunities to restore and create lowland calcareous grassland are being progressed by landowners, have been added to this layer, mainly sites involved in Gloucestershire Wildlife Trust's GrasWolds project.

Mapped Potential Measure	Sources and methods
003. Manage neutral grassland and lowland meadows	Neutral grassland or lowland meadow sites recorded in Natural England's Priority Habitat Inventory, updated where known with local habitat survey information including Gloucestershire Wildlife Trust's Phase 1 Habitat Survey, Habimap project UKHab surveys, and FWAG SouthWest surveys (June 2025). The final version of this layer is based on Gloucestershire's Nature Recovery Network Open Core Habitat layer features, checked against the known neutral geology features from the British Geological Society dataset.
004. Restore and create neutral grassland and lowland meadows	Nature Recovery Network open habitat network zones for high priority opportunities (see mapping summary section above)(June 2025), where this is overlaps with the neutral pH geology layer from the British Geological Society dataset. To simplify for loading speed, this layer is buffered by 1m and holes or pieces less than 0.25ha removed. For one site where a known opportunity to restore and create neutral grassland is being progressed by the landowner, the extent of the layer was stretched slightly to meet field boundaries.
005. Manage floodplain meadows	Floodplain meadow sites or neutral grassland sites which fall within floodplain zone 3, recorded in Natural England's Priority Habitat Inventory, updated where known with local habitat survey information including Gloucestershire Wildlife Trust's Phase 1 Habitat Survey, Habimap project UKHab surveys, and FWAG SouthWest surveys (June 2025). The final version of this layer is based on Gloucestershire's Nature Recovery Network Open Core Habitat layer features, checked against the known neutral geology features from the British Geological Society dataset. A 1m buffer, simplified to 5m tolerance, was added to floodplain zone 3 (June 2025) to accommodate overall sea level rise, increased rainfall & seasonal higher water levels.
006. Restore and create floodplain meadows	Nature Recovery Network open habitat network zones for high and medium priority opportunities (see mapping summary section above) (June 2025), where this is within floodplain zone 3, and overlaps with the neutral pH geology features from the British Geological Society dataset. A 1m buffer, simplified to 5m tolerance, was added to floodplain zone 3 (June 2025) to accommodate overall sea level rise, increased rainfall & seasonal higher water levels. To simplify for loading speed, the online version of this layer is buffered by 1m and holes or pieces less than 0.25ha removed. Some sites where known opportunities to restore and create neutral grassland are being progressed by landowners, have been added to this layer, mainly sites involved in the Eelscapes project.

Mapped Potential Measure	Sources and methods
007. Manage acid grassland and wet and dry heath	Acid grassland or heath sites recorded in Natural England's Priority Habitat Inventory, updated where known with local habitat survey information including Gloucestershire Wildlife Trust's Phase 1 Habitat Survey, Habimap project UKHab surveys, and FWAG SouthWest surveys (June 2025). The final version of this layer is based on Gloucestershire's Nature Recovery Network Open Core Habitat layer features, checked against known acidic geology features from the British Geological Society dataset. Locally acidic rock such as breccia is included, plus the few sandy and granitic areas around the county. Very small holes and parts were removed from the online version of the layer and due to simplification and buffering there may be small overlaps with the surrounding features. Acid grassland known on Cleeve Hill has been included based on recent surveys.
008. Restore and create acid grassland and wet and dry heath	Nature Recovery Network open habitat network zones for high and medium priority opportunities (see mapping summary section above) (June 2025), where this overlaps known acidic pH geology features from the British Geological Society dataset. To simplify for loading speed, the online version of this layer is buffered by 1m and holes less than 100m^2 or pieces less than 0.25ha removed.
009. Manage ancient semi-natural woodland, semi-natural woodland and broad-leaved woodland	Ancient semi-natural woodland, semi-natural woodland and broad-leaved woodland recorded in Natural England's Priority Habitat Inventory and the UK National Forest Inventory, updated where known with local habitat survey information including Gloucestershire Wildlife Trust's Phase 1 Habitat Survey, Gloucestershire Wildlife Trust's Habimap project UKHab surveys, and FWAG SouthWest surveys (June 2025), and a small number of other broad-leaved woodlands identified and verified during public consultation. The most recent version of this layer includes revisions from the Ancient Woodland Inventory Update Project, which was completed for Gloucestershire in 2025 and will be published on the Natural England open GIS data hub in Spring 2026. To improved website loading speed, this very detailed layer is simplified to 2m and holes under 100m^2 and pieces less than 0.25ha removed.
010. Expand and buffer ancient semi-natural woodland, semi-natural woodland and long-established woodland	Nature Recovery Network woodland habitat network zones for high priority opportunities (see mapping summary section above) (June 2025). In the final version of this layer a few small areas were corrected, updated, or removed from overlap with Irreplaceable Habitats post-consultation, and only those areas which fall within Natural England's Ancient Semi-natural Woodland Habitat Network mapping have been included.

