Gloucestershire Local Nature Recovery Strategy

Part 1

Gloucestershire's Biodiversity and Opportunities for Nature Recovery

2025

Version: Consultation 2.0

Executive Summary

Gloucestershire Local Nature Recovery Strategy is a spatial strategy that establishes biodiversity priorities and maps proposals for actions - Potential Measures - to drive nature's recovery. The main purpose of this strategy is to identify locations where creating or improving habitat will be most likely to provide the greatest benefit for nature and the wider environment. The development of a Local Nature Recovery Strategy for every county in England was one of the key requirements of the 2021 Environment Act.

The key uses of this Local Nature Recovery Strategy are intended to be:

- A spatial strategy to guide the best opportunities for nature recovery across Gloucestershire.
- A guide for farmers, landowners and land managers – to show the best locations for accessing funding for habitat management, restoration and creation, and species-specific projects. This strategy also shows opportunities which could be funded through Biodiversity Net Gain, agri-environment funding and other sources of funding.
- A statutory document in relation to the Biodiversity Duty for public authorities.
- A guide for developers, planners and others to support designs and master planning for green and blue infrastructure, wildlife corridors and habitat creation.
- Information to help create nature and biodiversity projects and town and parish biodiversity action plans and policies.

An important caveat - Site-specific management advice and monitoring

An important caveat to take into account when using this strategy is that this is a high level strategy developed using the current best existing biodiversity information.

For all detailed decisions about habitat management or creation on any particular site, the general recommendations of this strategy should be supplemented with site-specific advice from ecologists, land agents, land managers and Gloucestershire County Council Historic Environment Record, within settlement areas Local Authorities, and within protected landscapes the National Landscape teams.

Site specific advice including baseline ecological surveys and soil tests should be taken before determining habitat management plans or the best options for land management on that site. The ongoing management costs of habitat creation and enhancement should be planned for. Ongoing survey and monitoring is needed to assess the long term impact of conservation management interventions.

The strategy does not force the owners and managers of the land identified to make any changes. Instead, the strategy shows the priority opportunities and options for maintenance and creation of habitats, wildlife corridors and species-specific actions.

This strategy has been developed through a range of discussions and input of information from nature conservationists, planners, local authority officers and members, farmers, landowners, land managers, and members of the public in Gloucestershire.

From these discussions and information we have drawn out six key messages which describe the main aims for nature recovery in Gloucestershire:

1. **Safeguarding, managing and enhancing existing biodiversity-rich sites**
2. **Landscape scale connectivity – Better, bigger, more and more joined**
3. **Climate Emergency**
4. **Our relationship with water**
5. **The value of mixed and wilder habitats**
6. **Biodiversity in our developments and settlements**

1. **Safeguarding, managing and enhancing existing biodiversity-rich sites –** The complex ecological relationships between species in a habitat are difficult to recreate quickly once a habitat is degraded or destroyed. With the pressure on our wildlife, the highest priority is to safeguard and enhance high quality nature sites and species populations. Landowners and land managers who are already doing this should be supported.

2. **Landscape scale connectivity - Better, bigger, more and more joined** – maintaining good wildlife habitat and then increasing the size and connectivity of these habitats. This is the core theme of Nature Recovery as expressed in the Making Space for Nature report, with the aim of creating a resilient and coherent nature recovery network. Recommended areas to focus new habitat creation can contribute to meeting the goal of 30 by 30 - at least 30% of land to be protected for nature recovery by 2030.

3. **Climate Emergency** – Climate change is already affecting our wildlife, with temperature, rainfall and growing season changes affecting the timing of natural events such as emergence, pollination and where species can thrive. Nature based solutions can help mitigate some impacts of climate change. Landscape-scale nature recovery can help some species to move northwards or to new niches in response to climate changes.

4. **Our relationship with water** – The need to re-naturalise our river corridors and their relationship with the floodplain, and where appropriate to remove barriers in rivers which impact on the movement of fish species and on sedimentation. Natural flood management can also help to reduce flood risk and build resilience against drought. We need to tackle water quality issues from both point and diffuse sources, and to protect and improve water quantity, for both surface water and groundwater.

5. **The value of mixed and wilder habitats** – Including valuing scrub as a habitat and prioritising mixed habitats with different types and heights of vegetation – this variety is so important for many of our species.

6. **Biodiversity in our developments and settlements** – The importance of nature in our settlements, urban areas and new developments was emphasised by participants in our public engagement sessions, as well as by other stakeholders. Nature in amongst our urban areas and settlements is important for health and wellbeing, for nature connection, for climate change mitigation and for the connectivity of wildlife habitats.

The needs for nature recovery are due to a large range of factors and pressures on land and water. There are also a number of key issues that are better thought of as opportunities for nature recovery. Some of the key pressures and opportunities discussed in this strategy, beyond the key messages above, include:

- Recreational pressures and disturbance to wildlife
- Diseases and invasive non-native species
- Pressure on woodland regeneration from an increasing deer population
- The opportunity of conservation grazing
- The importance of fungi and soil health
- Working with the archaeological and historic environment
- Minerals extraction and restoration
- The need for ecological recording and monitoring

There are initiatives to create Sustainable Alternative Natural Green Spaces to help relieve recreational pressures on wildlife in some of our most biodiverse sites. Some of these recreational pressures include ground-nesting birds and Severn Estuary and floodplain waterbirds being disturbed by walkers, dogs and mountain bikes. The growth and health of wildlife in ponds and rivers can also be disturbed by dogs, including from pollution from anti-flea and anti-tick treatments on dogs' fur.

This strategy also considers the wider environmental benefits of nature recovery. These wider environmental benefits are also known as ecosystem services, which is a way to demonstrate how biodiversity is essential for resources we need to live. Symbols for some of these key ecosystem services, or wider environmental benefits, are used with permission from the Natural Capital Team at the Environment Agency. The Environment Agency's Natural Capital Team has developed a set of natural capital icons for use in their own tools, guidance, and products, as well as those of their partners, that support a natural capital approach. You can see these symbols next to the Potential Measures in Part 2 and next to the Biodiversity Priorities below.

<u>Key to symbols for key wider environmental benefits / ecosystem services</u>

Carbon storage and sequestration	
Air pollutant removal	
Water quality	
Water flow regulation / flood management	
Local climate regulation/ shading/ urban cooling	
Soil health / Soil erosion prevention	
Cultural / Recreation/ education/ health and wellbeing/ landscape beauty/ sense of place	

This strategy has 10 Biodiversity Priorities:

Biodiversity Priorities	Main wider environmental benefits
1. **Grassland, Meadows and Heathland** (open habitats): Improve the condition of and increase the resilience, extent and connectivity of open habitats. Improve the abundance and variety of associated species.	
2. **Woodland habitats**: Improve the condition of and increase the resilience, extent and connectivity of woodland habitats and tree cover. Improve the abundance and variety of associated species.	
3. **Mixed and mosaic habitats**: Create complex and dynamic mosaics of scrub, grassland, trees and wetland.	
4. **Open water habitats**: Improve the ecological condition of ponds and lakes to support species diversity.	
5. **Running water habitats**: Create more natural river courses and river banks, with better water quality, and dynamic mosaics of linked wetlands.	
6. **Wetland habitats**: Improve the condition of and increase the resilience, extent and connectivity of wetland habitats.	
7. **Estuarine habitats**: Protect and enhance internationally important estuarine habitats.	
8. **Nature-friendly farming and forestry**: Build the health of our soils and provide food sources for wildlife and habitat connectivity through our countryside.	
9. **Biodiversity in settlements and developments**: Increase biodiversity and wildlife corridors in the land around our homes.	
10. **Species priorities**: Strengthen the resilience of rare and threatened species that need specific management measures.	

Part 2 of this strategy describes the range of Potential Measures, which are recommended actions or management options, which help to deliver one or more of these Biodiversity Priorities. The areas where the Potential Measures would be best focused, for biodiversity outcomes, are located on the Local Nature Recovery Strategy map (officially known as the Local Habitat Map).

The main way to use this strategy is to click on your location of interest on the Local Nature Recovery Strategy map. This will show the range of opportunities for nature recovery that are priorities in that particular location, in the form of Potential Measures. The total set of text about the main and related measures gives the full description of what should be included in habitat management plans.

Areas covered by most of the key targeted habitat measures have been combined to define Areas that Could Become of Particular Importance for Biodiversity**. If you are within an Area that Could Become of Particular Importance for Biodiversity AND you are proposing nature recovery work that achieves the relevant text for the Potential Measure, WHERE that measure is mapped, then you would be able to apply the 15% increase in biodiversity units through the Strategic Significance Multiplier.**

We hope the full description of each measure will help inform successful applications for high quality agri-environment funding and other types of nature recovery project development to benefit habitats and species. We hope that public authorities, including strategic authorities, unitary, county, district, town and parish councils, will be able to use the key messages, priorities, and Potential Measures to inform how they deliver their Biodiversity Duty.

Planners will be able to use the spatial focuses of this strategy to inform Local Plan processes, as information to take into account in Strategic Housing Land Availability Assessments and to help seek opportunities for re-naturalisation of river corridors and natural flood management. We hope that housing and infrastructure developers will be able to use this strategy to prioritise biodiversity through biodiversity net gain and through actions such as incorporating wildlife corridors into new developments, including green building measures such as swift bricks and infrastructure improvements such as biodiversity-rich sustainable drainage systems.

Contents

1 What is a Local Nature Recovery Strategy?

The development of a Local Nature Recovery Strategy for every county in England was one of the key requirements of the 2021 Environment Act. The aim of a Local Nature Recovery Strategy is to establish priorities and map proposals for actions to drive nature's recovery and wider environmental benefits.

The main elements of the Gloucestershire Local Nature Recovery Strategy are:

1. Gloucestershire's Biodiversity and Opportunities for Nature Recovery (Part 1 of the Gloucestershire Local Nature Recovery Strategy)

2. Biodiversity Priorities and Potential Measures (Part 2 of the Gloucestershire Local Nature Recovery Strategy). The **Potential Measures** are the recommended actions or management options that will help deliver the biodiversity priorities.

3. Long-list of rare and threatened priority species in Gloucestershire, arranged in assemblages or groups in relation to their habitat needs.

4. The Local Nature Recovery Strategy map or Local Habitat Map, which maps where the Potential Measures should be focused for the best biodiversity outcomes. This identifies Areas that Could Become of Particular Importance to Biodiversity, or where the recovery or enhancement of biodiversity could make a particular contribution to other environmental benefits. It also shows a baseline map of Areas of Particular Importance for Biodiversity – sites already designated for wildlife importance, nationally and locally, and irreplaceable habitats.

The main purpose of this strategy is to identify locations where creating or improving habitat will be most likely to provide the greatest benefit for nature and the wider environment. The strategy does not force the owners and managers of the land identified to make any changes. Instead, the strategy shows the priority opportunities and options for maintenance and creation of habitats, wildlife corridors and species-specific actions.

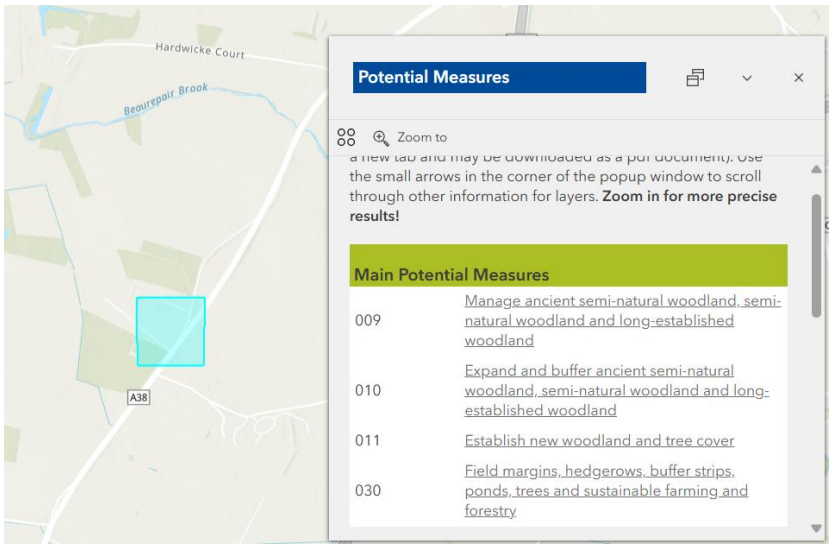
Gloucestershire County Council is the Responsible Authority appointed by Defra for the Gloucestershire Local Nature Recovery Strategy. Responsible authorities must review and republish this strategy when directed to do so by Defra, which could be between 3 and 10 years.

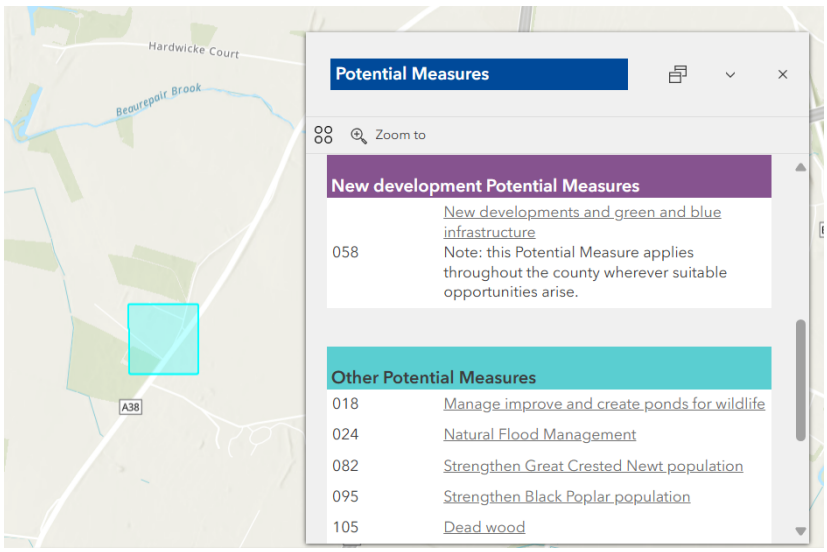
2 Who is this strategy for and how can it be used

How to use this strategy

The main way to use this strategy is to click on your location of interest on the Local Nature Recovery Strategy map (officially known as the Local Habitat Map). This will show a pop-up box with the range of opportunities for nature recovery that are priorities in that particular location, as a 200m^2 square, in the form of Potential Measures, which are management actions.

The main habitat Potential Measures will be listed first. The measure for New developments and Green and Blue Infrastructure is potentially applicable and important everywhere in the county. The lower part of the pop-up box will show other relevant habitat measures as well as species Potential Measures. See examples images below:





Each of the Potential Measures has a short explanatory title. If you click each short title further, you will see a full description of each Potential Measure from Part 2 of the strategy , as well as the unmapped measures that apply alongside and in relation to this Potential Measure. The pdf document will also show which species from the Priority Species List would benefit from these actions. In some cases there will also be guidance links and potential funding sources.

Potential Measure 009: Manage ancient semi-natural woodland, semi-natural woodland and long-established woodland

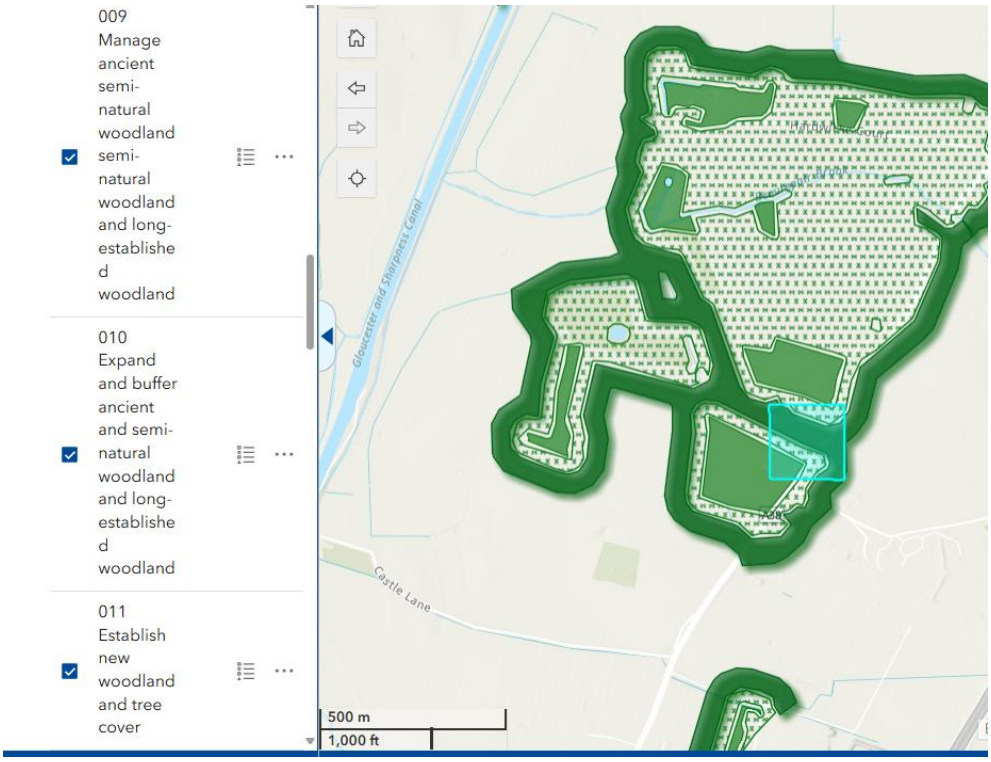
Measure 009: Manage ancient semi-natural woodland, semi-natural woodland and long-established woodland. Manage woodland to improve and maintain ecological condition, including improved structural diversity and availability of dead wood habitat.

Manage woodland to the UK Forestry Standard as a minimum. Create diversity in woodland age, species, provenance and structure through thinning, coppicing, creation of rides and glades, and restocking through a combination of planting, natural regeneration, coppice regrowth and restoration of natural ecological function. Strategically locate rides and glades to encourage greater continuity and connectivity of grassland and grassland edge habitats. Maintain existing coppice rotations and restore or create new coppice woodland in suitable areas.

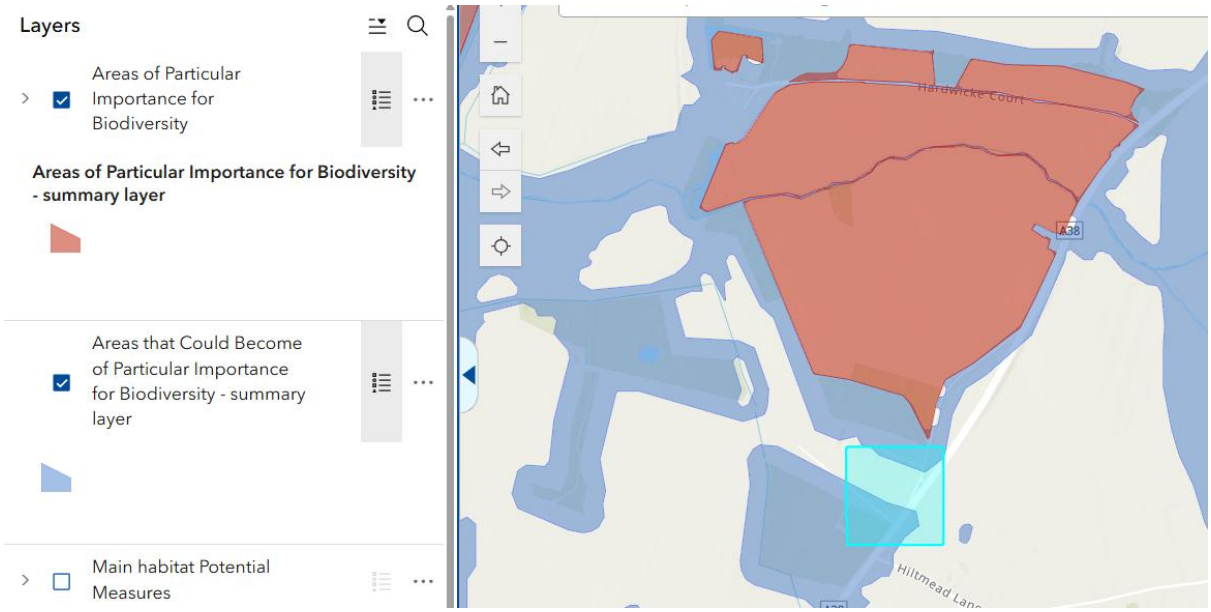
Ensure some areas of minimally managed, undisturbed, moist, low-light semi-natural ancient woodland with mature and veteran trees to offer a good environment for mycorrhizal fungi, heartwood and dead wood species. If needed, consider nest boxes, if they can be maintained, for species including pied flycatcher, marsh tit, redstart and spotted flycatcher. Include standing dead wood for species including lesser spotted woodpecker. Introduce fire breaks where climate change may increase the risk of fire. Eradicate invasive non-native plants such as laurel and rhododendron. Avoid placing game bird pens in woodland areas with a high botanical value or within 500 metres of a SSSI or other site with high biodiversity value.

