

# Local Nature Recovery Toolkit: The State of Nature and Opportunities for Nature Recovery

CONSULTATION DOCUMENT

# Introduction

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## What is a Local Nature Recovery Strategy?

Local Nature Recovery Strategies (LNRSs) are a new, England-wide approach to targeting nature recovery, as mandated by the Environment Act 2022. There will be 48 LNRSs together covering the whole of England, with each LNRS agreeing priorities and actions for nature's recovery and broader environmental benefits in the relevant Strategy Area.

The 48 LNRSs will help expand the Nature Recovery Network across England. They are also crucial to realising both our local and national environmental goals by helping us to adapt to climate change and foster healthier, more sustainable living.

As per the Environment Act, each LNRS must include:

1. **A Statement of Biodiversity Priorities**, including:
  - i. A description of the strategy area and its biodiversity
  - ii. Opportunities for recovering or enhancing biodiversity in the strategy area
  - iii. Priorities for biodiversity recovery or enhancement, considering contributions to other environmental benefits
  - iv. Proposals for potential measures related to those priorities
2. **A Local Habitat Map** that identifies:
  - i. national conservation sites in the strategy area
  - ii. local nature reserves in the strategy area
  - iii. other areas in the strategy area which:
    - are, or could become, of particular importance for biodiversity, or
    - are areas where the recovery or enhancement of biodiversity could make a particular contribution to other environmental benefits

Alongside having a role in the planning system and informing where public money is spent on nature recovery, LNRSs will shape how 'nature-based solutions' are delivered. These solutions will achieve various outcomes including flood management, carbon sequestration, and improvements in water quality.

## Why are we using the term 'Nature Recovery Toolkit'?

We have designed the LNRS for the West of England Mayoral Combined Authority and North Somerset to act as a guide to what the most effective actions for nature recovery are, and where the focus areas for nature recovery are. Users will be able to use an online, interactive map to understand the priorities and actions in their locality, and what guidance and funding is available to deliver them.

We intend for it to be used by farmers, businesses, communities, public organisations and policy makers to inform the most effective action for nature recovery.

Therefore, we believe the term 'Nature Recovery Toolkit' better reflects the design purpose of this product and will be more comprehensible to users. The Toolkit has still been designed to act as the

LNRS for the Mayoral Combined Authority and North Somerset and meets the requirements of the LNRS set out by Regulations.

### **Area covered by the Local Nature Recovery Toolkit**

The Local Nature Recovery Toolkit covers the West of England Mayoral Combined Authority (Bristol, South Gloucestershire, and Bath & North East Somerset; hereafter referred to as the 'Mayoral Combined Authority') and North Somerset. The area covered by the Toolkit is shown in the map below.

The Toolkit acts as the LNRS for both the Mayoral Combined Authority and North Somerset, and will henceforth be referred to as the Local Nature Recovery Toolkit.



### **Purpose of this document**

This document provides a description of the state of nature in the area covered by the Toolkit and its biodiversity (point 1.i) and opportunities for recovering or enhancing biodiversity in the area (point 1.ii).

These are used to inform the 'Priorities for biodiversity recovery or enhancement' and 'Proposals for potential measures related to those priorities', as well as the mapping of focus areas for nature recovery in the Local Habitat Map.

## **Structure**

After this introduction, the second section of this document, 'Context', summarises the decline in nature locally and nationwide, and why nature recovery is crucial.

The third section, 'The State of the Natural Environment', provides an overview of the state of nature, including our key protected sites, core habitats, and some of our most notable species.

The final section, 'Challenges and Opportunities', sets out what the key challenges facing nature are locally, and some of the opportunities to tackle them and secure nature's recovery.

There are three appendices to this document:

1. Appendix I: Relation to National Policy and Objectives, which explains the contribution of the Nature recovery Toolkit towards national policy and objectives related to the natural environment.
2. Appendix II: Description of the Natural Environment by Area, which provides much greater detail on the challenges facing nature and opportunities for nature recovery, broken down into different geographies.
3. Appendix III: Further Information on Climate Change, which provides a more detailed explanation of the impacts of climate change on nature and how this can be mitigated than is contained in this document.

## Context

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### Why do we need a Nature Recovery Toolkit?

#### The State of Nature: an ecological emergency

England is one of the world's most nature-depleted countries<sup>1</sup>, as demonstrated by historic and continuing declines of wildlife. From the data we have available, the state of nature locally is reflective of national trends.

Bird populations are particularly well-documented in the Mayoral Combined Authority and North Somerset, with the Avon Ornithological Club having conducted systematic bird counts since 1994. While the data doesn't provide statistically robust estimates, it does highlight significant declines of certain bird populations.

The overall bird count per surveyed square fell from over 200 in 1994 to under 170 in 2021, with certain species undergoing especially severe declines, including summer migrants and those reliant on insects for food.

For example, for every four starlings seen in the mid-nineties, only one has been seen in recent years. Even more startlingly, the number of squares in which cuckoos were recorded has fallen from almost 50% in the mid-nineties to less than 3% in 2021, and only a handful of cuckoos are now counted for every 100 counted in the mid-nineties. Swift and house martins have also suffered steep declines.