Mapped Potential Measure	Sources and methods
	To simplify for loading speed, pieces less than 0.25ha have been removed from the online version.
011. Establish new woodland and tree cover	Nature Recovery Network woodland habitat network zones for medium priority opportunities (see mapping summary section above) and high priority opportunities where these were not mapped to Potential Measure 010 (June 2025) ie those which fall outside Natural England's Ancient Semi-natural Woodland Habitat Network. To simplify for loading speed, the online version of this layer was simplified to 2m and pieces less than 0.25ha and small holes removed. Some sites where opportunities to establish new woodland or tree cover are being prioritised with landowners, have been added to this layer, mainly areas within the Severn Treescapes project area that are Nature Recovery Network woodland habitat network zones for low priority opportunities where these do not overlap core habitat, open habitat Nature Recovery Network zones or settlements and urban areas.
012. Restore Plantations on Ancient Woodland Sites	Plantations on Ancient Woodland Sites from the Ancient Woodland Inventory (September 2025), with updates from the pre-publication Revised Ancient Woodland Inventory dataset (January 2026).
013. Manage and expand wet woodland	Nature Recovery Network woodland habitat network zones for high and medium priority opportunities (see mapping summary section above) (June 2025), where these are also within the wetland opportunities layer (see Potential Measure 026 and Nature Recovery Network methodology document for details).
014. Create mixed mosaic habitats including scrub and orchard	Zones where the Woodland and Open Nature Recovery Network high and medium priority opportunities layers overlap with equal priority. Overlaps with adjacent Irreplaceable Habitats have been removed, and a small 5m buffer added to include adjacent linear features such as woodland tracks, banks and streams which could add value to the woodland and open habitat areas. To simplify for loading speed, the online version of this very detailed layer was simplified to 4m.
015. Manage wood pasture and parkland	Wood Pasture and Parkland sites recorded in Natural England's Wood Pasture and Parkland inventory (October 2025), with updates from the pre-publication Revised Ancient Woodland Inventory dataset (January 2026).
016. Restore and create wood pasture and parkland	Zones where the Woodland and Open Nature Recovery Network high and medium priority opportunities layers overlap, and are near to existing Wood Pasture and Parkland. This layer takes into account the pre-publication Revised Ancient Woodland

Mapped Potential Measure	Sources and methods
	Inventory dataset (January 2026). Very small features have been removed from the online version of the map to improve loading time.
017. Traditional orchard management, restoration and creation	Traditional orchards as recorded in the People's Trust For Endangered Species' Traditional Orchards Priority habitat inventory map (September 2024). Orchards in key clusters identified as high value in the Three Counties traditional Orchard Project (2018) have an additional 200m buffer zone around them based upon the need to improve connectivity for dead wood beetles.
018. Manage, improve and create ponds for wildlife	Area mapped corresponds to where the Nature Space Strategic Opportunity Areas highest priority zones in Gloucestershire for action for great crested newts (September 2024) are also within the Areas that Could Become of Particular Importance for Biodiversity.
019. Manage Lakes for biodiversity	All water bodies in Gloucestershire greater than 1 hectare, apart from the Severn Estuary; plus all lakes in the Cotswold Lakes area (formerly known as Cotswold Water Park) regardless of size.
020. River renaturalisation	Main rivers and watercourses from the Ordnance Survey Open Rivers dataset, plus a 20 metre buffer either side, ● in the flagship programme catchments of the Severn Vale Catchment Partnership, including Frome, Leadon and in Forest of Dean. ● Windrush catchment ● Cotswold Valleys rivers in the Cotswold Valleys Nature Improvement Area ● Westbury Brook, Langhope Brook, Chelt, Hatherley Brook, Carrant Brook , Swilgate, Tirle Brook and River Isbourne as advised by the Environment Agency.
021. Remove in-stream barriers	River obstacles from the Rivers Trust Rivers Obstacles map. (December 2025)
022. Improve ecological condition of rivers	All main rivers and watercourses in Gloucestershire. Dimore Brook included as advised by Gloucester City Council.
023. Safeguard tufa and headwater springs	Tufa sites recorded in Gloucestershire survey of tufa springs, 2017: https://nora.nerc.ac.uk/id/eprint/518747/1/OR17020.pdf plus those recorded by other local ecologists and surveys. The final version of this layer incorporates small additions following the consultation process.