An important caveat: Site specific management advice and monitoring

The next step is to check the detailed mapping of **individual** measures that you are interested in. The pop-up box picks up relevant measures across a 200m^2 square but in many cases the map zones for different measures will apply in different parts of that square, so it is important to look at the detail of the measures mapping, as demonstrated in the image below.



You can also switch on the Summary map layers to see if this location has been mapped as an **Area that Could Become of Particular Importance for Biodiversity,** the blue area shown in the image below.



The Local Nature Recovery Strategy has a strong link to focusing where the delivery of on-site and off-site biodiversity net gain should be focused. Within the Statutory Biodiversity Metric used to calculate the number of biodiversity units achieved in enhanced or new habitat creation, there is a Strategic Significance Multiplier. **If you are within an Area that Could Become of Particular Importance for Biodiversity AND you are proposing nature recovery work that achieves the relevant text for the Potential Measure, WHERE that measure is mapped, then you would be able to apply the 15% increase in biodiversity units through the Strategic Significance Multiplier.**

In the example in these illustrations, this would mean, within the mapping for each individual Potential Measure, you could apply the 15% strategic significance multiplier in relation to woodland management, woodland creation, hedgerows, pond management and pond creation, for examples. This would increase the payment to the landowner and manager by 15% and is therefore the incentive or mechanism to focus the delivery of biodiversity net gain where it will have the most impact for nature recovery. The total set of text about the main and related measures gives the full description of what should be included in a habitat management plan for off-site biodiversity net gain at that location, to qualify for the strategic significance multiplier.

The mapping of Potential Measures should also suggest opportunities for nature recovery work that can be funded through agri-environment funding or other sources. This strategy is as a county-level guide, but all detailed decisions about land management should be made in relation to site-specific advice and surveys. Habitat management and creation will also be relevant outside the zones mapped in the strategy; this mapping represents zones of best opportunities.

Who this strategy is for

Our intention is that one of the key uses of this Local Nature Recovery Strategy will be as a guide for farmers, landowners, land managers and their advisors and land agents as to the best options for biodiversity in relation to the land they manage. This can help make decisions around conservation management, land-use changes, changes in farming options and help to provide options and supporting justifications for applications for agri-environment funding, natural capital investment, biodiversity net gain, natural flood management funding and other grant funding.

The Environment Act 2021 established two specific mechanisms to support the delivery of Local Nature Recovery Strategies – mandatory biodiversity net gain, and a strengthened biodiversity duty for public authorities. The Local Nature Recovery Strategy plays a key role in recommending where, and what, habitat creation and other measures should be the outcomes of Biodiversity Net Gain in the planning system. Under the Biodiversity Duty for public authorities, local authorities must "have regard to" the Local Nature Recovery Strategy in, for example, the local planning process, as information to take into account in Strategic Housing Land Availability Assessments, to help seek opportunities for re-naturalisation of river corridors and natural flood management, and in making and monitoring Parish Biodiversity Action Plans.

Housing developers and other businesses who are making decisions that affect land or water management, can use this strategy to help steer their actions to help biodiversity in the most strategic direction, through biodiversity net gain, and through designs and masterplanning for green and blue infrastructure, wildlife corridors and habitat creation, green building measures such as swift bricks and infrastructure improvements such as biodiversity-rich sustainable drainage systems.

This strategy can also help inform anyone planning a nature or biodiversity project in Gloucestershire – nature conservation organisations, local companies, community projects, town and parish councils who are creating neighbourhood development plans or biodiversity action plans, and more, on actions that can make a difference to give nature a chance of recovery.

In settlement areas of Gloucestershire you will find a set of Settlements and Developments Potential Measures for a variety of actions that can help to safeguard and enhance biodiversity in our towns, villages and new developments. In rural areas of Gloucestershire, even outside the areas mapped as "Areas that Could Become of Particular Importance for Biodiversity, there are many relevant Potential Measures that can support biodiversity and wider connectivity for nature recovery.

An important caveat to take into account when using this strategy is that this is a high level strategy developed using the current best existing biodiversity information.

For all detailed decisions about habitat management or creation on any particular site, the general recommendations of this strategy should be supplemented with site-specific advice from ecologists, land agents, land managers and Gloucestershire County Council Historic Environment Record, within settlement areas Local Authorities, and within protected landscapes the National Landscape teams.

Site specific advice including baseline ecological surveys and soil tests should be taken before determining habitat management plans or the best options for land management on that site. The ongoing management costs of habitat creation and enhancement should be planned for. Ongoing survey and monitoring is needed to assess the long term impact of conservation management interventions.

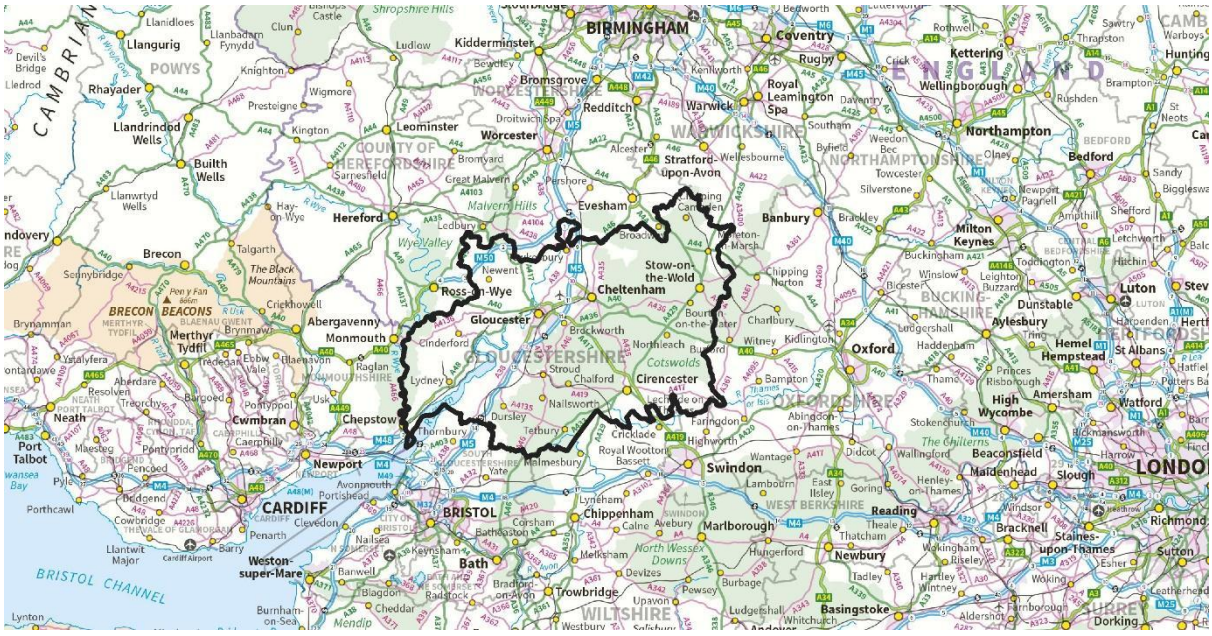
3 Gloucestershire and its biodiversity

3.1 Introduction to Gloucestershire

Gloucestershire is an administrative historic county within the South West region of England, bordering South East Wales, the West Midlands and South East regions (Map 1). At time of publication there are currently six administrative districts within the county: Cotswold, Forest of Dean, Stroud District, Cheltenham, Tewkesbury Borough, and Gloucester City. The county is approximately 270,450ha hectares in extent, at least 5,000ha of this being estuarine habitat. Gloucestershire has a population of over 630,000 residents which is likely to approach 700,000 by mid-century. The main areas of population (over 100,000) are situated in the largest settlements of Gloucester and Cheltenham but also within the wider adjoining Severn Vale.

Gloucestershire is a highly diverse county and is particularly special for its ancient woodland, unimproved limestone (calcareous) grassland, wetlands, old orchards, and species-rich hedgerows. It supports a range of protected and priority species, some of which are becoming increasingly rare such as a range of bat species, amphibians, reptiles, invertebrates, and rare plants.

The location of Gloucestershire is shown below:



Three National Landscapes (formerly known as Areas of Outstanding Natural Beauty, still the legal name of the designation): the Cotswolds, Wye Valley, and a small part of the Malvern Hills, overlap with the county. The National Landscapes together cover over 51% of the land area of Gloucestershire and all stretch well beyond the county boundaries into Monmouthshire, Herefordshire, Worcestershire, Warwickshire, Wiltshire, South Gloucestershire, and Oxfordshire.

As well as encompassing the lower end of the UK's longest river, the River Severn (220 miles), Gloucestershire also hosts the source and upper parts of the Thames catchment (the UK's second longest river, 215 miles). Smaller river catchments occur throughout Gloucestershire, including the River Wye, River Frome and River Cam, with numerous tributaries.

Agricultural or horticultural practices occur on around 75% of Gloucestershire's total area and significant areas of forestry can be added to this. Gloucestershire's farmland area incorporates many types of habitat or features including disturbed or fallow ground, uncultivated field margins, hedgerows, ponds, grasslands (many flower rich), small woods, and orchards. The total area of woodland in Gloucestershire is 36,028 hectares[1], with an extensive wooded area in the lower Wye Valley and Forest of Dean while the area around the Severn Estuary is the least wooded. In much of Gloucestershire outside of the Forest of Dean, woodland is relatively fragmented and consists of smaller patches of habitat.

69% of woodland in Gloucestershire is under sustainable management[2] and a fair proportion of this is managed commercially for timber, and some areas of privately owned woodland are unmanaged. Many forestry/woodland areas are important for recreation and the enjoyment of the countryside.

The general land cover categories in Gloucestershire are dominated by agricultural, forestry, commercial and domestic uses. Areas of 'natural' vegetation occur within these uses but also outside them, for example on nature reserves. Table 1 reveals woodland and plantation amounting to around a modest 10%, however, this excludes some of the smallest patches of which there are many as well as trees being present within other land cover categories too. The Gloucestershire Tree Strategy in 2020 concluded that total tree cover within woods and beyond them was at least 13.5%[3].

Table: 'Land' Cover 2012 for Gloucestershire (*Derived from Cole et al.*[4])

Grouped 'Land' Cover Categories	*Proportion within Gloucestershire (%)*
Predominantly arable/horticulture (crops, fallow etc.)	49.8
All grassland/ pasture including improved and semi-improved grasslands, plus other land with significant natural vegetation (such as tall herb, bracken, scrub, scattered trees, and smaller woods)	29.7
Larger areas of woodland/plantation	9.6
Urban, settlements, sports/leisure & commercial	7.7
Estuary including intertidal habitats, plus large water bodies and water courses	2.4

[1] NFI 2021
[2] Forestry Commission headline key performance indicator - Percentage of woodland that is sustainably managed. March 2023. Additional information can be found at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1162830/Forestry-Commission-Key-Performance-Indicators-Report-2022-23.pdf (page 17).
[3] Gloucestershire LNP (2020). Gloucestershire Tree Strategy https://www.gloucestershirenature.org.uk/glos-tree-strategy
[4] Cole, B., King, S., Ogutu, B., Palmer, D., Smith, G., Balzter, H. (2015). Corine Land Cover 2012 for the UK, Jersey and Guernsey. NERC Environmental Information Data Centre https://doi.org/10.5285/32533dd6-7c1b-43e1-b892-e80d61a5ea1d

3.2 Gloucestershire's existing biodiversity

In Gloucestershire, there are a significant number of designated sites of international and national importance for nature that are afforded special legal protection[5,6] as well as Local Nature Reserves and Local Wildlife Sites that are given a level of protection through National Planning Policy and Local Plans. Internationally designated sites include European Special Areas of Conservation (SACs) and European Special Protection Areas (SPAs). Nationally designated sites include Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs). There is a need to update this baseline of designated sites, and to update the species and habitat information for which these sites are designated, for example, the important species of the Severn Estuary have been changing over time and with climate change.

Internationally important sites within Gloucestershire

- The Wye Valley Woodlands SAC is designated for its *Asperulo-Fagetum* beech forests, *Tilio-Acerion* (lime) forests of slopes, screes and ravines and *Taxus baccata* (yew) woods of the British Isles. https://sac.jncc.gov.uk/site/UK0012727

- The Wye Valley and Forest of Dean Bat Sites SAC, designated for lesser and greater horseshoe bats. https://sac.jncc.gov.uk/site/UK0014794

- Severn Estuary SAC, SPA and RAMSAR designations. The SAC qualifying features are estuaries, mudflats and sandflats not covered by seawater at low tide, Atlantic salt meadows (*Glauco Puccinellietalia maritimae*), sandbanks which are slightly covered by sea water all the time, and reefs. The site also supports sea lamprey, river lamprey, twaite shad, Atlantic salmon, European eel and sea trout. https://sac.jncc.gov.uk/site/UK0013030. The current SPA[7] designation supports an assemblage of at least 20,000 waterbirds, including overwintering gadwall, greater white-fronted goose, Bewick's swan, dunlin, common redshank and common shelduck. https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9015022.pdf. Similarly the RAMSAR designation covers the habitats of intertidal mudflats, sand banks, saltmarsh, shingle, and rocky platforms, the invertebrate community, several species of waterbirds and passage and wintering waders, and several species of fish migrating between sea and river via the estuary[8].

- Walmore Common SPA is the only significant area of peat in Gloucestershire and the current SPA designation supports over wintering Bewick's swan. https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9007051.pdf

- River Wye SAC is designated for water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* (water-crowfoot and water-starwort) vegetation. The following species are also qualifying features: white-clawed crayfish, sea lamprey, brook lamprey, river lamprey, Twaite shad, Allis shad, Atlantic salmon, bullhead, otter and aquatic invertebrates. https://sac.jncc.gov.uk/site/UK0012642

- Cotswold Beechwoods SAC is designated for being the most westerly extensive blocks of *Asperulo-Fagetum* beech forests in the UK. The woods are floristically richer than the Chilterns, and rare plants include red helleborine, stinking hellebore, narrow-lipped helleborine and wood barley. There is a rich mollusc fauna. The woods are structurally

[5] Ramsar Convention plus Habitats Regulations and Wildlife & Countryside Act (as amended)
[6] See - https://www.gov.uk/check-your-business-protected-area
[7] https://publications.naturalengland.org.uk/publication/5601088380076032
[8] https://rsis.ramsar.org/ris/67

varied, including blocks of high forest and some areas of remnant beech coppice. Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) with important orchid rich sites is also a qualifying feature. https://sac.jncc.gov.uk/site/UK0013658

- Rodborough Common SAC Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) - important orchid sites. Rodborough Common is one of the most extensive area of semi-natural dry grasslands surviving in the Cotswolds, and represents CG5 *Bromus erectus – Brachypodium pinnatum* grassland, which is more or less confined to the Cotswolds. https://sac.jncc.gov.uk/site/UK0012826

- Dixton Wood SAC is designated for Violet click beetle. It is a small site with a large number of ancient ash pollards, and supports a rich fauna of scarce invertebrate species associated with decaying timber on ancient trees. https://sac.jncc.gov.uk/site/UK0030135

North Meadow SAC is just outside the Gloucestershire county boundary, in Wiltshire, and is an exceptional example of lowland floodplain meadow.

Sites of national importance in Gloucestershire

National Nature Reserves in Gloucestershire[9] include:

- Cotswold Commons and Beechwoods NNR. At 7.5km^2, it is the largest nature reserve in the Cotswolds. Consisting of limestone grasslands and woodlands, it follows the scarp slopes of the Painswick valley. It includes the internationally important Cotswolds Beechwoods SAC (described above). Among the wider woodlands Buckholt Wood is of note with over 780 species of fungi recorded. The grasslands support a wide range of flora and insects, including the rare Duke of Burgundy butterfly at Rudge Hill Common. The limestone headwaters on the scarp slopes provide some very good habitat for white-clawed crayfish, and high quality assemblages for aquatic invertebrates and bryophytes. .

- Highbury Wood NNR. Situated on the eastern bank of the River Wye, and part of an almost unbroken chain of ancient woods that link Chepstow (Monmouthshire) to Ross-on-Wye (Herefordshire), the 46 hectare wood is rich and diverse, noted for its variety of woodland types. The large-leaved lime, wild service tree, and whitebeam are examples of rare trees here, with the large-leaved lime particularly important as it is restricted to the Wye Valley. Hazel dormice are present at the reserve.

- Lady Park Wood NNR. An unmanaged and near natural woodland which is part of the Wye Valley Woodlands SAC (above), Lady Park Wood is home to both the UK's native species of lime tree as well as whitebeam. Rare bats have been recorded, especially greater and lesser horseshoe bats which are found in significant numbers.

- The Hudnalls NNR. Also within the Wye Valley Woodlands SAC, and managed with minimum intervention, the lime-beech-oak woodland on strongly acid soils is of a type virtually unknown outside of the Lower Wye Valley. Alongside the other woodland NNRS, rare plants are found here supporting rich insect and bird communities, including some rare members of the true fly (*Diptera*) family.

[9] https://www.gov.uk/government/publications/gloucestershires-national-nature-reserves/gloucestershires-national-nature-reserves

Sites of Special Scientific Interest

There are 123[10] Sites of Special Scientific Interest (SSSIs) designated in Gloucestershire. Some of the largest are recognised internationally as SACs/SPAs (for example, Severn Estuary, River Wye, Cotswolds Commons and Beechwoods). Other large SSSIs include Minchinhampton Common, nationally important for calcareous grassland plants and fungi[11], and Cleeve Common[12], which at 455 hectares is Gloucestershire's largest common. It is important as an extensive area of limestone grassland, home to rich plant communities of wildflowers, grasses and fungi that support a wide variety of species. Woodchester Park[13] is another large SSSI, with diverse fauna, flora and fungi associated with the mix of grassland, woodland and wetland habitats. Greater horseshoe bats are present here and there is "outstanding invertebrate interest" on the site*. The Cotswold Water Park[14], more recently designated, covers more than 170 lakes that support 35,000 waterbirds in winter and a range of aquatic plants.

Among the many examples of smaller SSSIs, that are still extremely important biologically, is Badgeworth SSSI[15]. This is one of only two sites in the UK where Adder's-tongue Spearwort (*Ranunculus ophioglossifolius*) can be found, with its own name locally, "Badgeworth buttercup". Wotton Hill[16] is another example. The woodland here is one of only two UK sites where the rare limestone woundwort is present.

Irreplaceable Habitats

Irreplaceable habitats were defined in relation to Biodiversity Net Gain guidance in 2024[17]. The irreplaceable habitats, according to this initial definition, present in Gloucestershire are:

- Ancient woodland – this includes
    - Ancient Semi-Natural Woodlands
    - Plantations on Ancient Woodland Sites
    - Ancient Wood Pasture and Parkland
    - Infilled Ancient Wood Pasture and Parkland
- Ancient trees and veteran Trees
- Lowland fens

17,928 hectares of the woodland in Gloucestershire is ancient (6.8% of Gloucestershire), and Gloucestershire currently has 351 identified Ancient and Veteran Trees (Ancient Tree Inventory, Woodland Trust).

You will only get planning permission for development that results in loss of irreplaceable habitat in exceptional circumstances. The 10% biodiversity net gain requirement does not apply when there is loss of irreplaceable habitat because it would be impossible to achieve. Instead, you need to minimise adverse impacts and agree a compensation strategy with the planning authority.

---

[10] *https://designatedsites.naturalengland.org.uk/SiteList.aspx?siteName=&countyCode=16&responsiblePerson=&DesignationType=SSSI*

[11] *Minchinhampton Common - https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1002432.pdf*

[12] *Cleeve Common - https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1000720.pdf*

[13] *Woodchester Park -https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1003561.pdf*

[14] *Cotswold Water Park - https://www.gov.uk/government/news/cotswold-water-park-confirmed-as-a-site-of-special-scientific-interest*

[15] *Badgeworth - https://www.gloucestershirewildlifetrust.co.uk/nature-reserves/badgeworth*

[16] *Wotton Hill - https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1003582.pdf*

[17] https://www.gov.uk/guidance/irreplaceable-habitats and https://www.legislation.gov.uk/uksi/2024/48/contents/made

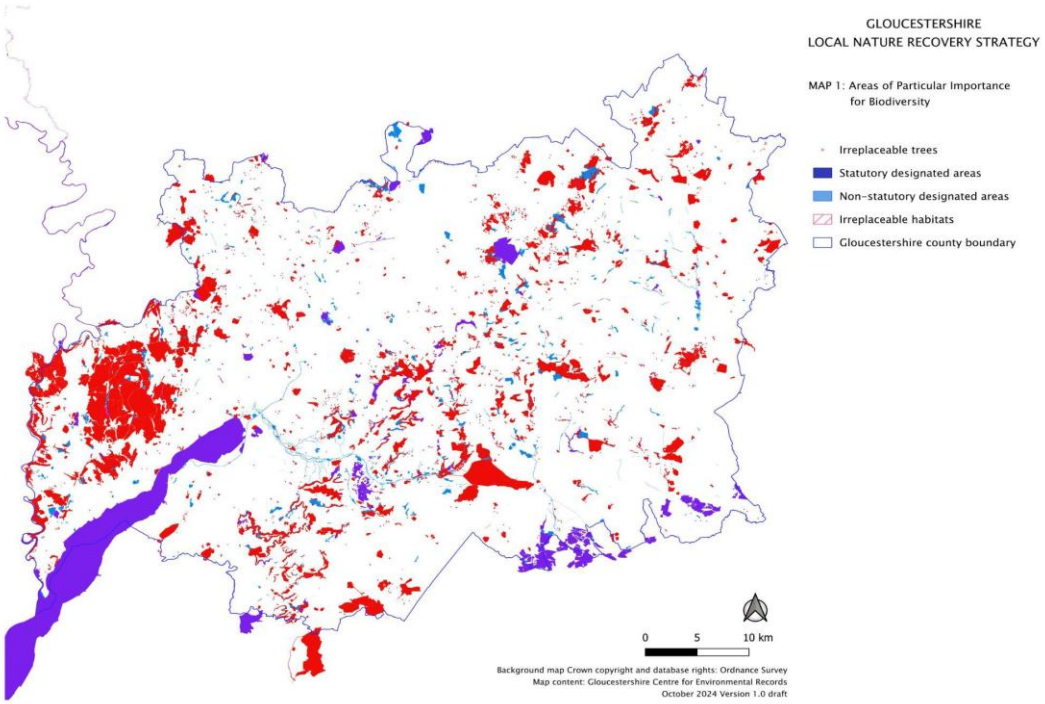
Sites of county importance

Local Nature Reserves (LNRs)[18] are declared by local authorities (councils) on land they control that is of importance for wildlife, geology or environmental education and is accessible to visitors for the enjoyment of nature. These specially selected sites number just over 10 in Gloucestershire include well known sites such as Robinswood Hill and Alney Island.

Local Wildlife Sites are designated at a county level [19], and at date of publication there are 902 Local Wildlife Sites in Gloucestershire. These are part of a nationwide non-statutory site protection system which collectively form the bulk of the county's identified natural heritage. Yet, they cover only about 1% of the county's land area, a clear indication that although we have many biodiversity-rich sites, they are small and fragmented and although they have some policy protection, they have no real legal status. There is an identified need to resource the review and updating of Local Wildlife Site designations and monitoring.

Conservation Road Verges - Road verges can sometimes support remnants of old and species-rich meadows and be bounded by species-rich hedgerows or mature trees. A selection of the most important road verges for biodiversity has been identified by Gloucestershire Wildlife Trust working in partnership with Gloucestershire County Council, and these are designated in the county as conservation road verges[20]. At date of publication there are 109 conservation road verges in Gloucestershire. Road verges can be useful refuges for wildlife and can act as corridors connecting species and habitats across the county.

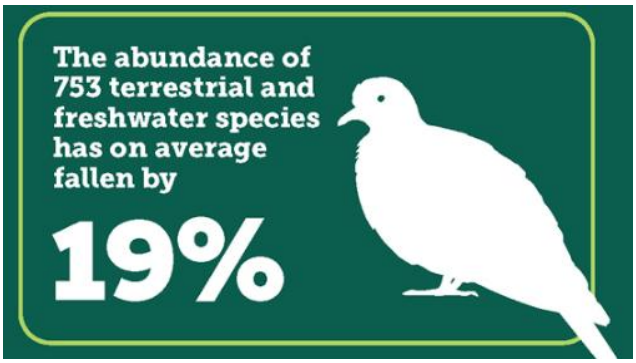
The map below shows Gloucestershire's designated nature sites (SACs, SPAs, NNRs, SSSIs), Local Wildlife Sites and irreplaceable habitats – comprising a map of Gloucestershire's **Areas that are of particular importance for biodiversity**:



[18] See - https://www.gov.uk/guidance/create-and-manage-local-nature-reserves
[19] See - https://www.gloucestershirewildlifetrust.co.uk/wildlife/local-wildlife-sites
[20] https://www.gloucestershire.gov.uk/plans-policies-procedures-and-manuals/biodiversity-and-highways/

4 Opportunities for recovering or enhancing biodiversity in Gloucestershire

4.1 Why is Nature recovery needed?



The UK is one of the most nature-depleted countries in the world. The regular UK State of Nature reports show how the abundance and diversity of our wildlife have been declining for decades. The 2023 UK State of Nature report states that the abundance of 753 terrestrial and freshwater species has on average fallen by 19% across the UK since 1970[21].

This average rate of decline is getting worse. Four years earlier the average rate of decline of UK species abundance was reported as 13% since 1970[22].

Although these statistics use a 1970 baseline, our wildlife habitats and species have been reducing since before that. Examples cited in the 2013 UK State of Nature report[23] include:

- The area of coppiced woodland in the UK fell by at least 90% from 1900 to 1970, affecting invertebrates and wildflowers
- The area of lowland meadow in England and Wales declined by 97% between the 1930s and 1984, affecting wildflowers and insects
- Declines in farmland birds, such as corn bunting, were already being recorded during the 19th century. The agricultural intensification changes driven by the 1947 Agriculture Act led to hedgerows being lost as fields became larger, chemical use increased and the quality and quantity of farmland habitats diminished.

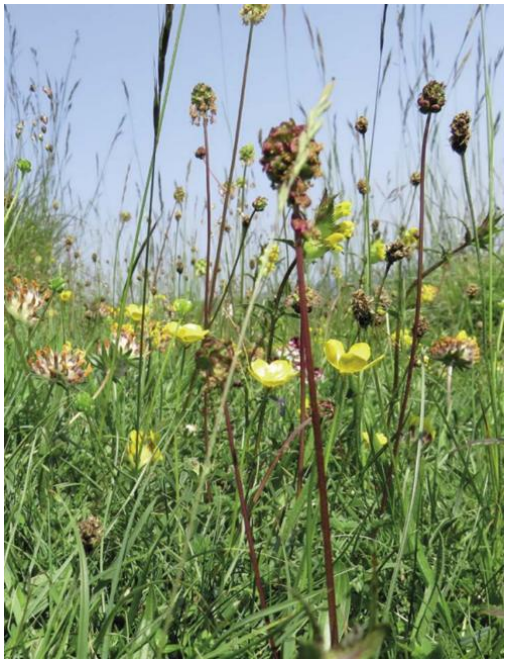
Not only is our wildlife greatly diminished and increasingly isolated, it also now has to deal with the impacts of climate change. Wildlife can try to adapt to climate change by moving across the landscape to a new climate space, in a warming climate in the northern hemisphere this is normally northward. To do this we need ecological networks with habitat corridors, easier “stepping stones” between habitats and features such as field margins, hedgerows and wildflower headlands that make the landscape more permeable. Species will also adapt to climate change through micro-climate opportunities such as slope directions or gradients, height of vegetation and opportunities for shade, and to help this we need larger wildlife sites with a diverse variety of conditions and habitats, sometimes described as mosaic habitats. Gloucestershire is already very important for nature, supported by many land managers, but we need to develop robust nature recovery networks to support adaptation to climate change at the scale required.

Below there are some examples within Gloucestershire that show this need to reverse these declines in nature – and within each of these examples there are also some success stories or examples of actions that are making a difference.

[21] https://stateofnature.org.uk/wp-content/uploads/2023/09/TP25999-State-of-Nature-main-report_2023_FULL-DOC-v12.pdf
[22] https://stateofnature.org.uk/wp-content/uploads/2023/09/State-of-Nature-2019-UK-full-report.pdf
[23] https://stateofnature.org.uk/wp-content/uploads/2023/09/state-of-nature-report-2013-uk.pdf

For example, the Cotswolds National Landscape Board reports that in the 1930s, 40% of the Cotswolds Area of Outstanding Natural Beauty (AONB) was covered in wildflower-rich and fungi-rich grassland on calcareous soils, and today that has fallen to less than 1.5%[24]. However, many farmers, landowners and organisations such as Cotswolds National Landscape Board, Gloucestershire Wildlife Trust and the National Trust are already managing existing good quality meadows, and restoring and creating new meadow habitat, through agri-environment schemes and projects such as Cotswold National Landscape's Glorious Cotswold Grasslands project and the National Trust's Stroud Landscape Project[25]. This strategy has Potential Measures for both managing, and restoring and creating, lowland calcareous grassland and neutral grassland and lowland meadows.

The large blue butterfly was extinct in the UK in 1979, but has been successfully reintroduced to Daneway Banks nature reserve and other sites in Gloucestershire, by a partnership of Gloucestershire Wildlife Trust and the Royal Entomological Society, thanks to new research and understanding of the grazing and management patterns of this limestone grassland site, to support the food plants of the large blue and the presence of the red ant *Myrmica Sabuleti* on which the large blue's life cycle depends. See **Measure 088: Strengthen Large blue population**.



Calcareous grassland – credit Simon Smith

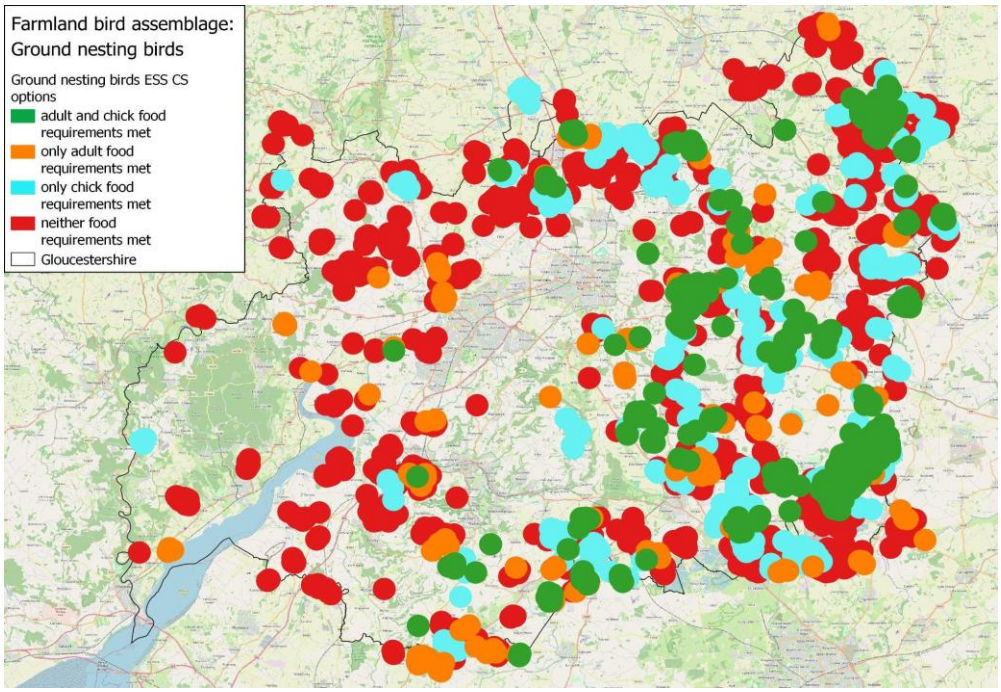
Curlew chick ringed in Gloucestershire in 2023 – credit Mike Smart

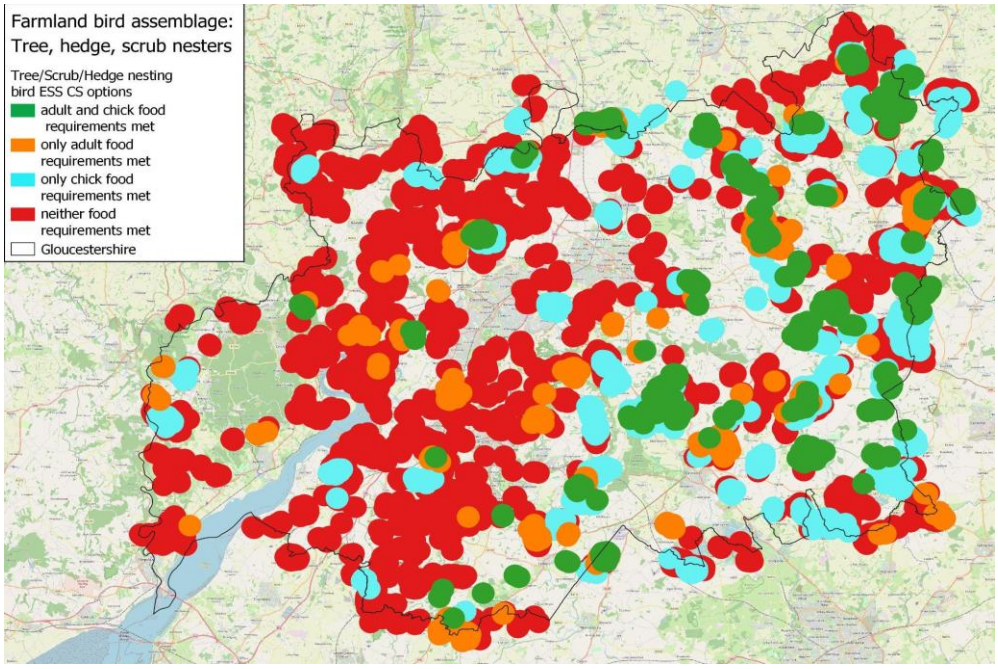
In another example, Gloucestershire Naturalists Society and WWT are working together to monitor and protect curlews in the Severn and Avon Vales. During 2023 they worked with local farmers to protect 27 nests, from which 9 curlew chicks fledged. However, this number of new chicks is not enough to maintain overall curlew population numbers in the long-term. See **Measure 070: Strengthen breeding curlew population**.

[24] https://www.cotswolds-nl.org.uk/our-landscape/wildflower-grassland/
[25] https://www.nationaltrust.org.uk/visit/gloucestershire-cotswolds/minchinhampton-and-rodborough-commons/stroud-landscape-project

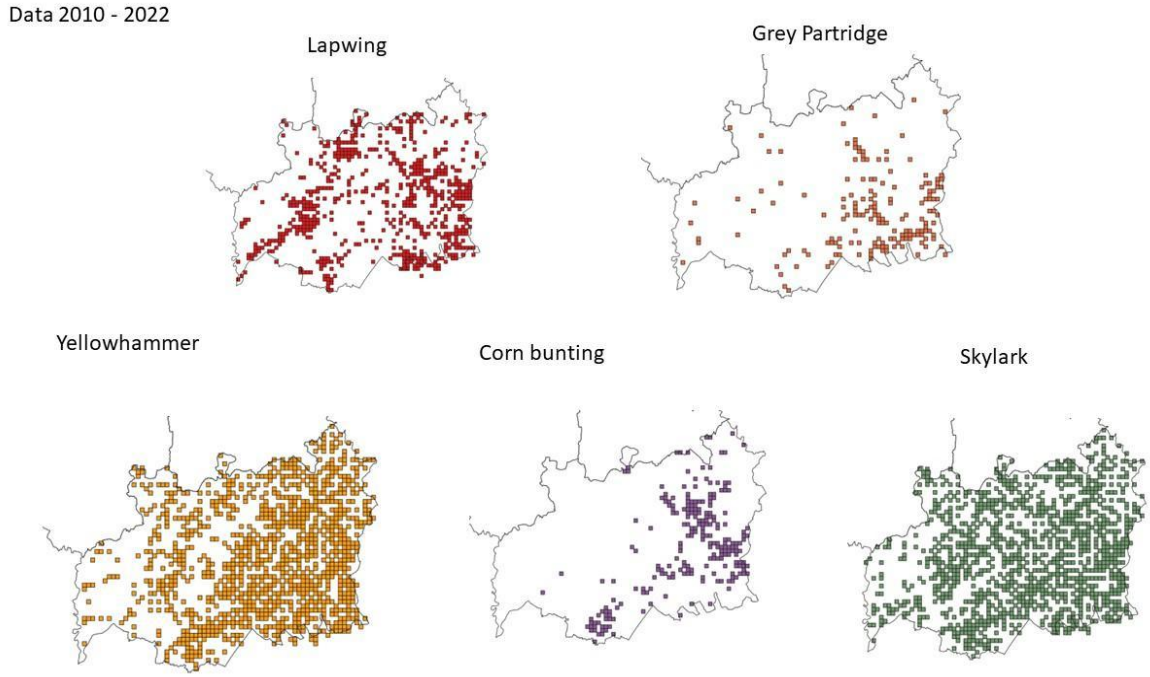
In a third example, the historic decline in farmland birds such as lapwing, grey partridge, yellowhammer, corn bunting and skylark has also been reported in Gloucestershire (statistic or map?). However, Gloucestershire Centre for Environmental Records analysed records of these birds against details from Environmental stewardship schemes and Countryside stewardship scheme options providing nest sites for ground nesting birds. These agri-environment schemes were analysed for having options for:

- food for the adult birds (tends to be seeds, chickweed, cereals, spring-sown crops);
- food sources for the chicks (tends to be insects, larvae, worms – needs field margins or buffer strips or grassland/pasture);
- nesting sites.





In the case of the corn bunting, grey partridge and to a certain extent lapwing, you can see how meeting the nesting and feeding needs of both adults and chicks – for example in the south-east of Gloucestershire - seems to be making a difference to ensure population recovery.