Mapped Potential Measure	Sources and methods
024. Natural Flood Management	Mapped to High and Medium areas in the Environment Agency Spatial prioritisation of catchments suitable for using Natural Flood Management (July 2025).
025. Manage floodplain wetland mosaic	Wetland habitat as recorded in Natural England's Priority Habitat Inventory, updated where known with local habitat survey information including Gloucestershire Wildlife Trust's Phase 1 Habitat Survey, Gloucestershire Wildlife Trust's Habimap project UKHab surveys, and FWAG SouthWest surveys, (June 2025).
026. Restore and create wetland and floodplain wetland mosaic	Opportunity mapping for freshwater wetland habitats (June 2025), based on sites within Floodzone 3 (buffered to an extra 1m, as described above), areas of impeded drainage or naturally wet soils plus high (>10) topographical wetness index, and areas of peat, with slopes greater than 10 degrees excluded. See Nature Recovery Network methodology document for details. The most recent version of this layer has a small number of post-consultation corrections such as built areas removed, and the open water of the Severn Estuary removed. To simplify for loading speed, this layer is simplified to 4m tolerance. Some sites where known opportunities to restore and create wetland and floodplain wetland mosaic are being progressed by landowners, have been added to this layer, mainly sites involved in the Eelscapes Landscape Recovery project.
027. Manage and restore fens, mires and lowland peatland sites	Mapped to known fens, mires and lowland peatland sites of Woorgreens, Edgehills, Lower Foxes Bridge bog, Ashleworth Ham and Walmore Common.
028. Protect and manage saltmarsh and mudflats	Estuarine intertidal zone up to the high water mark.
029. Restore and create saltmarsh	Estuarine intertidal zone up to the high water mark, plus mapping for Wetlands for carbon storage (saltmarsh) from WWT Wetland data explorer as of 2025. The zone falls within Natural England's Coastal Habitat Network map layer.
045. Field margins, hedgerows, buffer strips, ponds, trees and sustainable farming and forestry	All rural areas where more general measures for nature would be beneficial. The layer is comprised of all areas not mapped as settlement and not mapped as Areas of Particular Importance for Biodiversity or Areas that Could Become of Particular Importance for Biodiversity. This is necessarily a large and detailed layer which may be slow to load. The online version has been simplified to 4m tolerance for enhanced speed of loading.

Mapped Potential Measure	Sources and methods
057. Urban greenspace, bluespaces and wildlife corridors	Greenspace corridors and strategic areas as digitised from the Joint Core Strategy Green Infrastructure Strategy 2014. Added to this are allotment, playing field, open space and Robinswood Hill Country Park areas from Gloucester City Plan shapefiles, and wildlife corridors preserving ecological connection between Robinswood Hill as a scarp outlier and the Cotswold edge scarp. Some small areas were corrected and/or added following the consultation process. To speed up online map loading the web version has been simplified to 2m.
058. Biodiversity in settlements and gardens	All settlements and urban areas. This map layer was created from a kernel density plot of Mastermap 2024 'manmade' topographic areas. The settlement layer is derived from highest density category. The densest built-up areas were buffered and simplified, and areas under 6 hectares removed.
059. New developments and green and blue infrastructure	A layer that applies everywhere in Gloucestershire.
060. Green bridges and wildlife crossings	Potential high priority areas to consider for Green Bridges and/or wildlife crossings, proposed in partner discussions with Gloucestershire County Council, National Trust and Gloucestershire Wildlife Trust as prompted by requests from National Highways and National Rail. Mapped to key areas where better habitat is either side of National Highways/ Motorways or there is more scope for developing wildlife corridors, on M5 Tewkesbury/Ashchurch area, M5 Whitminster area to A38, M5 Cam to south Gloucestershire border, M50 near Kempley Green, and A40 near May Hill Village. Also mapped were a potential 'bridge' on the A40 at Sherborne to promote habitat connectivity; and areas in the Forest of Dean where Gloucestershire Centre for Environmental Records suggest Pine Marten road mortality is more likely in Berry Hill/ Lydbrook and along the A4136. The layer was buffered with an extra 1m to enhance the map detail, and simplified to 1m tolerance.
SPECIES	All species data used to create mapping is from a 25 year period 1999 – 2024.