To help focus actions for different species of farmland birds and to meet the nesting and feeding needs of both adult farmland birds and chicks, this strategy has these measures:

- **Measure 096. Individual species needs of farmland birds**
- **Measure 097. Add food sources for ground-nesting adult farmland birds**
- **Measure 098. Add food sources for ground-nesting farmland bird chicks**
- **Measure 099. Add food sources for hedge-nesting adult farmland birds**
- **Measure 100. Add food sources for hedge-nesting farmland bird chicks**

4.2 The key messages of this strategy

This strategy has been developed through a range of discussions and input of information from nature conservationists, planners, local authority officers and members, farmers, landowners, land managers, and members of the public in Gloucestershire. From these discussions and information we have drawn out some overall key messages for this strategy.

These six key messages describe the main aims for nature recovery in Gloucestershire:

1. **Safeguarding, managing and enhancing existing biodiversity-rich sites existing biodiversity-rich sites**
2. **Landscape scale connectivity – Better, bigger, more and more joined**
3. **Climate Emergency**
4. **Our relationship with water**
5. **The value of mixed and wilder habitats**
6. **Biodiversity in our developments and settlements**

4.2.1 Safeguarding, managing and enhancing existing biodiversity-rich sites

In 2010, the Making Space for Nature Report[26] (also known as the Lawton Report after the Chair of the authoring panel) was published, setting out the aims of Nature Recovery. This report eventually led to the Environment Act 2021[27] which legislated for Local Nature Recovery Strategies, Biodiversity Net Gain, and the Biodiversity Duty for public authorities.

The recommendations of the Making Space for Nature report can be summarised with the phrase of "bigger, better, more and more joined, in a more permeable matrix". There is also a hierarchy to the recommendations, with "Better" – the maintenance, protection and improvement of existing good wildlife habitat, being the highest priority. Making Space for Nature says:

> "In general, the first priority is to enhance the quality of remaining wildlife habitat. Increasing connectivity helps, but first there needs to be high quality sites with thriving wildlife populations to connect."

Landowners and land managers who have already improved habitat for wildlife and who are already maintaining wildlife sites well for biodiversity should be supported. The resources that are needed to continue good management for biodiversity are not always fully recognised and rewarded. It is hoped that this strategy can underline the need to fund the maintenance and improvement of existing good quality habitat and support mechanisms to secure ways to resource this.

Many of our existing important wildlife habitats have developed over long periods of time - for example, ancient woodland, traditional meadows, old orchards or heathland - and in relation to ongoing methods of management. The complex ecological relationships between species in a habitat, including the soil ecology, microbes and mycorrhizal fungi, are difficult to recreate quickly once a habitat is degraded or destroyed. Therefore, protecting existing high quality sites of importance to biodiversity from harm is a top priority.

Because of the importance of safeguarding, managing and enhancing existing biodiversity-rich sites, for most of the key habitats in Gloucestershire there are Potential Measures about how to manage or safeguard that habitat.

[26] Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J., & Wynne, G.R. (2010) Making Space for Nature: a review of England's wildlife sites and ecological network. Report to Defra https://www.gov.uk/government/news/making-space-for-nature-a-review-of-englands-wildlife-sites-published-today

[27] https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

4.2.2 Landscape scale connectivity - Better, bigger, more and more joined

The Making Space for Nature Report 2010 also informed the Government that the existing network of protected sites was not preventing species declines, because sites were too small and too isolated. It advocated the need to create a healthy ecological network operating across the landscape as a whole, to help reverse biodiversity loss and provide resilience to external threats and pressures, including the impact of climate change.

The hierarchy of importance of the five recommendations of "bigger, better, more and more joined, in a more permeable matrix" are shown below:

Making Space for Nature recommendations		
Priority level	**Summary word(s)**	**Recommendation**
1	BETTER	Improve the quality of current sites by better habitat management.
2	BIGGER	Increase the size of current wildlife sites.
3	MORE JOINED	Enhance connections between, or join up, sites, either through physical corridors, or through 'stepping stones'.
4	MORE	Create new sites.
5	A MORE PERMEABLE MATRIX	Reduce the pressures on wildlife by improving the wider environment.

The principle of these recommendations is that in order to prevent further decline and implement Nature's Recovery, existing wildlife habitat needs to be bigger (big enough to maintain the species that depend on it), of better quality (well managed so the habitats are brought up to and remain in good condition), more (there should be more sites) and more joined (that they need to be connected up through additional patches of habitat or corridors), in a more permeable matrix (that the wider landscape needs to allow species to move through it more easily).

Based on those principles, this Local Nature Recovery Strategy sets out how existing biodiversity sites, priority habitats and species can survive better by making small patches bigger and making sure they are well enough connected for species to be able to move between them. Gloucestershire's Nature Recovery Network mapping[28], was a starting point for the strategy to build towards connected habitats. The Nature Recovery Network map shows the current core areas of good quality wildlife habitats – the focus of the "BETTER" element of maintaining and improving the quality of current sites. It also expresses the best opportunity zones for extending and buffering habitat, creating new habitat and starting to connect these up – the "BIGGER, MORE and MORE JOINED" elements. There are more details about the Nature Recovery Network mapping in the Data and Evidence section below.

The Nature Recovery Network mapping forms a foundation of the mapping of the "areas which could become of importance for biodiversity" in this Local Nature Recovery Strategy. These zones are where there are the opportunities for habitat management and creation to be of the most benefit to our wildlife, and therefore where we would propose that nature conservation management and habitat

[28] https://naturalcapital.gcerdata.com/

creation is focused, where feasible, in order to join up the existing wildlife sites (including local wildlife sites). These zones are the main areas where Potential Measures for restoring and creating key habitats are focused.

In 2020 the UK government committed to protect and conserve a minimum of 30% of UK land and sea for biodiversity by 2030, as part of the international UN 30 by 30 commitment. Creation of new habitat within the recommended areas to create and improve wildlife-rich habitat identified by this Local Nature Recovery Strategy can help contribute towards meeting the goal of 30 by 30.

In these priority map zones for "bigger, better, more and more joined" habitat creation, particularly the areas identified in the strategy map as Areas that Could Become of Particularly Importance for Biodiversity, it would be beneficial to reduce habitat loss and pressure from new developments, where this can be achieved in Local Plans.

In relation to the fifth Making Space for Nature recommendation of a more permeable matrix for wildlife across our landscape, by improving the wider environment, actions to increase biodiversity and habitat connectivity in the wider countryside are recommended, such as field margins, river buffer strips, hedgerows and ponds, and strengthening the species populations of farmland birds and rare arable plants. Even in "open" habitats, linear corridors of rough grassland banks, and open wood-meadow provide important stepping stone habitats and corridors through the landscape. Similarly, existing monoculture woodland can be managed with wildlife in mind, with woodland rides and clearings, and diversifying native tree species like birch and lime in beech woodland, managing for deer and creating a biodiverse understory. Relevant potential measures include:

- **Measure 030: Field margins, hedgerows, buffer strips, ponds, trees and sustainable farming and forestry**
- **Measure 042: Riparian buffer strips**
- **Measure 096: Individual species needs of farmland birds**
- **Measure 104: Rare arable plants and soil fauna, flora and fungi**
- **Measure 054: Sustainable forestry and nature recovery**

4.2.3 Climate Emergency

The global climate and nature crises are inter-linked. The Wildlife Trusts' Adaptation Report 2022 expresses this well: "Climate change is driving nature's decline, and the loss of wild spaces is leaving us ill-equipped to reduce carbon emissions and adapt to climate change. Meanwhile, degraded habitats are actively emitting carbon instead of storing it. The risk of species extinction is estimated to increase ten-fold for a warming level of 3°C compared to 1.5°C"[29].

In the Gloucester City Council Climate Change Strategy[30], WSP and Gloucester City Council used the latest UK Climate projections (UKCP18) and related tools to identify projected changes in climate for Gloucester City, that by the 2080s:

- The average summer day could be up to 5°C warmer
- Increased winter rainfall by over 20%
- Reduced summer rainfall by over 35%
- An increase in the number and severity of wildfires
- Three times fewer frost days and a reduction in snowfall
- A shift in the growing season
- An increased likelihood of surface water and river flooding, influenced by tides and extreme rainfall
- Heatwaves occurring six times more often
- An increase in the frequency and intensity of storms

These changes are likely to be applicable to all of Gloucestershire. In addition, there will be hotter average temperatures in our rivers, water bodies and the Severn estuary. The Cotswolds high wold in particular is expected to encounter more dry and drought conditions. Climate change exacerbates the risk that non-native species (including pests and pathogens) may establish and spread.

There are a range of ways in which the theme of climate change is part of this strategy. These include:

1. how climate change affects nature and how we can respond to that:
    - Help species movement through a resilient nature network
    - Control spread of pests, diseases and invasive non-native species
    - Protect the habitats and species most vulnerable to climate change
    - Respond to coast changes from sea level rise

2. how nature can help us adapt to climate change:
    - Help to reduce the effects of drought
    - Help to reduce the risk of flooding
    - Provide shading and micro-climates to reduce the effects of extreme heat and increased fire risk

3. how nature can mitigate the effects of climate change through carbon sequestration.

[29] https://www.wildlifetrusts.org/sites/default/files/2022-06/AdaptationReport.pdf
[30] https://democracy.gloucester.gov.uk/documents/s60448/appendix 1 climate change strategy and action plan.pdf

As average temperatures rise, the geographical range of many species will need to move northwards, or to new niches including higher up slopes. Some species will also need more ability to move in response to extreme weather events and other changes due to climate change. The "Making Space for Nature" vision of larger, less fragmented and better connected wildlife sites will help improve the resilience of wildlife species populations and increase the ability of those species that can move in response to climate change.

Some habitats are particularly vulnerable to climate change. The Natural England and RSPB Climate Change Adaptation Manual 2015[31] assessed the relative sensitivity of habitats to climate change. Of Gloucestershire's key habitats, these are the ones with HIGH sensitivity to climate change:

- Coastal saltmarsh
- Standing water
- Lowland fen
- Rivers and streams, including ephemeral waterbodies

Additional research shows that invertebrate populations in Calcareous grasslands can also be severely impacted by heatwave and drought conditions, as flowering plants respond by reducing or ceasing nectar production and butterflies stop flying over a certain temperature. Of Gloucestershire's key habitats, these are the ones with Medium sensitivity to climate change:

- Floodplain Grazing Marsh
- Lowland Meadows (wet)
- Calcareous grassland
- Reedbeds
- Lowland Heathland
- Intertidal Mudflats
- Lowland beech and yew woodlands
- Wet woodland

Climate change will affect the survival rates of ancient and veteran tree species. Management interventions[32] to retain these trees and promote survival will be important, as well as encouraging identification and development of future veteran and ancient trees within the landscape - see **Measure 036: Safeguard and establish ancient and veteran trees**.

The potential for different tree species to be more resilient to climate change should be taken into consideration. Current guidance on climate change and future resilience advises growing a mixed and large suite of species (including native and non-native). This goes for new planting of woodlands and individual trees, but also in restocking after felling of commercial woodlands and in restoration of plantations on ancient woodland sites[33].

The Severn Estuary Shoreline Management Plans[34] indicate which areas are already intended for Managed Realignment[35], or for Hold The Line, in relation to likely changes to the coastline from sea level rise. There are opportunities for habitat restoration to help better achieve the managed

[31] https://publications.naturalengland.org.uk/publication/5679197848862720
[32] https://cdn.forestresearch.gov.uk/2022/05/UKFSPG026.pdf
[33] https://www.gov.uk/government/publications/managing-englands-woodlands-in-a-climate-emergency
[34] https://severnestuarycoastalgroup.org.uk/wp-content/uploads/sites/4/2023/07/smp2partamainreportfinal-160323161232.pdf
[35] https://environment.data.gov.uk/shoreline-planning/shoreline-management-plan/SMP19

realignment in the zones where this is recommended - see the Potential Measures in relation to Estuarine habitats.

With sea level rise and increased temperatures, there is a risk that saltwater intrusion may start to impact freshwater habitats on the floodplain, that floodplain land will flood for longer or more frequently, and also that increased water temperatures will reduce the levels of dissolved oxygen and increase algal growth, affecting wildlife.

The Potential Measures recommended in this strategy contain many that will help adapt to, and reduce the effects of, drought, flooding, extreme heat or fire risk. These include measures where trees, scrub or changes in topography can provide more shade to reduce the temperatures of rivers, of urban areas, or of grassland plants, which struggle to maintain sufficient nectar production in higher temperatures. There are other measures that aim to enhance and maintain soil health and resilience to drought, through sustainable and regenerative farming techniques. Natural flood management measures, re-naturalisation of river corridors, and habitat creation measures (such as creating more wet woodland across the county and heath and associated mossy bogs in the Forest of Dean) will help reduce flood risks.

Maintaining and restoring semi-natural habitats, including woodland, wetlands, saltmarsh, heath and unploughed meadow grassland, can actively create carbon sinks that sequester carbon in the long-term, as carbon is captured within biomass and in the soil. WWT's project to recreate saltmarsh habitat within a 148 hectare site on the Awre peninsula, including by engineering a breach in the sea wall, is a great example of such habitat creation that will sequester carbon and help adapt to sea level rise, erosion and flood risk, as well as improving biodiversity

Regenerative farming techniques which promote healthier soils with living roots and minimal soil disturbance, also help to increase carbon sequestration in the soil - see **Measure 052: Soil health and regenerative farming**. The Natural England Carbon Storage and Sequestration by Habitat report 2021[36] is a good source for information on the different carbon sequestration potential from different habitats.

[36] https://publications.naturalengland.org.uk/publication/5419124441481216

4.2.4 Our relationship with water

A range of aspects of our relationship with water were key themes emerging in many aspects of the discussions held while developing this strategy.

As a result of traditional agricultural and land management Gloucestershire's landscape is a heavily drained landscape. This, in conjunction with modification of rivers for a wide variety of purposes, has left a legacy of drained fields as well as restricted, culverted and canalised rivers. Weirs, gates and locks restrict the movement of species within our rivers, as well as inhibiting natural processes. Barriers also restrict diversity of flow patterns and vegetation structures both within the channel and along the banks. Water pollution is a significant issue, from both point and diffuse sources. In addition, straightened and canalised watercourses exacerbate flood risks, including in downstream areas. These are all pressures and threats for our wild species, resulting in a lack of diverse morphology and vegetation structures both within the channel and along the banks.

We should take the opportunity to re-naturalise our rivers and floodplains. Rivers need to be dynamic and currently do not have the space to do what they need to do – they are too contained in their linear channels. We should see the land next to watercourses as functionally-linked land, where the river can re-establish its course, provide space for flood-plain habitats, and where some habitats can help reduce water pollution. Getting more water back into Gloucestershire's landscape and soils can help with carbon sequestration and with natural flood management, as well as increase opportunities for biodiversity. Key Potential Measures in relation to this are **Measure 020: River re-naturalisation** and **Measure 043: Floodplain reconnection**, with a range of other inter-related measures.

In Gloucestershire's woodlands, and other habitats, we should enhance the connectivity and ecological functionality of the watercourses, through identification and re-establishment of functional riparian zones. A functional riparian zone intercepts surface water flows before they meet a flowing stream or other drainage channel – forcing the surface water to slow down and filter through the ground vegetation before meeting the main channel, which allows carried sediment to drop out. Within the riparian zone, the main channel should be functioning in a naturally diverse and ever-changing way, connected to its flood plain.

Our woodlands can become sponges, holding up sufficient water through natural and human intervention woody debris blockages in the watercourses that flow through them. The wooded flood plains will largely be riparian woodland (wet woodland), with tree species that are appropriate to this wet situation such as willows, aspen and alder.

In addition to increasing and enhancing the diversity of species, restoring and naturalising watercourses can help to re-wet areas, increasing the recharge of groundwater in the right locations and the storage of water within soils. This increases the resilience of watercourses to drought, and by extension the security of our water resources.

In February 2024, Chris Uttley of Stroud District Council opened an event called "Flood Management with a Time Machine"[37], that told stories of the changes we have made to rivers over the last 100 years, and how we can repair them, and celebrated wetland habitats in the Stroud Valleys that slow, store and filter water with these words:

> "We think we know the stories of flooding. We see them in the news every year. They are stories of grannies being rescued from houses by men in inflatable boats. Helicopters flying over floodplains to show us that they are flooded. People driving cars into floods and

[37] https://slowtheflow.net/flood-management-with-a-time-machine/ and https://www.stroud.gov.uk/environment/projects/stroud-valleys-natural-flood-management-project/ and https://nbscomics.com/2023/05/30/2023-sound-of-a-river/

inevitably, farmers pulling cars out of floods with tractors. And of course, lives ruined and sometimes sadly lost.

But there are different stories too. Stories we don't hear much about – about how sometimes the best flood defence is a beach, a saltmarsh, a bog or a forest, or a field of healthy soil. About how the choices we make about managing our landscape, about the food we put on our plates will affect how much flooding we get. Stories about farmers and communities helping each other, working together to make many small changes to reduce flooding."

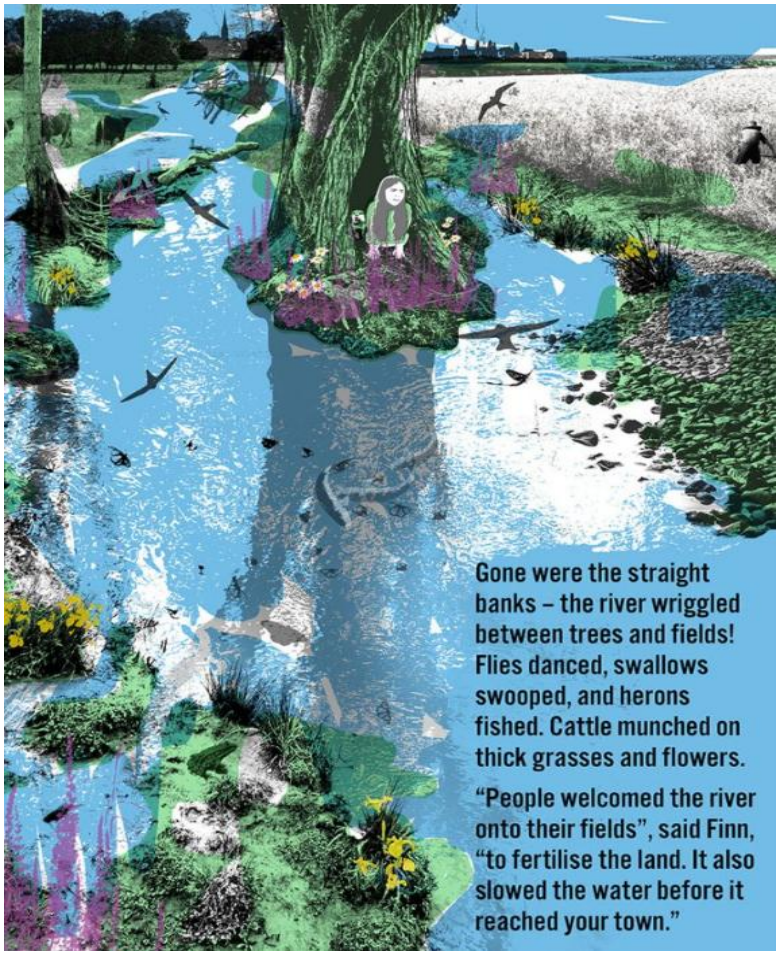


Image from Sound of a River comic by Joe Magee and Chris Uttley

Many factors affect the water quality of our rivers, ponds and lakes. These include uncontrolled and untreated overflows of sewage and waste water, as well as excess nutrients and soil sediments in the run-off from farmland, roads and hard surfaces, or in relation to the disposal of manures, and from excessive uses of pesticides and herbicides. Soil compaction from machinery, or bare earth at times of high rainfall can lead to soil erosion and sediments entering water courses. In relation to run-off of nutrients and soils from farms, regenerative farming principles such as soil cover crops, minimising soil disturbance and retaining living roots can help. There are a range of Potential Measures relating to water quality and soil or nutrient run-off, including:

- **Measure 022: Improve ecological condition of rivers**
- **Measure 044: Reduce pollution from agricultural inputs**
- **Measure 045: Improve Water quality**
- **Measure 046: Sewage and wastewater**
- **Measure 050: Limit groundwater abstraction and surface flow abstraction**
- **Measure 052: Soil health and regenerative farming**

4.2.5 The value of mixed and wilder habitats

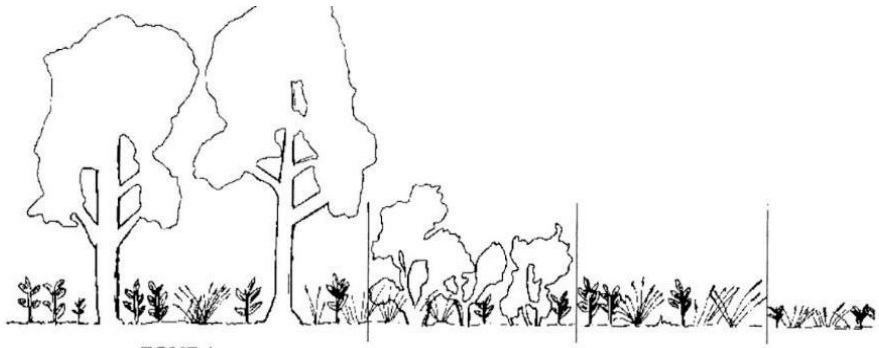
A strong theme that came through in many strategy discussions, including the Nature Recovery working group, the species task and finish group and the public engagement events, was the value of mixed or mosaic habitats of scrub, different heights of grasses, trees and disturbed ground, which can be of great benefit to many wild species. In many places this can be achieved through a mix of allowing more natural processes of succession to happen, and site management to provide varied habitat structure. See **Measure 014: Create mixed mosaic habitats including scrub, including orchard**.