Mapped Potential Measure	Sources and methods
	The open water area of the Severn Estuary has not been included in the species layers unless directly relevant to the Potential Measure, e.g. for River Severn Fish.
071. Strengthen breeding curlew population	Mapped to coastal and grazing marsh Priority Habitat Inventory sites (June 2025) in the Severn Vale, and additionally known breeding sites (with 1km buffer) near Bourton-on-the-Water and Tewkesbury, on advice from LNRS Species task and finish group and local bird experts. Matched to Gloucestershire habitat inventory parcel data with urban land (e.g. roads or buildings) removed.
072. Increase resilience of wood warbler population	2km buffers created based on areas identified from LNRS Species task and finish group advice and Gloucestershire Centre for Environmental Records species records (Nag's Head and Flaxley Woods) with contiguous field boundaries included. Habitat filtered to include only woodland. Layer also clipped to within the Areas that Could Become of Particular Importance for Biodiversity.
076. Greater horseshoe bat flightlines	Wide corridor visualisation of greater horseshoe bat flightlines between Forest of Dean roosts and Woodchester Park. Based on continuous hedgerow lines and watercourse corridors, and known River Severn crossing locations.
077. Strengthen lesser horseshoe bat population	Mapped to Forest of Dean bat Special Areas of Conservation areas all with 3km buffer. Additionally location records at Gloucestershire Centre for Environmental Records have been used to identify other potential key locations in the county (e.g. Sherborne, and Stroud Valleys) with each location also buffered by 3km. Habitat has been filtered for preferred habitat of broadleaved woodland. Linear water features between buffer sites have also been included.
078. Strengthen western barbastelle population	Mapped to Nags head plantation, Chedworth tunnel/woods, Sherborne estate, Lower woods, Brimscombe mines (balls green), Cannop valley, Siccaridge woods, Highnam woods, Coaley woods, and Sapperton tunnel, on advice of local bat experts. Additionally a 7km buffer was created around these sites and any woodland or linear feature (road/rail/waterway) has also been included.
080. Strengthen soprano pipistrelle population	Mapped to lakes/woodland at Gatcombe, Woodchester, Bakers Mill (Siccaridge), Toadsmoor, Cotswold Water Park, Mythe Bridge, Cannop Pond, Frampton Lakes, Dowdeswell Reservoir, on advice of local bat experts. Additionally any lake/static water body found next to woodland has also been included.
081. Beaver reintroduction and habitat creation	Rivers with 100m buffer in Forest of Dean and River Frome catchments from early draft recommendations of Gloucestershire Wildlife Trust beaver feasibility study.

Mapped Potential Measure	Sources and methods
082. Strengthen adder population	Mapped to nature reserves with known presence, as well as sites where remedial action has been instigated, on advice from Gloucestershire Wildlife Trust. Additionally main population clusters have been selected (considered more than 5 adders within a 2km area), a 2km buffer added and the layer filtered to remove urban areas. Buffer sizes chosen based on radiotracking studies which suggests that although gravid females remain near hibernacula males and juveniles can travel up to 2km for mating and hunting. Area extended to include Aylburton Common from advice received during public consultation, relating to historic population on the Common.
083. Strengthen great crested newt population	Area mapped corresponds to Naturespace Strategic Opportunity Areas highest priority zones in Gloucestershire for action for great crested newts (September 2024).
084. Strengthen white-clawed crayfish population	Mapped to rivers/streams/brooks within Gloucestershire which are identified to have white clawed crayfish, and an absence of signal crayfish, and because they are either source/final sites for translocations, physically isolated upstream from signal crayfish, or are unknown and have potential to be source sites, on advice from Gloucestershire Wildlife Trust officer working on white clawed crayfish conservation (2025).
085. Strengthen scarce blue-tailed damselfly population	Mapped to the Cotswold Water Park / Lakes area as this area would be a priority for action, on advice of Cotswold Lakes Trust.
086. Strengthen violet click beetle population	Corridor created between Bredon Hill and Dixton Wood SACs with habitat filtered to remove urban features, and expanded to match field boundaries using available county data. Violet click beetle is elusive and corridor was chosen as it may contain veteran Ash or Beech of correct trunk width within suitable habitat. As Bredon Hill is outside of Gloucestershire the corridor crosses the county boundary into Worcestershire.
087. Strengthen rugged oil beetle population	Mapped to nature reserves and SSSIs where rugged oil beetle presence was indicated by species records held at Gloucestershire Centre for Environmental Records. All species data was buffered by 1.5km and filtered to grassland. As a nest parasite, Rugged Oil Beetle distribution is reliant on ground-nesting solitary bee species. The maximum dispersal distance for some solitary bees is approx. 1.5km therefore buffers around beetle occurrences were set to this size. Although gardens are a known habitat these were not included due to limitation of the habitat dataset and the need to prioritise the best potential habitat. For the same reason, this layer once defined as above was also clipped to within the Areas that Could Become of Particular Importance for Biodiversity.