In some places a mixed or mosaic habitat approach will challenge ideas about what "looks nice" and hence it is positive to promote "messy" as a potentially beneficial attribute for wildlife. We need to be prepared to evolve our societal views on how green spaces and landscapes should look, if these views restrict biodiversity, climate resilience or sustainability. As the report summarising the community engagement sessions says:

> "A vibrant, messy, varied abundance of nature was central to the way that many participants described their vision for nature across Gloucestershire. There was wide recognition that for nature to thrive, edges, variety and connection are essential. Participants shared visions of long verges, gardens teaming with wildflowers, woodland gradually merging into scrub, and hedgerows full of variety and life. At the heart of many of the discussions was a feeling that for nature to recover, we need to reclaim and celebrate messiness over straight lines, variety over monoculture and the 'wild' over the manicured. This was seen as a mindset change as much as a practical shift.
>
> … The importance of unmown lawns and grass verges was raised. Participants want to see 'messy' gardens, rich in biodiversity and teeming with life through an 'urban mosaic of habitats'.
>
> ...'They are not weeds but food for bees'"[38]

A key aspect of this mixed habitat theme is the concept of ecotones between different habitats - see **Measure 035: Ecotones and edges**. Ecotones are gradual changes in habitat structure, for example between woodlands and neighbouring field, or between hedgerows, field margins and field, to enable a variety of scrub or shrubs and longer grasses and plants, sometimes known as "saum", rather than sharp boundaries between different habitats. The ecotone concept is illustrated in this diagram from *The nature conservation value of scrub in Britain*, JNCC 2000[39]:

[38] Community input into Gloucestershire's Local Nature Recovery Strategy 2024
[39] The nature conservation value of scrub in Britain, JNCC 2000 https://data.jncc.gov.uk/data/39590874-8927-4c42-b02a-374712caccd6/JNCC-Report-308-SCAN-WEB.pdf



ZONE A
Woodland lacking grassland plant species.

ZONE B
'Mantel' zone of shrubs, many of the Rose (Rosaceae) family. Ground flora consists of woodland and 'Saum' plant species unless grazed where grassland species would predominate.

ZONE C
'Saum' zone dominated by tall herbs and grasses including rare species. Many typical grassland plants occur as unusual large forms.

ZONE D
'True' grassland in which low-growing species are more abundant.

Creating varied ecotones, and creating areas where natural processes are allowed to create a complex and dynamic mosaic of habitats:

- provides a varied habitat structure that benefits many species, including adders and newts who need a variety of different types of habitat within a small area.
- provides wildlife corridors to enable movement of species through the landscape, including small mammals and bats.
- provides shade to maintain nectar production in grassland flora and refuge for invertebrates in higher temperatures.
- provides diverse food sources for a range of species including farmland birds.

In many cases, a mosaic habitat could have the following target features:

- a dynamic mosaic of bare or disturbed ground, species-rich grassland, scrub and trees, and/or wetland and ponds where relevant
- an average tree and scrub canopy cover of between 10% and 30% across the site; the closer to 20% the better
- the height and density of scrub and grassland should vary across the site. Scrub should be managed to have complex variation in height and to have gaps in canopy cover to allow other ground flora to grow. The more structural variety, the better.
- varied ground levels with different aspects and gradients can provide different microclimates and species niches.

Mosaic habitat is great for wildlife at any scale but the bigger the better, ideally this should be created on sites large enough for natural processes to create variety.

4.2.6 Biodiversity in our developments and settlements

Much of the landscape-scale vision of “bigger, better, more and more joined” involves habitat maintenance and creation across our rural and farmed landscape. Urban wildlife, green spaces and blue spaces (water-related) are also part of this potential for habitat connectivity.

Importantly, nature in our settlements and urban areas brings huge benefits for our health and wellbeing, our ability to engage with nature and feel a sense of connectedness with nature, and economic benefits from improving the quality of life experienced in our neighbourhoods.

Trees, green spaces and urban planting can all be green infrastructure that provides ecosystem services benefits, such as shading from street trees, improvements to air quality, flood management and biodiversity-rich sustainable drainage systems.

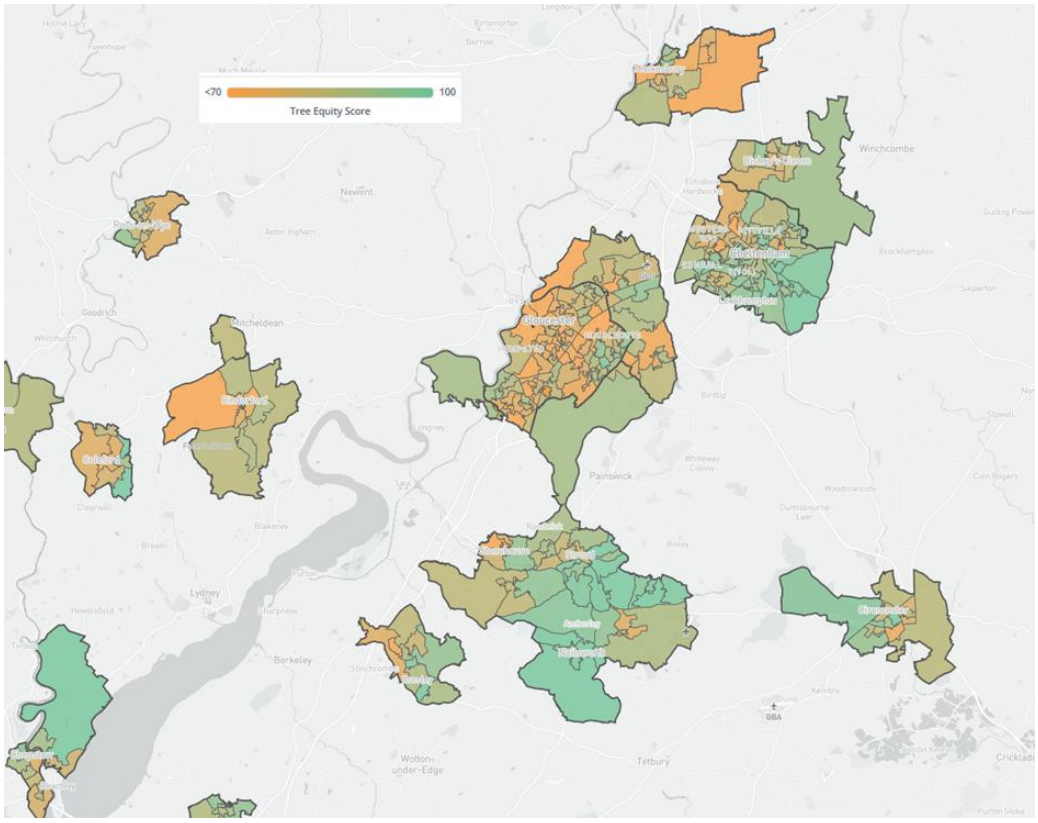
The importance of this theme was insisted on during the public engagement sessions. The report summarising the community engagement sessions says:

> “All the nature recovery workshops were clear that recovering nature can’t just be about our countryside, it also needs to be about our urban spaces. Participants want to see more rewilding of urban space, existing green space protected, and an abundance of biodiversity in urban areas. Whether it’s gardens, road verges, school grounds, disused railway lines, parks, council-owned land, or allotments, the role of urban areas in nature recovery is important both for its own sake as well as to help create wildlife corridors and connect habitats with one another.
>
> Not only are pockets of urban nature important for biodiversity, but they are also important for people and communities in many other ways. The co-benefits of nature recovery were felt to include a whole raft of community, mental, and physical health benefits. Participants felt that enabling people to connect with nature also encourages communities to care about nature and therefore to care for it. They can also be crucial for community cohesion and recruiting nature volunteers, who play a vital part in much of the nature conservation work taking place across Gloucestershire.
>
> The importance of communities being able to access nature was stressed, particularly in the workshops in more urban areas. The phrase ‘we are nature’ was raised many times, with participants rejecting the separation between nature and humans.
>
> There were clear visions about how our built environment can do so much more to support nature’s recovery, with specific suggestions including swift bricks, green roofs, rain gardens, avenues of trees, community composting, and rainwater harvesting. … Participants want local communities to be able to buy locally sourced sustainable food. They want urban spaces with fruit trees by our roads and in our parks, and vegetables and herbs growing on our streets.”

A systematic meta review of the health benefits of green social prescribing in 2024[40] concluded that there is clear evidence of the benefit for improving mental health, from engagement with and access to nature.

[40] [1] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8498096/ and https://www.england.nhs.uk/personalisedcare/social-prescribing/green-social-prescribing/

In Gloucestershire, there are inequalities of access to nature, with the communities that are in the lowest 20% of the Index of Multiple Deprivation being mainly in the urban areas of Gloucester and Cheltenham, and having a strong correlation with the areas of Gloucestershire highlighted in the Tree Equity Index[41]. that highlights inequitable access to trees in urban and settlement areas:



The communities in Gloucestershire that are within the most deprived 20% in the Index of Multiple Deprivation:

- Gloucester: Barton & Tredworth, Coney Hill, Kingsholm & Wotton, Matson & Robinswood, Moreland, Podsmead, Tuffley (south part of ward), Westgate (east part of ward).
- Cheltenham: Hesters Way, Oakley, Springbank, St Marks (south-west part of ward), St Pauls, Swindon Village (south part of ward).
- Cinderford West
- Tewkesbury South

Forestry Research have published research[42] and maps[43] showing existing provision of public access to woodlands in England, as well as opportunities for increasing access.

In Gloucestershire, the Local Nature Partnership and Climate Leadership Gloucestershire[44] call for an aim for everyone to live within 15 minutes of biodiversity-rich accessible green space, in order to reduce these inequalities of access to nature, improve health and local economy, and benefit biodiversity.

[41] https://www.woodlandtrust.org.uk/protecting-trees-and-woods/benefits-of-urban-trees/tree-equity/
[42] https://www.forestresearch.gov.uk/publications/access-to-woodland-in-england/
[43] https://storymaps.arcgis.com/stories/5451463d27e44e5ca23a0d2a52be20c6
[44] https://www.gloucestershire.gov.uk/planning-and-environment/greener-gloucestershire-climate-dashboard/our-partners/climate-leadership-gloucestershire-clg/greener-gloucestershire-action-plan/biodiversity/

For areas where new developments are proposed, there is the opportunity, and in most cases the requirement, to create new blue and green infrastructure and wildlife corridors within its design. This strategy advocates for new developments to incorporate wild areas and linear wildlife corridors as wide as possible into their design to encourage species movement and habitat connectivity, with a principle of creating connectivity to the nearest core habitat in the Nature Recovery Network map. We endorse the Woodland Trust recommendation for creating 30% tree cover in new developments.

Local Plans should have regard to this Local Nature Recovery Strategy. In doing so, we hope that this contributes to the growing discourse that Local Plans should more and more be based on a shared vision for each town, developed with the community, as recommended by the Urban Design Group's "Achieving good town form" [45] 2024 paper. The restoration of nature and strategies such as the Local Nature Recovery Strategy should be part of the shared local vision for the basis of local planning.

Green and Blue Infrastructure standards, such as Building with Nature[46] standards or Natural England's Green Infrastructure Framework should be used to design and deliver biodiversity in developments and urban areas. Gloucestershire has a Strategic Framework for Green Infrastructure[47] giving an overview for the county. The legal protections for bats roosting in buildings should continue to be prioritised.

Gardens, allotments, churchyards and urban green spaces and parks can all be managed to be important for wildlife and biodiversity, and to form part of wider habitat connectivity. One of the threats to urban biodiversity and a threat to increasing the likelihood of flooding is the replacing of gardens or green spaces with impermeable surfaces. Planning regulations, development design and choices in the home and garden should aim to avoid replacing gardens and lawns with parking spaces, astroturf or hard landscaping.

Biodiversity-rich Sustainable Drainage Systems are important to hold water in the catchment for longer, reducing flooding and draining overflows, while also creating green space and connectivity in urban areas. Along highways, the use of gully pots should be reduced if feasible, and where they are used they should be sited away from kerb edges, and ladders used in gully pots, to help prevent amphibians and other species from getting stuck. Gully pots can cause mortality for wildlife and should not be used if possible. Good Sustainable Drainage Systems (SuDS) design can remove the need for gully pots and this approach should be promoted. See **Measure 069 Biodiversity-rich Sustainable Drainage Systems.**

There are four over-arching Measures in relation to most settlements and development areas which link to a wider set of Development and Community Measures:

- **Measure 056: Urban green spaces, blue spaces and wildlife corridors**
- **Measure 057: Biodiversity in settlements and gardens**
- **Measure 058: New developments and green and blue infrastructure**
- **Measure 059: Green bridges and wildlife crossings**

[45] Achieving good town form, Urban Design Group 2024
https://www.udg.org.uk/sites/default/files/publications/files/Achieving%20good%20town%20form%20Final.pdf
[46] https://www.buildingwithnature.org.uk/
[47] https://www.gloucestershirenature.org.uk/green-infrastructure-pledge

4.3 Ecosystem services and biodiversity

Although our species and habitats have their own intrinsic value, our natural environment also provides us all the resources we need for survival (ecosystem services), biodiversity (the variety of living things) underpins the delivery of all ecosystem services, that is, without biodiversity we would not have the resources we need to live.

Some examples of these ecosystem services are shown below. For some of these we show a symbol, used with permission from the Natural Capital Team at the Environment Agency. The Environment Agency's Natural Capital Team has developed a set of natural capital icons for use in their own tools, guidance, and products, as well as those of their partners, that support a natural capital approach. These icons are designed to give natural capital a strong, recognisable identity, making it easier for people to identify and engage with it. These symbols will appear next to Potential Measures in Part 2, to show how different measures contribute to these wider environmental benefits:

		Symbol
Provisioning services	Food provision	
	Water supply	
	Raw materials including wood and fibres	
	Energy – hydro or biomass	
Regulating services	Carbon storage and sequestration	
	Air pollutant removal	
	Water quality	
	Water flow regulation / flood management	
	Local climate regulation/ shading/ urban cooling	
	Pollination	
	Soil erosion prevention	
	Soil health	
	Biological pest and disease control	
	Waste decomposition	
Cultural services	Recreation	
	Education	
	Interaction with nature / health and wellbeing	
	Landscape beauty / Sense of place	

Many of these ecosystem services are benefits that a number of Potential Measures of this strategy contribute to, such as new woodland and tree cover increasing carbon sequestration, and shading and local climate regulation. However, some ecosystem services are directly referenced by Potential Measures of this strategy, examples being **Potential Measure 024: Natural Flood Management** and **Potential Measure 065: Access to biodiversity-rich green spaces**.

4.4 Pressures and opportunities

Some of the key pressures on nature, and opportunities in relation to these, are addressed in the Key Messages section above, including:

- Habitat loss and fragmentation
- Climate change
- Water quality and quantity
- Water courses with artificially-restricted banks and barriers inhibiting natural processes and the movement of species
- The need for field margins, hedgerows and wilder areas to help species survive and move across the farmed landscape

Other key pressures, threats, and also issues that are best thought of as opportunities, are discussed below, including:

- Recreational pressures and disturbance to wildlife
- Diseases and invasive non-native species
- The pressure on woodland regeneration from an increasing deer population
- Conservation grazing
- The importance of fungi and soil health in nature recovery
- Working with the archeological and historic environment
- Minerals extraction and restoration
- The need for ecological recording and monitoring

4.4.1 Recreational pressures and disturbance to wildlife

Access to nature is vital for human wellbeing, and we should increase the opportunities for everyone to live within 15 minutes from biodiversity-rich accessible green spaces. However, pressure from outdoor recreational activities and other human activities can create disturbance to wildlife, particularly in more sensitive habitats. Effective nature recovery should address these pressures through informed planning, public engagement, and targeted action. Some examples of these types of pressures include:

- Dogs entering ponds and waterways can disrupt water plants and the breeding and foraging activities of species such as the great crested newt. In addition, commonly used veterinary treatments like imidacloprid and fipronil—found in anti-flea and tick products used on dog's fur—wash off dogs into ponds and streams, where they are toxic to aquatic invertebrates and insects.
- Severn Estuary and floodplain waterbirds can be disturbed by ramblers, dog-walkers, wildfowlers, clay pigeon shooting, sailing boats, jet-skis and low-flying helicopters.
- Ground-nesting birds are vulnerable to off-path walkers, free-roaming dogs, and mountain biking.
- On steep slopes in the Wye Valley there are rare ferns, bryophytes, whitebeams and service trees which should be protected from physical damage from recreational activities such as rock-climbing.
- Artificial lighting at night affects the behaviour and survival of nocturnal species, especially bats and insects.
- Bats rely on undisturbed roosts, particularly in old buildings and caves. Development, renovation, or unregulated access to these roosts could cause Gloucestershire's bat populations to significantly drop.

- Wildlife crime, including hare coursing, can directly reduce species abundance.
- The siting of new energy infrastructure should be carefully managed to avoid adverse impacts on wildlife and habitats.

Suitable Alternative Natural Green Spaces (SANGS) can be developed in some cases as places which can contribute towards reducing recreational pressures on existing important wildlife sites. The creation of SANGS sites should also be a good opportunity to achieve some new habitat creation. However, it is important to ensure that Suitable Alternative Natural Green Space recreation areas are established away from ecologically sensitive sites.

Relevant Potential Measures include

- **Measure 018. Manage, improve and create ponds for wildlife,**
- **Measure 064. Dark Skies,**
- **Measure 065. Access to biodiversity-rich green spaces**
- **Measure 107. Wye Valley bryophytes and distinctive species,**
- **Measure 109. Strengthen Severn Estuary and Floodplain waterbird populations** and
- **Measures 073 – 079** about different Bat species.)