Mapped Potential Measure	Sources and methods
088. Strengthen hairy click beetle population	Mapped to River Severn along tidal range (up to Upper Lode Lock Tewksbury) and River Wye along tidal range (up to Bigsweir Bridge) on advice from Environment Agency - both with a buffer of 20m to include marginal vegetation.
089. Strengthen large blue population	On advice from Gloucestershire Wildlife Trust and Butterfly Conservation, mapped to Minchinhampton and Rodborough Commons, Painswick Beacon, Daneway Banks (and linked areas), Woodchester Park (for future reintroductions). Additionally Swifts Hill SSSI, Dorvel Wood, Laurie Lee Wood, and Blackness Banks have been included due to location record occurrence held at Gloucestershire Centre for Environmental Records on these sites.
090. Strengthen Duke of Burgundy population	On advice from LNRS Species task and finish group, mapped to Rodborough Common, Painswick Beacon, Edge Common, Huddinknoll Hill, Bull's Cross, Juniper Hill, Painswick Beacon, Cirencester Golf Club, Ravensgate Common, Rough Bank NR, Kites Hill Reserve, Charlton Kings Common, and any SSSI, NNR, common land, or private land parcel where species records intersected.
091. Strengthen wood white population	Mapped to relevant woodlands in Forest of Dean and some woodlands in Stroud in relation to species records held at Gloucestershire Centre for Environmental Records. To prioritise the most promising potential habitat connections, the layer was also clipped to within the Areas that Could Become of Particular Importance for Biodiversity.
092. Strengthen lead belle population	Mapped to Forest of Dean and Cleeve Common SSSI, on advice from LNRS Species task and finish group. 1km buffer around species records was used to determine location, and habitat filtered to only include scrub/gorse. Disperal rates for lead belle are unavailable however papers suggest that the dispersal rate for geometridae is around 1km. Species records held at Gloucestershire Centre for Environmental Records were used to limit map layer to this extent.
093. Strengthen Phyllonorycter sagitella population	Area created to match Highnam Woods, on advice of LNRS Species task and finish group.
094. Maintain chalk carpet population	Area created to match quarries in Cleeve Common, on advice of LNRS Species task and finish group.
095. Strengthen *Lauria sempronii* snail population	Matched to location clusters from presence records held at Gloucestershire Centre for Environmental Records from the past 25 years. 500m buffer created around clusters as per guidance.
096. Strengthen juniper population	Area created to match Rodborough Common, Minchinhampton Common, Painswick Beacon, Juniper Hill's (Edgeworth and Pitchcombe) SSSI's, on advice of LNRS Species task and finish group. Any remaining clusters (more than 2 records within 500m area) were buffered to 1km and boundaries snapped to calcareous grassland. With papers suggesting an expontetial