4.4.2 Diseases and invasive non-native species

Climate change exacerbates the risk that new wildlife diseases, pests and invasive species will establish and spread.

An important current issue for woodland habitats is the ash chalara disease causing our ash trees to die or to be pre-emptively removed. As well as changing woodland habitats too rapidly and affecting the retention of dead wood to support a range of species, there are some plant and insect species that rely on ash, and attention should be paid to efforts to mitigate the loss of biodiversity from ash dieback. Relevant Potential Measures include **Measure 040: Ash dieback response** and **Measure 106: Veteran ash pollards**.

The term invasive non-native species refers to plants, animals and microorganisms causing negative impacts (environmental, social or economic) when moved to an area beyond their natural range, intentionally or unintentionally, by humans. Invasive non-native species present in Gloucestershire include Himalayan balsam, giant hogweed, *Crassula helmsii*, American signal crayfish, American mink, *Elodea* species, American skunk cabbage, Muntjac deer and Sika deer.

It is important to note that any list of invasive non-native species affecting Gloucestershire is likely to change over time. Water hyacinth, for example, may become more of an issue as climate change progresses, and new species may also be introduced. A small number of new non native species establish in the UK every year (10-15), with at least one predicted to become invasive[48].

One of the ways invasive non-native species affect local ecology is by outcompeting native species. Himalayan balsam forms dense vegetation across large areas shading out native plants, and by producing high numbers of seeds that disperse up to 7m from each plant, they can spread rapidly[49]. *Crassula helmsii*, a problematic wetland plant, can form a dense matt across water bodies, shading and out-competing native species.

[48] https://post.parliament.uk/research-briefings/post-pn-0673/
[49] https://gloucester.gov.uk/environment-waste-recycling/nature-and-conservation/invasive-non-native-species-inns/

As well as competition, invasive non-native species may also impact native species through predation, introducing disease, and altering habitats, or a combination. The American signal crayfish is larger than our native white clawed crayfish, burrows into river banks causing erosion and collapse, and has brought with it a fungal disease called the “crayfish plague”, fatal to the native species.

Due to their devastating ecological impact on native species and habitats, controlling invasive non-native species in Gloucestershire remains an essential aspect of supporting local nature to flourish. Relevant Potential Measures include **Measure 047: Remove invasive non-native species** and **Measure 083: Strengthen white-clawed crayfish population**.

4.4.3 Pressure on woodland regeneration from an increasing deer population

The deer population in England as a whole is increasing and is becoming a significant issue in relation to the ability to increase woodland cover, and therefore management of deer needs to be prioritised. If we want to regenerate our woodlands, create new ones and orchards and see the next cohort of trees come through in Wood pastures, as well as retain some of our rarer species in more open habitats, we need to think about the number of deer present. To regenerate a woodland, the deer population needs to be approximately 2 to 4 deer per square kilometre[50] for the period of time it takes to establish the woodland. Actions include tree protection, fencing, and using drone surveys to monitor and help manage deer movements effectively. Relevant Potential Measures include **Measure 038: Protecting tree growth**.

Muntjac deer are an invasive non-native species[51] and destroy regenerating plants, feed selectively and choose many flowering plants, and are one of the main causes of nightingale loss in the UK as they eat their habitat. Gloucestershire is still, in places, the frontier of Muntjac deer population expansion and so there is still an opportunity to roll back that expansion. Sika deer are also an invasive non-native species and also have a very destructive effect on regeneration and ground flora. There is still a good opportunity for it to be feasible to remove Sika deer herds from Gloucestershire. At the time of publication, the Central Cotswold Hills Deer Management Group are experiencing an increase in the native Fallow deer population and a steadily increasing population of Muntjac deer. The high level of grazing and browsing by Fallow deer means that where there are very large herds, it can be impossible to bring ground flora regeneration back to manageable levels. Roe deer are also a native species but can also cause a detrimental effect on plant and tree regeneration if herd sizes get to medium or high levels, but are more territorial so can be easier to control.

4.4.4 The opportunity of conservation grazing

Many of the measures proposed in this strategy for the creation and maintenance of “open” priority habitats, of grasslands and meadows, recommend the use of extensive grazing as often the most ideal way to manage these habitats. Extensive grazing is less intensive grazing by a lower stocking density of cattle, sheep or horses. Conservation grazing can involve the use of conservation breeds and the use of GPS collars to be able to control and vary which areas are grazed. Reducing the intensity of grazing can also help to reduce the cost of external feed inputs to a farm, while improving soil health. **Measure 033: Conservation grazing** therefore applies in relation to a range of different Potential Measures in this strategy.

[50] Identifying threshold densities for wild deer in the UK above which negative impacts may occur - PUTMAN - 2011 - Mammal Review - Wiley Online Library
[51] https://basc.org.uk/invasive-non-native-deer-species-in-the-uk/

4.4.5 The importance of fungi and soil health in nature recovery

Fungi are ecosystem engineers that sustain the health and diversity of almost all ecosystems on the planet, including those of Gloucestershire, and influence almost every aspect of human life. Fungi build soils and maintain healthy soils. They sustain almost all plant life by providing plants with crucial nutrients, and defending them from disease and drought. The metabolic activities of fungi regulate the composition of the atmosphere: billions of tonnes of carbon enter soils through fungal activity every year, and of the carbon that is stored in soils – which amounts to twice the amount of carbon found in plants and the atmosphere combined – a substantial proportion is bound up in tough substances produced by fungi. In these ways and more, fungi lie at the base of the food webs that support much of life on Earth, including our own.

Despite the vital roles of fungi in driving vital biogeochemical processes and sustaining global biodiversity, this diverse kingdom of life has not received a kingdom's worth of attention and has been overlooked in climate change strategies, conservation agendas and nature recovery efforts. This is a problem: the destruction of fungal communities accelerates both climate change and biodiversity loss, jeopardising the health and resilience of ecosystems.

The underrepresentation of fungi in our lists of endangered species and nature recovery strategies does not mean that they are immune from human activity. There are many threats to fungi, each with significant knock-on effects. Large swathes of the fungal kingdom are intimately associated with plants and so are killed off by the same activities, such as deforestation. Fungi are subject to additional disruptions, from ploughing to the overuse of fungicides and fertilisers, to habitat fragmentation.

The urgent need for fungal conservation is becoming ever more widely accepted among decision makers. There is no better indicator of this than the historic Fungal Conservation Pledge, launched at the sixteenth meeting of the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD) in Colombia, October 2024, by Chile and the United Kingdom in collaboration with the Fungi Foundation. The pledge seeks to advance concrete measures to prioritise fungi in national and international legislation, policies, and agreements, and will hopefully be adopted by the UN CBD Secretariat at the next COP of the CBD, paving the way for a new era in fungal conservation.

Fungi have long supported and enriched life in Gloucestershire and have a crucial role to play in nature recovery schemes. Fungi in Gloucestershire are under-recorded relative to animals and plants, and we lack thorough baseline surveys at the time of publication. However, lack of data does not mean that fungi aren't present and playing vital roles. A number of resources containing concrete recommendations for including fungi within nature recovery projects are under development at the time of publication of this report. Habitat management, creation, and restoration projects, together with environmental land management schemes and gardens in Gloucestershire should make an effort to implement the latest guidelines for fungal conservation. Some of the Potential Measures that refer to this include **Measure 052: Soil health and Regenerative Farming; Measure 104: Rare arable plants and soil fauna, flora and fungi; and Measure 105: Dead wood**. The best place to start is to consult a professional mycologist (consultants are listed on the website of the British Mycological Society), or a representative from the Gloucestershire Wildlife Trust, or Plantlife.

4.4.6 Working with the archaeological and historic environment

Conserving and enhancing the archaeological and historic environment is an integral part of protecting, managing, and planning for nature and landscapes to deliver sustainable nature recovery. Human activity has shaped our nature and landscapes for millennia - from woodlands to water bodies, and calcareous grassland to river valleys, each landscape and habitat has been influenced and shaped by human activity. The natural and historic environment working in synergy can produce multiple environmental outcomes and public benefits, including preserving heritage features, habitats, and landscapes by making them more resilient to change, engaging and enthusing new audiences, boosting value for public money, contributing to a circular low-carbon economy, reinforcing cultural identity, and connecting people with nature.

Heritage assets and historic landscapes are also habitats, and their characteristics will often dictate what species can and cannot thrive, and inform decisions about restoration options and appropriate management. For example, industrial heritage such as the former mines and quarries of the Forest of Dean and Cotswolds, can provide valuable mosaic habitats, as well as open space and fringe habitats in woodland, and thereby be important for protected and priority species such as birds, bats, reptiles and invertebrates, as well as having heritage value. A range of old and historic buildings provide important habitat for bats and for nesting birds. Historic routeways, designed landscapes and other heritage assets are often wildlife rich sites which, if appropriately managed, can help form the essential linkages within biodiversity networks. Heritage can also help us build resilience, understand how people and places have responded to climatic events through history and how earlier solutions may suggest contributions to resolving current problems, for example the management of water meadows of the Cotswold rivers and Severn Vale.

Habitat creation and restoration projects in Gloucestershire should consult the Gloucestershire Historic Environment Record[52] to identify any known archaeological sites within proposed areas for tree planting and seek specialist advice on their management, such as avoiding damage from tree planting, tree roots and forestry operation, informing the design of a planting scheme in relation to the historic woodland character of an area, or considering the use of glades or fire breaks to maximise the protection to archaeological features.

Biodiversity projects should also follow the four core principles of Natural England's guidance for nature recovery and the historic environment[53] including considering the historic environment from the outset as part of maximising environmental benefits, ensuring that the legal, policy and guidance requirements for its protection are abided by and damage to it is avoided wherever possible or harm is minimised and mitigated appropriately.

There is potential to maximise benefits through integrating the historic environment into nature recovery by:

- using it to understand whether certain habitats and species will prosper and to inform decisions about restoration options and appropriate management.
- managing historic routes, designed landscapes and other heritage assets where rich in wildlife as important links in a national biodiversity network.
- helping understand how people have responded to climatic events through history and tell the story of climate change as part of the project.

[52] https://www.gloucestershire.gov.uk/planning-and-environment/archaeology/request-archaeological-data-from-gloucestershires-historic-environment-record-her/ and countryadvice@gloucestershire.gov.uk

[53] https://worldheritageuk.org/articles/latest-news/nature-recovery-the-historic-environment/

- minimising soil disturbance, reducing erosion and protecting embedded carbon to improve soil health, air and water quality at the same time as protecting and enhancing archaeology.
- putting it at the heart of plan-making for places to reinforce the special character of our landscapes through the recognition of the historic environment's contribution to ecological and cultural diversity.
- using it as an engagement tool and lens through which to experience nature, by providing access through heritage sites to the countryside and bringing about wider benefits such as tourism and volunteering.

4.4.7 Minerals extraction and restoration

The Cotswolds Lakes/ Cotswold Water Park area of Gloucestershire and Wiltshire is a patchwork of lakes, wetland and floodplain habitats along with agricultural, urban and industrial land uses, much of it created or restored after mineral extraction. Future mineral extraction, including at the planned Down Ampney quarry site, has the effect of wholesale landscape change in the short-term.

The minerals restoration planning process represents an opportunity for nature recovery and to create a net gain for biodiversity. Opportunities should be taken for strategic approaches for biodiversity and nature recovery in relation to minerals planning in the Cotswold Lakes/ Water Park area, with input from local communities and nature conservation partners. The restoration of minerals workings should take account of the Cotswold Water Park Nature Recovery Plan[54] and take opportunities for wider connections for wetland habitats.

4.4.8 The need for ecological recording and monitoring

The evidence base for Gloucestershire's first Local Nature Recovery Strategy has benefited from a huge collaborative effort from the combined skills and knowledge of hundreds of expert naturalists, ecology professionals and dedicated volunteers. Both challenges and opportunities for improving the evidence base were identified at an early stage. Challenges mostly concern gaps in skills, recording effort or geographic coverage of information, both for species and habitats. Opportunities relate strongly to human resources, both in terms of experts and new opportunities for volunteer input and Citizen Science projects.

Species recording

As part of the process of developing this Local Nature Recovery Strategy, a Local Nature Recovery Strategy Species Task and Finish Group was convened between October 2023 and March 2024. The group's collaborative effort created a long list of 552 species in Gloucestershire that are rare or threatened, which shows the scale of the challenge of nature recovery.

Verified records from local volunteer naturalists, professional ecologists and national recording schemes have built a historical database within Gloucestershire which was used by the Species Task and Finish Group to create the Prioritiy Species list. This list is therefore indicative of surveyor effort and may not truly reflect the biodiversity within Gloucestershire as many taxa have been under-recorded, such as fungi, soil fauna, fish and mustelids. Furthermore, some areas within Gloucestershire have been identified as being under-surveyed even for the more well-recorded groups.

[54] https://www.cotswold.gov.uk/planning-and-building/landscape/cotswold-water-park/

The gaps in knowledge raised during the work of the Species Task and Finish Group revealed a need for a county-wide monitoring strategy. The process not only identified gaps in recording effort, both geographically and for particular groups, but also gaps in our understanding of species life-cycles and management needs, particularly for fungi and invertebrates. Future iterations of the Local Nature Recovery Strategy should incorporate these species once additional scientific research has been conducted and more informed management requirements have been established.

Habitat recording

New local habitat survey information, including from Gloucestershire Wildlife Trust's Habimap[1] project and from Farming and Wildlife Advisory Group South West, has helped to improve the accuracy of the national datasets of information about habitats in Gloucestershire. These habitat records in turn helped to update and improve the basis of the Nature Recovery Network mapping developed by Gloucestershire Wildlife Trust and Gloucestershire Centre for Environmental Records, which formed the key start point for the Local Nature Recovery Strategy process in Gloucestershire and is the basis for many of the mapped focus areas for Habitat Potential Measures and for the Areas that Could Become of Particular Importance for Biodiversity. However, there is still a long way to go to record comprehensive and fully up-to-date habitat information across Gloucestershire.

Training

Both species and habitat recording are crucial to maintaining a robust and relevant Local Nature Recovery Strategy. Local expertise and an increasing interest in Citizen Science have combined well in Gloucestershire to provide a good baseline for the Strategy. The process has however highlighted a need within the monitoring strategy to develop and train experts in specific taxonomic groups to address recording gaps and ensure that under-represented taxa are effectively surveyed and understood over time. These skills are vital for accurate recording and also for ensuring that data from Citizen Science projects can be verified and kept to the highest standard. The ongoing process of training, supporting and inspiring habitat surveyors for Habimap and other projects mirrors the need for expert species knowledge and identification skills.

Delivery of recording and monitoring

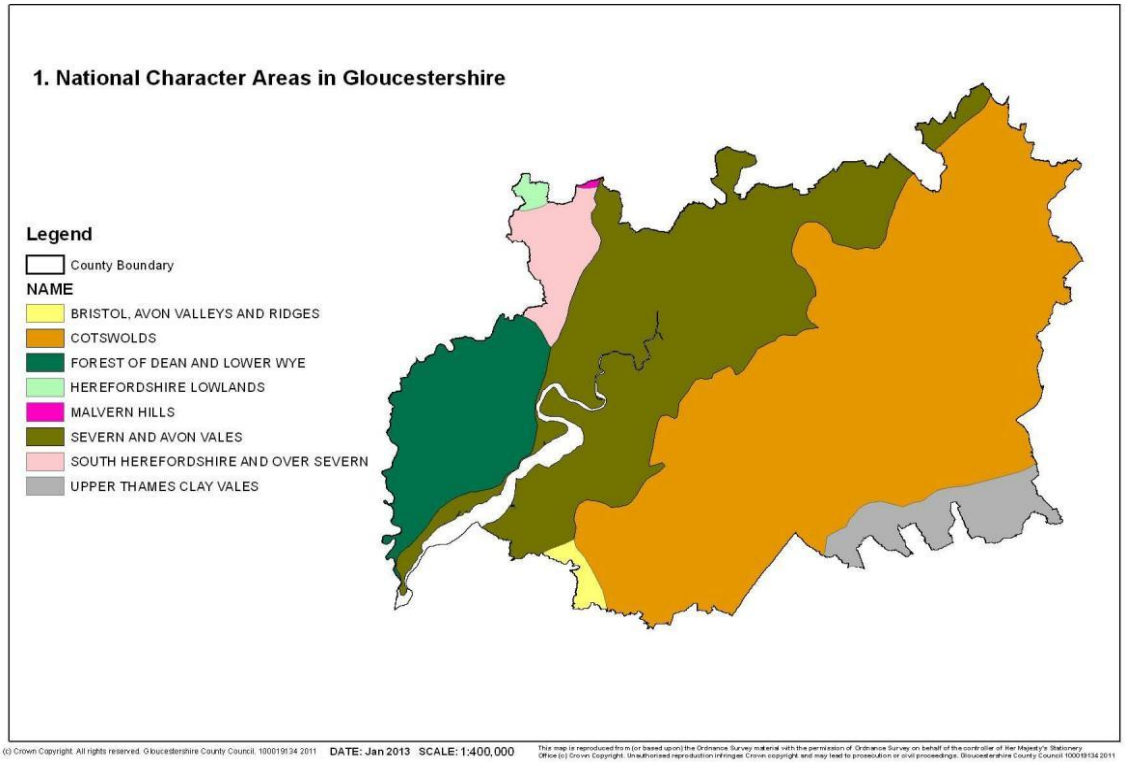
The delivery phase of this Strategy should have a strong focus on prioritising and resourcing high quality ecological recording and monitoring of habitats and species in Gloucestershire and growing the expertise needed to achieve an excellent evidence base for practical nature restoration.

4.5 Opportunities for habitat and species in each National Character Area

Gloucestershire's rich and diverse habitats are a reflection of the underlying geology and historic land use influences. As a result, the county contains five very distinctive landscapes:

Gloucestershire Landscapes	Corresponding National Character Area
The Forest of Dean [comprising the statutory forest but also part of the Lower Wye Valley] (west)	NCA 105: Forest of Dean and Lower Wye
The Cotswolds [with sub-areas of scarp and outliers; high wold and dip slope; and river valleys] (east and south)	NCA 107: Cotswolds
The Severn Vale & Estuary (central)	NCA 106: Severn and Avon Vales
The Cotswold Water Park (south east)	NCA 108: Upper Thames Clay Vales
The Leadon Valley (north west)	NCA 104: South Herefordshire and Over Severn

Natural England National Character Area profiles[55] (NCAs) describe these landscapes in more detail and demonstrate the continuing connectivity of these landscapes beyond the county boundary. A further three National Character Areas overlap the county by a small amount (Bristol Avon Valleys and Ridges; Herefordshire Lowlands; Malvern Hills).



This section describes the context of the main priority habitats and species for each of the main National Character Areas that are in Gloucestershire.

[55] https://www.gov.uk/guidance/national-character-area-profiles-information-for-local-decision-making

4.5.1 Forest of Dean and Lower Wye

The Forest of Dean and Lower Wye (NCA 105) forms a large distinctive landscape in the west of the county bordering Wales and Herefordshire. The Forest of Dean consists of mainly higher ground and ridges with extensive woodland and more open ground that merges into the Severn Vale, Leadon Valley and the Lower Wye Valley which is part of the Wye Valley national Landscape[56].

In the Forest of Dean, the geology, topography and past land use dominate with large impacts evident from past mining, industry, and more recently from forestry and agriculture. The landscape is a mosaic of open and wooded ground characteristic of medieval hunting forests. The location has extensive archaeological remains and historic structures. Forestry tends to be more common on the higher ground. The Forest of Dean is a stronghold for nature[57], with large areas of woodland, including ancient semi-natural woodland, plus open space that provide a mosaic of habitats for a great range of species. Of note are the colonies of greater and lesser horseshoe bats, the largest colonies of these species in Europe. The Forest of Dean has the largest population of lesser horseshoe bats in the UK, at 26% of the UK population. The Forest of Dean is also well known for its diversity of plants, birds, and invertebrates and there is the aspiration for the Forest of Dean to become a UNESCO World Heritage Site.

Gloucestershire has a relatively small but important amount of acid grassland and heathland, which is mainly found within the Forest of Dean area, as well as Cleeve Common, and this strategy has a range of Potential Measures relating to these habitats. There is some potential to restore mires and lowland peat in small areas of the Forest of Dean through re-wetting or the actions of beavers – these potential areas are limited in geographical extent but highly important habitats, including for carbon sequestration.

There is a strong water connection between the Forest, the Wye, the Severn and its estuary, so Potential Measures about river re-naturalisation and riparian tree planting, as well as tufa (relatively rare calcium deposits in river headwaters which benefit specialised invertebrate and other species) are important in this area, with the Forest to Sea project by the Severn Vale Catchment Partnership being a key way these are being progressed. There are also isolated populations of white-clawed crayfish in the Forest of Dean, with the potential to create ARK sites to boost and protect populations.

The Lower Wye Valley part of the National Character Area (NCA 105) sits within the Wye Valley Area of Outstanding Natural Beauty. The River Wye and its limestone gorge dominate in Gloucestershire and adjoining Monmouthshire. There are steep wooded slopes and in places open pasture and meadow bounded by old hedgerows or stone walls. There is a tidal influence on the Wye in the county and like the Severn, the Wye is important for migratory fish. The Lower Wye Valley has a wealth of woodland and meadow species including rare mammals, plants[58], and insects.

Traditional orchards, providing an excellent habitat for veteranised wood and a mixed mosaic habitat, and important for species such as the noble chafer beetle, are an important habitat within the Forest of Dean and Lower Wye area, as well as other parts of Gloucestershire, so there is a Potential Measure for traditional orchard management, restoration and creation. Opportunities should be taken to create more landscape scale connectivity of wooded habitats between the Wye and Forest of Dean and Wales, especially to encourage movement of pine marten populations.

The Forest of Dean area owned and managed by Forestry England is a great example of a working forest which is supplying sustainably-sourced timber whilst conserving plant and animal species,

[56] Wye Valley National Landscape
[57] Our Shared Forest – Forest of Dean land Management Plan (2019) https://www.forestryengland.uk/sites/default/files/documents/Our%20Shared%20Forest%20-%20Forest%20of%20Dean%20Land%20Management%20Plan%20published%20June%202019.pdf
[58] Wye Valley is recognised by Plantlife as an Important Plant Area - www.plantlife.org.uk

recovering vital ecosystems and returning missing species to our landscapes[59]. The Forest has seen some great work in terms of species recovery projects including pine marten and beaver.

Under a partnership between Forestry England, Natural England and the Beaver Trust, beavers were reintroduced in 2018 and 2024 into two separate enclosures in the Forest[60] (Greathough Brook and Perry Hay). Beavers are 'ecosystem engineers' and the dams they create can slow the flow of water at times of heavy rainfall, releasing it slowly during dry periods thereby reducing the ecological impacts of drought. They have now settled in and are having multiple positive impacts on biodiversity, habitats, water quality and flow rates. The beavers at Greathough Brook have even managed to reduce flooding in a village downstream.

Also, between 2019 and 2021, a collaboration between Gloucestershire Wildlife Trust, Forestry England, Forest Research and Vincent Wildlife Trust saw 35 pine martens being successfully released into the Forest of Dean[61]. Monitoring shows that they have been spreading via connected nature networks and habitat corridors across the region, with some spreading throughout the Forest, and others venturing across the Wye into Wales, others northwards following the Wye, and one marten was even found in the Stroud Valleys. This project will bolster the expanding Welsh population and help establish a resilient pine marten population in the south-west. The 'Martens on the Move' team is now leading on monitoring as they continue to spread[62].

[59] https://www.forestryengland.uk/the-forest-dean/our-work
[60] https://www.forestryengland.uk/the-forest-dean/beavers-the-forest-dean and https://beavertrust.org/more-beavers-move-into-the-forest-of-dean/
[61] https://www.gloucestershirewildlifetrust.co.uk/project-pine-marten

[62] https://www.vwt.org.uk/projects/martens-on-the-move-a-new-era-of-pine-marten-conservation

4.5.2 Cotswolds

The Cotswolds National Character Area[63] (NCA 107) is extensive and although most of it is located within Gloucestershire it also stretches well beyond the county boundaries to the north, south and east. There are two main areas of semi-natural habitat within the NCA that have been identified previously as local Nature Improvement Areas and form significant parts of the local Nature Recovery Network mapping.

Arable farming is extensive across the high ground and dip slope of the Cotswolds but there is permanent pasture on the steeper slopes. The unimproved calcareous grasslands, lowland meadow in the valley bottoms, ancient woodland, limestone watercourses including tufa formations, and open farmland are of significant biodiversity value[64].

The Cotswolds are nationally important for unimproved calcareous grasslands, which have become increasingly fragmented over the last 70-80 years. Unimproved calcareous grasslands are extraordinarily rich in plant species (with up to 40 species per square metre[65]) and butterflies but smaller fragments support a much reduced range of species than larger ones[66]. Scattered scrub is an important element for many species including butterflies. There are therefore Potential Measures in this strategy for managing, restoring and creating lowland calcareous grassland as well as a range of measures for some of the species found on calcareous grassland, such as juniper, large blue, Duke of Burgundy and more.

Cotswolds National Landscape's Glorious Cotswold Grasslands project has been running since 2019, working with landowners to create and restore species rich lowland calcareous grassland and lowland meadows. The National Trust's Stroud Landscape Project is taking a landscape-scale approach between Crickley Hill and Wotton-under-Edge in working with landowners to restore, create and connect habitats including species-rich lowland meadow and calcareous grassland. Other projects such as the Grasswolds landscape recovery project proposal will add to this work. Opportunities should be identified to further consolidate this work which will increase the connectivity and resilience of the open habitat network in the Cotswolds.

Neutral and floodplain meadows are found in the deeper soils of the valley bottoms (often grading into calcareous grassland further up the slope), these require an appropriate cycle of grazing or hay cutting to maintain their species diversity. There are concentrations of this habitat particularly around the east flowing rivers that form the Cotswold rivers Nature Improvement Area. Where possible opportunities should be taken to reconnect rivers with their floodplain to allow the natural cycle of overtopping. Often the meadows are very small and fragmented. As well as increasing patch size, connectivity could be enhanced through flower rich arable field margins.

The steepness of the scarp, and therefore its lack of suitability for arable farming means that there remains a spine of ancient woodland and unimproved calcareous grassland stretching north to south. This forms the Cotswold scarp local nature improvement area and a key part of the nature recovery network. While there is this spine of core habitat, it is significantly fragmented in places and opportunities should be taken to improve the quality of semi-natural grasslands and woodland through appropriate management, increasing the extent of the habitat areas and creating connectivity between them. Care should be taken not to cut off the open habitat network through establishment of

[63] Largely aligns with the Cotswolds National Landscape Area of Outstanding Natural Beauty
[64] Recognised as an Important Plant Area by Plantlife - www.plantlife.org.uk
[65] Ellenberg H, Leuschner C (2010) Vegetation Mitteleuropas mit den Alpen: in ökologischer, dynamischer und historischer Sicht. UTB, Stuttgart
[66] Loos, J., Krauss, J., Lyons, A. *et al.* Local and landscape responses of biodiversity in calcareous grasslands. *Biodivers Conserv* **30**, 2415–2432 (2021).

woodlands. Where these networks intersect, matrix habitats like grassland with scattered scrub, or woodlands with large glades and rides can form appropriate network intersections.

Veteran ash pollards are characteristic of the Cotswolds area, and their importance as a habitat is increased as ash dieback significantly reduces the number of ash trees. There is therefore a species Potential Measure to conserve veteran ash pollards, to help vulnerable species that rely on ash, such as lichens and dead-wood species especially click beetles.

The rivers represent key examples of oolitic limestone rivers, have high wildlife value and are of national importance. The quality of these rivers is threatened where unsympathetic land management causes diffuse water pollution, and from point source pollution from sewage outfalls during release events. There are opportunities to create habitat next to rivers to help improve their ecological condition, including river buffer strips, riparian tree planting or management or creation of floodplain meadows. Adaptation to climate change, including the need to hold back water, would benefit from relinking watercourses with their floodplain and using in-stream natural flood management techniques, potentially including beaver.

The limestone of the Cotswolds results in a good number of tufa formations. Sensitive land management is needed to ensure that they survive.[67] They support plants, mosses, liverworts and algae, and specialist invertebrate communities including a number of species of conservation concern. These tufa springs, slides and steps/cascades are vulnerable to changes in the water table e.g. below water table quarrying and disruption to natural spring lines by drainage works and by overgrowth of vegetation such as invasive non-native species.

By working with landowners, work in recent years has been targeted to create viable habitat for water voles based upon minimum viable area (MVA) methodology. Adjoining flood plain areas, such as at Sherbourne Water Meadows, have also been a focus for activity which has benefitted a wide range of plants and animals. There are opportunities to continue this work and replicate the approach further downstream in Oxfordshire.

Improvement in water quality will need to focus on the management of the adjoining valley sides where there is a great opportunity to create wildlife corridors based on a mosaic of woodland, scrub and limestone grassland running north and west from the rivers Thames and Avon to the Cotswolds scarp. There is a Potential Measure on improving the ecological condition of rivers (**Measure 022**), as well as a number of measures about ways to improve water quality, including **Measures 044, 045 and 046**.

Improving water quality will greatly benefit species including white clawed crayfish, water vole and otter and a wide range of invertebrates. There are some small catchments in the Cotswolds where the native white clawed crayfish is withstanding competition from the American signal crayfish, and a Potential Measure on white clawed crayfish aims to bolster efforts to help this continue.

The open arable areas of the Cotswold dip slope are particularly important for farmland birds and important arable plants. Across the wider farmed landscape, particularly of the dip slope, the opportunity is to integrate wildlife into productive farming through a regenerative or eco-agricultural approach. Management to support good soil structure and the integration of margins, buffer strips, bigger bushier hedgerows, trees, ponds and wild corners, enabling integrated pest management, across the whole farmed landscape would enable many more species to thrive. Extensive conservation grazing will help support the restoration of species-rich grassland. Where land is marginally productive it may be better to revert to grassland.

[67] https://cdn.buglife.org.uk/2019/08/Sheet-2-General-guidance-web.pdf

4.5.3 Severn and Avon Vales

The Gloucestershire part of the Severn and Avon Vales, NCA 106, is the **Severn Vale**, an open low-lying agricultural landscape that dominates the central region of Gloucestershire. It is linked to the Avon Vale in the north and stretches from Tewkesbury to the border with Wales at Chepstow in the south. This is the landscape where the City of Gloucester is situated with the M5 motorway running through it and Cheltenham nestling beneath the Cotswold scarp. At the southern end the meandering central River Severn slowly transforms to become the Severn Estuary where the landscape is even more open. The two main aspects of importance for biodiversity in this area are one, the tidal estuarine ecosystems, and two the grasslands, wetlands, hedgerows and orchards of the vale.

The Severn Estuary in Gloucestershire is dominated by the powerful River Severn with an estuary with the second biggest tidal range in the world. A meandering river channel is flanked with extensive banks of sand and mud that are flooded at high tide. Areas of salt marsh vegetation are currently limited in extent. The ecosystem of this estuary is of international importance for birds and migratory fish and is bordered by floodplain grazing land and eroding cliffs and rocks in places[68]. There are two small harbours (ports) in the central zone at Lydney and Sharpness which are accessible only at certain parts of a very large tidal range. Relative lack of human disturbance across the Severn and shoreline helps maintain important habitats for wildlife.

The value of the estuary and floodplain for birds is widely acknowledged and internationally recognised. Large populations of numerous bird species rely on the Severn for wintering and migration, including birds stopping to feed as part of their migration journeys (stopovers), in addition to species that are present year-round. The estuary is of significance for migratory fish, linking breeding, maturing and spawning grounds in freshwaters for endangered species including European eel, twaite shad, salmon, lamprey and sea trout. It has the most diverse range of fish species in Britain and some of the country's most important nursery sites.[69] Although invertebrate communities are less well studied they are known to play a key role in supporting the biodiversity of the area, for example attracting bird life. Scarce plants can also be found here, connected to the saltmarshes, such as the Slender Hare's-ear. The overall scale of the ecosystem and it's habitats together are a critical part of it's significance for nature.

It is important to protect the Severn Estuary SPA through careful Strategic Local Development Plans, ensuring the approved mitigation strategy is followed, ensuring suitable sustainable accessible natural greenspace (SANGs) recreation areas are established away from ecologically sensitive sites.

There are important opportunities in the Severn Vale for floodplain meadows, fens and wetlands. We should take opportunities to plan for a landscape scale expansion of wetlands, intertidal habitats, rhines and unimproved grasslands along river floodplains through restoration, expansion and re-linkage of existing remnant areas of semi-natural habitat. Opportunities should be taken to create biodiverse floodplain habitats along the Severn Vale to support recovery of species including European eel and true fox-sedge, for example through the Eelscapes project.

The floodplain of the River Severn is highly productive agricultural land. There are a significant number of good sites of species-rich grassland, including floodplain meadows. Much of the area is important for over wintering waterbirds, and a series of core areas which remain wet in summer support breeding waders, as well as acting as drop in locations for migrating waders.

The Severn Vale has limited woodland cover today but has traditional orchards, hedgerows with trees plus important areas of lowland meadow and floodplain grazing marsh. The area is known for its

[68] The shores of the Severn Estuary are recognised as an Important Plant Area by Plantlife - www.plantlife.org.uk
[69] https://severnestuarypartnership.org.uk/the-estuary/physical-natural-environment/fish/

variety of birds, invertebrates, flora and fungi, including the relatively rare native black poplar which is characteristic of the Severn and Avon vales, and globally vulnerable Orchard Toothcrust fungus. It is a significant area not just for biodiversity but also for food production, flood regulation and recreational opportunities.

Regenerative farming principles should be taken up, to incorporate more opportunities for biodiversity into productive farmland and protect ecosystem services, particularly soil and water quality.

Traditional orchards in the Severn Vale should be retained and restored, and links created through habitat creation, hedgerow management and hedgerow and in field tree planting, with woodlands and veteran trees to create a long term sustainable resource for deadwood fungi, invertebrates and cavity nesting species.

There are important horseshoe bat commuting routes through the Severn Vales, between the Forest of Dean and the Cotswolds. Dark hedgerow and woodland corridors should be safeguarded for horseshoe bats and other bat species, as described in **Measure 075: Greater horseshoe bat flightlines**.

The Severn Vale area contains hills which are outliers of the Cotswold oolitic limestone: Bredon, Dumbleton, Churchdown and Robinswood Hills. These hills are the same limestone formation as the Cotswold hills but are separated from them by lower lying land of the Severn and Avon Vales. Robinswood Hill and Churchdown Hill are at particular risk of ecological connectivity being cut off from the main Cotswolds Hills due to urban expansion. Ecological connectivity should be maintained through an undeveloped green corridor to enable genetic exchange to occur between populations on the outliers and the main Cotswolds. Between Gloucestershire and Worcestershire, opportunities should be taken to create greater habitat connectivity between Dixton Wood in Gloucestershire and Bredon Hill in Worcestershire (both sites are designated as SACs for their deadwood invertebrate interest), to expand the size of habitat suitable for the rare violet click beetle and other rare invertebrates – **Measure 085: Strengthen violet click beetle population**.

Other opportunities should also be taken to establish more east-west connectivity of semi natural habitats between the Cotswolds and Leadon Vale, particularly in relation to BugLife's B Lines[70] - **Measure 031: Create wildlife corridor connectivity**.

[70] https://www.buglife.org.uk/our-work/b-lines/

4.5.4 Upper Thames Clay Vales

The Cotswold Water Park is part of the Upper Thames Clay Vales, NCA 108, and covers the south eastern corner of Gloucestershire and extends into Wiltshire and small parts of the administrative areas of Swindon and West Oxfordshire. Amidst this area of open, gently undulating farmland there are around 200 lakes present in this upper part of the River Thames catchment. These lakes have been created since the mid-20th Century primarily for sand and gravel extraction[71] and constitute the most extensive marl lake system (highly calcareous[72]) in Britain.

Alongside the lakes there is other associated wetland habitat and a landscape that supports distinctive aquatic plant communities and significant breeding and wintering water bird populations. The wider mixed farmed landscape has some important species rich lowland meadows and floodplain meadows including North Meadow and Clattinger Farm SAC and NNR but there is little woodland but hedgerows and trees in places. The Cotswold Water Park is well visited with the growing settlements of Swindon and Oxford not far away. This is another important recreational location and a long valued biodiverse part of Gloucestershire.

Species associated with the lakes of the Cotswold Water Park include charophytes, waterbirds, passerines, bats, dragonflies, barberry carpet moth, and black poplar. This area is important for neutral lowland meadows and floodplain meadows, and meadow species such as snakes head fritillary. There are opportunities to create more meadow and grassland connectivity along the Thames and to the Cotswold rivers. There are also opportunities for further creation of wet woodland habitat in the Cotswold Water Park area.

4.5.5 South Herefordshire and Over Severn

The Leadon Vale is part of the South Herefordshire and Over Severn, NCA 104, to the north west of Gloucester, a rural landscape that continues into South Herefordshire. It includes the distinctive high point of May Hill, many woods, neutral and calcareous grassland, traditional orchards, and the River Leadon, and its floodplain, which flows into the Severn. The area is mainly a mix of arable and livestock farming and is well known for its populations of wild daffodils.

It is important for traditional Orchards and their associated species, such as noble chafer, lesser spotted woodpecker and mistletoe marble moth. Opportunities should be taken to create more landscape scale connectivity of wooded habitats through this area, to connect the Wye and Forest of Dean northwards into Herefordshire and Worcestershire towards the Wyre Forest - the Severn Treescapes project.

The River Leadon has extensive poor water quality, with agricultural inputs having a significant impact. Better land and soil management could help to improve this. There are also a number of barriers to fish along the river which could be removed or bypassed to facilitate fish movements. One of the Leadon's key tributaries - the Glynch Brook - also has low flow issues which need to be addressed. Improvements could be made by delivering the proposed Wilder Leadon project, through the Severn Vale Catchment Partnership.