Mapped Potential Measure	Sources and methods
	decay for wind pollen dispersal, and juniper being dioecious, clusters of two or more records were chosen for buffers. Paper searches for wind pollen dispersal of this species were limited - therefore a standard buffer of 1km was applied to matching records of the correct habitat type.
103. Pearl-bordered fritillary and small pearl-bordered fritillary	Gloucestershire Centre for Environmental Records species records buffered to 200m plus Bromesberrow estate. Main clusters are at centre of Natural England Wood pasture and parkland habitat records so those network areas were chosen. The layer also clipped to within the Areas that Could Become of Particular Importance for Biodiversity. A 10m buffer was applied to bridge small edge gaps in the clipped layer, then small holes and parts were removed from the online version to speed up map loading times.
106. Rare arable plants and soil fauna, flora and fungi	Mapped to grassland or arable habitat which aligns with either location records held at Gloucestershire Centre for Environmental Records for species within the assemblage, or county/national important plant locations in IAPA tetrads from Plantlife surveying.
108. Veteran ash pollards	Areas mapped to land parcels matching with ash pollards listed in the ancient tree inventory. Additionally areas near Hawkesbury, Winchcombe (and surrounding villages), and any woodland North of Cirencester (classed as ancient/semi natural woodland in the N.E ancient woodland inventory) have also been included on expert advice.
109. Fly orchid and white helleborine	Mapped to Shill Hill, Swifts Hill, Cotswold Commons and Beechwoods NNR, on advice of LNRS Species task and finish group, with other areas added in relation to records held at Gloucestershire Centre for Environmental Records.
110. Wye Valley bryophytes and distinctive species	Areas mapped to woodland in the Wye Valley Gorge between Ban-y-Gor and Symonds Yat, on advice from LNRS Species task and finish group. Selection is based on limited species records for assemblage and expert advice on bryophytes (mosses and liverworts), *Sorbus* species and Cosnard's Beetle locations.
111. Moths dependent on small- and large-leaved lime	Mapped as per advice from LNRS Species task and finish group to Wye Valley sites between Tutshill and St.Briavels/Mork. Selection is based on location of lime and lime-associated moth species and any connected contiguous woodland.
112. Strengthen Severn Estuary and Floodplain waterbird populations	Ramsar Site plus Severn Estuary SPA Functionally Linked Land Bird Sites https://environment.data.gov.uk/dataset/87cf206e-491b-4319-8763-2bc32fd3d7c7 plus other relevant floodplain sites as advised by Mike Smart, WWT and the LNRS Species Task and Finish group.

Mapped Potential Measure	Sources and methods
113. Strengthen River Severn fish populations	Mapped to River Severn and River Severn tributaries within Gloucestershire to target all possible spawning areas for assemblage species, using a 20m buffer. Eels were excluded during layer creation as they may move overland to find static waterbodies. For the purpose of displaying online this layer was clipped to the Gloucestershire county boundary, but it should be noted that the mapped area, as with other estuarine species, should be considered in the context of the Estuary as a whole.
Areas That Could Become of Particular Importance for Biodiversity – summary layer	A combined layer indicating the total coverage of the following Potential Measures: 001 Manage lowland calcareous grassland 002 Restore and create lowland calcareous grassland 003 Manage neutral grassland and lowland meadows 004 Restore and create neutral grassland and lowland meadows 005 Manage floodplain meadows 006 Restore and create floodplain meadows 007 Manage acid grassland and wet and dry heath 008 Restore and create acid grassland and wet and dry heath 009 Manage ancient semi-natural woodland, semi-natural woodland and long-established woodland 010 Expand and buffer ancient semi-natural woodland, semi-natural woodland and long-established woodland 012 Restore Plantations on Ancient Woodland Sites 013 Manage and expand wet woodland 014 Create mixed mosaic habitats including scrub and orchard 015 Manage wood pasture and parkland 016 Restore and create wood pasture and parkland 017 Traditional orchard management, restoration and creation

Mapped Potential Measure	Sources and methods
	018 Manage, improve and create ponds for wildlife 019 Manage Lakes for biodiversity 020 River re-naturalisation 021 Remove in-stream barriers 023 Safeguard tufa and headwater springs 025 Manage wetland and floodplain wetland mosaic 026 Restore and create wetland and floodplain wetland mosaic 027 Manage and restore fens, mires and lowland peatland sites 028 Protect and manage saltmarsh and mudflats 029 Restore and create saltmarsh 072 Increase resilience of Wood Warbler population 081 Beaver reintroduction and habitat creation 084 Strengthen White-clawed Crayfish population 085 Strengthen Scarce Blue-tailed Damselfly population 087 Strengthen Rugged Oil Beetle population 088 Strengthen Hairy Click Beetle population 089 Strengthen Large Blue population 090 Strengthen Duke of Burgundy population 091 Strengthen Wood White population 092 Strengthen Lead Belle population 093 Strengthen *Phyllonorycter sagitella* population

Mapped Potential Measure	Sources and methods
	094 Maintain Chalk Carpet population 095 Strengthen *Lauria sempronii* snail population 096 Strengthen Juniper population 109 Fly Orchid and White Helleborine 110 Wye Valley bryophytes and distinctive species 111 Moths dependent on Small- and Large-leaved Lime