[71] Cotswold Water Park Nature Recovery Plan 2021
[72] Joint Nature Conservation Committee. (2015). Common Standards Monitoring Guidance for Freshwater Lakes. Available at: https://data.jncc.gov.uk/data/1b15dd18-48e3-4479-a168-79789216bc3d/CSM-FreshwaterLakes-2015.pdf

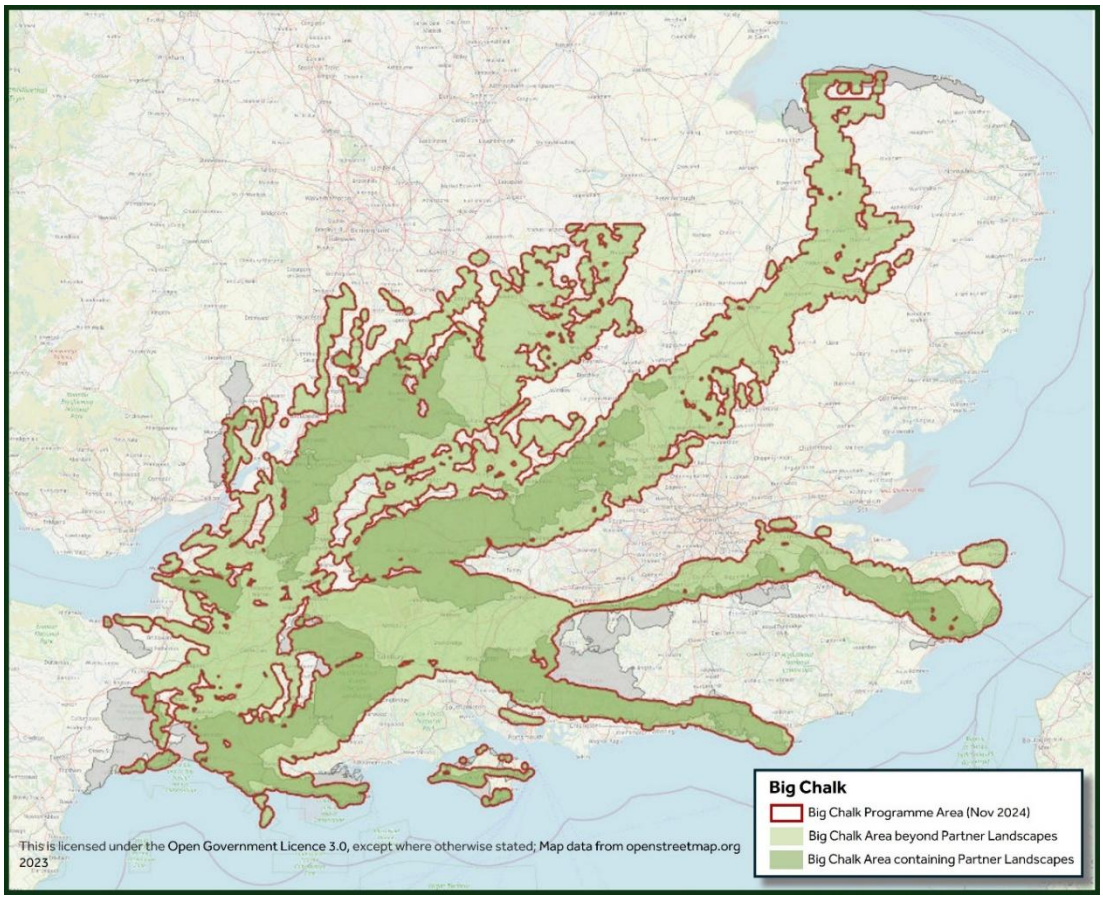
4.6 Wider Ecological Connections beyond Gloucestershire

In order to secure the recovery of nature in the face of climate change we need to plan and act to help nature move through the landscape as it adapts to a warming climate. We need to think about Gloucestershire's future wildlife. What species will need to be living here in 10, 50 and 100 years time and how will they get here? More mobile species are already moving at a scale greater than an individual county and Gloucestershire has a number of features that make it important for supporting movement at this scale.

Limestone and Big Chalk

Calcareous (limestone and chalk) landscapes in the south of England contain the most species-rich habitats within the UK. When combined across the whole landscape, these habitats make the calcareous landscapes one of the best places to allow wildlife to recover and adapt to climate change.

With a north south reach of 171 miles, Big Chalk[73] represents one of the best opportunities offered by the English landscape to support the northward movement of species to a new climate space. Gloucestershire plays an important role as both a destination for these species and as part of a route further north.



Big Chalk is a pan-England partnership programme designed to facilitate this recovery and movement across the calcareous (chalk and limestone) landscapes of southern England. It seeks to amplify the efforts of partners to create a robust ecological network on a scale hitherto unimagined.

[73] https://www.big-chalk.org/

The Big Chalk area is huge, covering some 259,317 km^2, or 20% of England and there are many people, organisations and partnerships striving to deliver the Big Chalk vision in a variety of ways. It is important that the Big Chalk partnership champions and supports these efforts rather than competes with them.

Big Chalk seeks to do this in two main ways:

- Championing and connecting the contributions of partners across political and institutional boundaries.

- Defining priorities, influencing funders and policy makers to support and secure resources for new activities.

The partnership is headed by a Board and topic groups and conferences bring partners together across an array of subject areas. A wider membership list keeps people in touch. Individual projects can apply for Big Chalk accreditation through a project registration scheme.

The Big Chalk Partnership is already proving to be influential with funders and policy makers. As nature recovery effort continues to grow Big Chalk can combine our voices and efforts to better create and realise opportunities for the recovery of nature.

Migrating Birds

Gloucestershire already plays an internationally important role in supporting migratory birds. The Cotswolds scarp functions as a north-south route rich in cover and food utilised by many birds. The regular seasonal sightings of the mountain nesting Ring Ouzel at Cleeve Common whilst on migration illustrates this well.

The Severn Estuary is recognised internationally as important for numerous species of migrating and wintering birds, through its RAMSAR site designation. Birds visiting the Severn Estuary seasonally include populations of Bewick's swan, greater white-fronted goose, common shelduck, gadwall, dunlin and common redshank[74] amongst many others. The habitats of the Severn Estuary provide a key refuelling point where birds will stop and rest as they travel the "North Atlantic Flyway", a bird migration route linking Siberia, Europe and Africa[75].

It is likely that the number and type of birds visiting the Severn and the wider county will change over time as the warming climate produces "winners and losers"[76]. Southerly-distributed waterbirds are likely to benefit as the climate warms, meaning their populations may increase and expand their range. Yet migratory bird populations, already declining widely around the world at a rapid pace, are one of the bird groups thought most likely to be affected by climate change in a negative way.[77] This means whilst the species migrating through Gloucestershire are likely to change, perhaps significantly, its natural habitats will continue to play an important role for birds.

In addition to the climate-caused changes in distribution and abundance of species, the Severn Estuary can play an important role in particularly cold years in the UK, where the temperatures negatively affect more northern and easterly bird populations. In these years numbers of migratory birds in Gloucestershire and the Severn are likely to increase.

[74] https://jncc.gov.uk/jncc-assets/RIS/UK11081.pdf
[75] https://www.rspb.org.uk/helping-nature/what-we-do/influence-government-and-business/casework/the-sev ern-estuary
[76] https://www.bbc.co.uk/news/science-environment-66858850
[77] https://www.bto.org/our-science/publications/research-reports/climate-change-and-uks-birds

River Catchments

Rivers and tributaries link Gloucestershire to surrounding counties and parts of England and Wales further afield. Rivers act as wildlife corridors, providing paths through the landscape and a flow of resources including food sources. They are one of the richest freshwater habitats, supporting plants and animals that need running water to survive. The longest river in the UK, the Severn, starts in Wales and flows through the English counties of Shropshire and Worcestershire before flowing through Gloucestershire. Near Tewkesbury, the Warwickshire Avon meets the Severn, as its easternmost and largest tributary.

The Severn tributaries are particularly important for connectivity with regard to migratory fish in the River Severn. Whilst barriers to fish passage for the Severn have been addressed in Worcestershire using technical fish passes, Gloucestershire needs to address the barriers posed by Upper Lode weir and Maisemore weir for species needing to complete upstream and downstream migrations, opening up access to and from the Warwickshire Avon as well as the Severn. Other significant barriers need to be addressed in the Frome catchment, the Leadon and across the Forest of Dean. The majority of the tributaries that discharge into the Severn and Severn estuary have flapped outfalls, restricting access to fish, eels and lamprey, denying access to more suitable habitat for their respective life stages. Fish passage needs to be enabled at all confluences to the Estuary.

The River Thames catchment is also a significant feature of the Gloucestershire landscape. The source of the River Thames is near Kemble, and several Cotswolds rivers feed into the Upper Thames: the Churn, Coln, Leach, Windrush, and Evenlode. Cotswold Water Park, a series of 180 lakes formed in sites of gravel extraction, is located in the Thames catchment, with around 23 miles of the Thames River running through the area.

The Catchment Based Approach (CaBA) and local Catchment Partnerships bring together organisations from all sectors to work towards a healthy water environment[78]. Those catchment partnerships that include part of Gloucestershire include the Severn Vale, The Upper Thames, Windrush, Evenlode, Warwickshire Avon, and Bristol Avon Catchment Partnerships.

[78] https://catchmentbasedapproach.org/about/

4.7 National Environmental Objectives

The Environment Act 2021 and the government's 2023 Environmental Improvement Plan[79] created a range of national environmental objectives which each local nature recovery strategy should contribute to. These are summarised below, with indications of the main ways this strategy helps to contribute.

National targets set under the Environment Act (2021)

Objective	Main Relevant Potential Measures
Biodiversity on land - Restore or create in excess of 500,000 hectares of a range of wildlife-rich habitat outside protected sites by 2042, compared to 2022 levels	All Potential Measures about restoration or creation of habitats.
Biodiversity on land – Halt the decline of species abundance by 2030. Ensure that species abundance in 2042 is greater than in 2022, and at least 10% greater than 2030.	All Potential Measures contribute to this main aim.
Biodiversity on land - reduce the risk of species' extinction by 2042, when compared to the risk of species' extinction in 2022	All Potential Measures about habitat quality, resilience, size and connectivity, and priority species measures supporting recovery of additional rare and threatened species.
Woodland cover - Increase total tree and woodland cover from 14.5% of land area now to 16.5% by 2050	Main relevant Potential Measures: **Measure 009: Expand and buffer ancient semi-natural woodland, semi-natural woodland and long-established woodland.** **Measure 010: Establish new woodland and tree cover.** **Measure 066: Urban tree planting and management**
Improve water quality and availability - Reduce nitrogen (N), phosphorus (P) and sediment pollution from agriculture into the water environment by at least 40% by 2038, compared to a 2018 baseline	Main relevant Potential Measures: **Measure 052: Soil health and regenerative farming** **Measure 044: Reduce pollution from agricultural inputs** **Measure 045: Water quality**

[79] Environmental Improvement Plan

Key additional relevant commitment from the Environmental Improvement Plan (2023)

Objective	**Main Relevant Potential Measures**
Work to ensure that everyone in England lives within 15 minutes' walk of a green or blue space	**Measure 065: Access to biodiversity-rich green space**
Restore approximately 280,000 hectares of peatland in England by 2050	**Measure 026: Restore and create wetland and floodplain wetland mosaic**
Restore 75% of our water bodies to good ecological status	Main relevant Potential Measures: **Measure 018: Manage, improve and create ponds for wildlife** **Measure 019: Manage lakes for biodiversity** **Measure 022: Improve ecological condition of rivers** **Measure 044: Reduce pollution from agricultural inputs** **Measure 045: Water quality** **Measure 046: Sewage and wastewater**
Protect 30% of land and of sea in the UK for nature's recovery by 2030	All Potential Measures about management of habitats and about restoration or creation of habitats.
Support farmers to create or restore 30,000 miles of hedgerows by 2037 and 45,000 miles of hedgerows by 2050	Main relevant Potential Measures: **Measure 037: Hedgerows** **Measure 030: Field margins, hedgerows, buffer strips, ponds, trees and sustainable farming and forestry**
Manage our woodlands for biodiversity, climate and sustainable forestry	**Measure 054: Sustainable forestry and nature recovery**
Restore 75% of Sites of Special Scientific Interest to favourable condition by 2042.	All Potential Measures about management of habitats and about restoration or creation of habitats.
Ensure delivery & management of actions & policies that contribute towards our 25YEP goals are suitable & adaptive to a changing climate	Main relevant Potential Measures: **Measure 031: Create wildlife corridor connectivity** **Measure 034: Physical structure** **Measure 039: Woodland climate adaptation** **Measure 043: Floodplain reconnection** **Measure 053: Drought resilient farming techniques**
Make sure LNRSs include proposals for Nature-based Solutions which	**Measure 024: Natural flood management**

improve flood risk management where appropriate	
Achieve Good Environmental Status for our seas	Main relevant Potential Measures: **Measure 028: Protect and manage saltmarsh and mudflats** **Measure 029: Restore and create saltmarsh** **Measure 048: Severn Estuary marine biosecurity**
Reduce emissions of nitrogen oxides by 73% and ammonia by 16% by 2030 relative to 2005 levels	Main relevant Potential Measures: **Measure 044: Reduce pollution from agricultural inputs** **Measure 045: Water quality** **Measure 042: Riparian buffer strips**
Reducing the rates of introduction and establishment of invasive nonnative species by at least 50%, by 2030	Main relevant Potential Measures: **Measure 047: Remove invasive non-native species** **Measure 039: Protecting tree growth** **Measure 083: Strengthen white clawed crayfish population**

4.8 Biodiversity Priorities in Gloucestershire

The following Biodiversity Priorities for nature recovery in Gloucestershire were identified through the strategy development process:

	PRIORITY TYPE	OUTCOME	WHY
1	Grassland, Meadows and Heathland (open habitats)	Improve the condition of and increase the resilience, extent and connectivity of open habitats. Improve the abundance and variety of associated species.	Different types of wildflower-rich grasslands are important in Gloucestershire – and are currently often isolated fragments.
2	Woodland Habitats	Improve the condition of and increase the resilience, extent and connectivity of woodland habitats and tree cover. Improve the abundance and variety of associated species.	Woodlands and trees support a wide range of species, provide shading, improve air quality and store carbon.
3	Mixed and mosaic Habitats	Create complex and dynamic mosaics of scrub, grassland, trees and wetland.	Many species need a variety of habitats rather than just one, so a mixture of trees, scrub and grassland provides a range of food sources and places to nest, and will help species move and adapt to climate change.
4	Open water Habitats	Improve the ecological condition of ponds and lakes to support species diversity.	Ponds are really important for species like newts, frogs and toads.
5	Running water Habitats	Create more natural river courses and river banks, with better water quality, and dynamic mosaics of linked wetlands.	Can we create more natural river banks and river courses, and help our rare fish survive?
6	Wetland Habitats	Improve the condition of and increase the resilience, extent and connectivity of wetland habitats.	Wetlands support a diverse range of species and can help store carbon.
7	Estuarine Habitats	Protect and enhance internationally important estuarine habitats.	The Severn Estuary is internationally important for nature.
8	Biodiversity in settlements and developments	Increase biodiversity and wildlife corridors in the land around our homes.	The land around our homes can provide wildlife corridors, pollinator plants and more, and bring people into better direct contact with nature.
9	Nature-friendly farming and forestry	Build the health of our soils and provide food sources for wildlife and habitat connectivity through our countryside.	Biodiversity is important and can be supported everywhere, not just in “islands” of nature reserves. Protecting soils also reduces loss of sediment and nutrients to watercourses, reducing pollution
10	Species priorities	Strengthen the resilience of rare and threatened species that need specific management measures.	Some key actions are needed in specific places to help rare and threatened species.

5 Data and Evidence

5.1 Strategy development process

Gloucestershire County Council led on public and community engagement for the Local Nature Recovery Strategy, and commissioned Gloucestershire Local Nature Partnership to coordinate the input of local organisations and experts into the strategy, and to work in partnership with Gloucestershire County Council on community input.

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

- Local Nature Recovery Strategy technical steering group, with representation 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 included many nature conservation organisations and local authority planners and ecologists. The Nature Recovery working group contributed detailed information 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 to align with and build on the Nature Recovery Plans of the Cotswolds, Malverns 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 googledoc 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.

  The main partner organisations involved 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

- 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.

- 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.

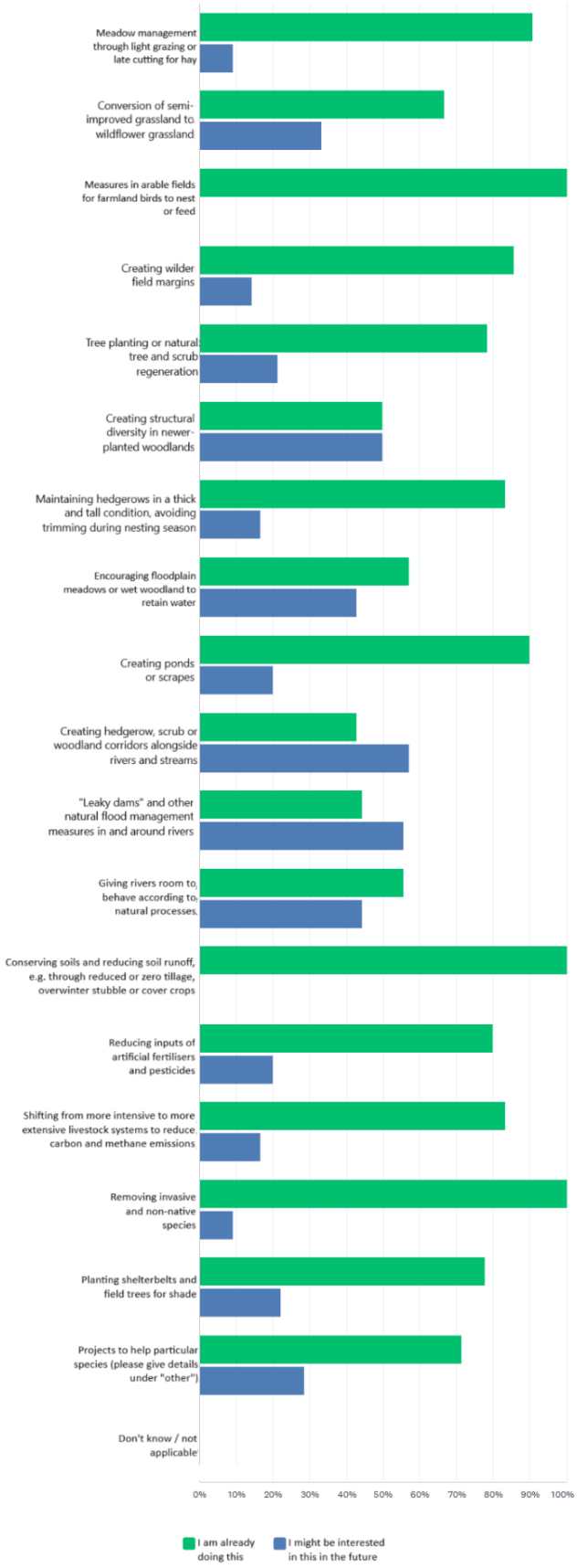
    - the need for the Local Nature Recovery Strategy to support the ongoing management of good quality habitat, where landowners have already invested in habitat creation and maintenance. Biodiversity net gain is not designed to reward the maintenance of this previous work and investment. People want to 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.



- A species task and finish group of Gloucestershire Centre for Environmental Records and ecology experts in Gloucestershire was convened to develop a long list of rare and threatened species in Gloucestershire, and then to shortlist priority individual species and species groups for specific species priorities and potential measures, and to group the long list of rare and threatened species 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 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 035: 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 105: Dead wood**
  - **Measure 036: Safeguard and establish ancient and veteran trees**
  - **Measure 085: Strengthen violet click beetle population**
  - **Measure 040: Ash dieback response**
  - **Measure 106: Veteran ash pollards**

- 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[80], 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.

[80] Report on LNRS community engagement workshops .docx

- 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.

- 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.

- 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.

5.2 Mapping development process

Gloucestershire's Nature Recovery Network map[81] is 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 key start point for the Local Nature Recovery Strategy process in Gloucestershire, and is the basis for many of the Areas that Could Become of Particular Importance for Biodiversity where different Potential Measures are focused.

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' - in other words, for a key suite of species typical of the habitat type, how easy is it for those species to spread given that some surrounding areas 'cost' (in ecological terms) more than others to move through? A score for the cost distance is 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.

To define the biodiversity priorities and Potential Measures, a range of other map zones have been identified, with the help of partners, in relation to other specific habitats such as tufa or saltmarsh, ideal wildlife corridors, strategic gaps, projects, settlements and species.

[81] https://naturalcapital.gcerdata.com/