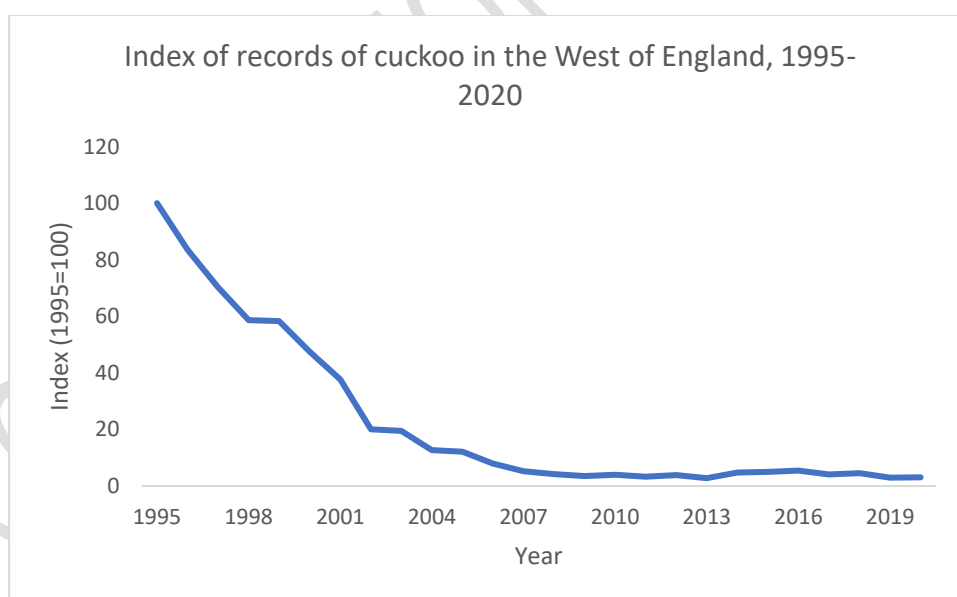


Figure 1 – Figures from BTO suggest that the population of cuckoo has crashed in the period between 1995 to 2021. For every 100 cuckoos counted in the area covered by the Toolkit in 1995, there are now only around four.

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<sup>1</sup> As measured by the Global Biodiversity Intactness Index. See <https://www.nhm.ac.uk/our-science/data/biodiversity-indicators/global-biodiversity-intactness-index.html> for more detail.

Local data on bird counts is broadly consistent with national trends, which show long-term declines in our wildlife:

- 45% decline in butterfly distribution since 1976<sup>2</sup>
- 25% decline in moth numbers since 1970<sup>3</sup>
- A 64% decline in the abundance of UK Priority Species<sup>3</sup>
- A 54% decline in breeding farmland birds<sup>3</sup>
- 43% of bird species and 26% of terrestrial mammal species are now threatened with extinction.<sup>3</sup>
- 25% of the UK's fish stocks are in critical condition<sup>3</sup>

While evidence before 1970 is patchy, we do know that wildlife in the UK and locally had already been significantly depleted by this point.

### Why does nature's decline matter?

The decline in nature matters to all of us because of the vital role that wildlife and nature play in supporting our wellbeing, society, and economy. Nature provides the air we breathe, the food we eat, the water we drink, and many of the resources crucial for our survival and quality of life.

### **Food production**

About three quarters of all crop types we cultivate rely on insect pollination, and so our ability to feed ourselves is reliant on insects and pollination. An alarming example of the impact of insect decline is in China's Sichuan province, where orchards need to be pollinated by hand due to the absence of natural pollinators<sup>4</sup>.

Deteriorating soil health poses a major challenge to farming and food security. In the UK a significant area of soil is at risk of compaction or erosion, and soil degradation is calculated to cost the economy £1.2 billion a year.<sup>5</sup>

Insects, worms, and soil microbes play a crucial role by breaking down organic matter such as leaves and manure, replenishing the soil with nutrients needed for that plant growth. Without a healthy and biodiverse soil, the complex processes that support our food production and the natural world are put at risk.

### **Unknown consequences**

Understanding how ecosystems function is an ongoing challenge. Nature is complex and predicting the consequences of its decline is challenging. We do know that nature's decline and climate change are destabilising Earth's ecosystems and, as a result, there will continue to be 'ecological tipping points' which, if passed, can cause sudden, dramatic, and potentially irreversible changes in nature's ability to function.

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<sup>2</sup> Butterfly Conservation (2023), The State of the UK's Butterflies 2022

<sup>3</sup> State of Nature Report (2019)

<sup>4</sup> <https://www.foodunfolded.com/article/pollinating-orchards-by-hand-lessons-from-sichuan-china>

<sup>5</sup> <https://www.gov.uk/government/publications/state-of-the-environment/summary-state-of-the-environment-soil>

## Nature and the economy

Over half of the world's GDP is moderately or highly dependent on nature<sup>6</sup>. In the UK, the health benefits linked with outdoor recreation are valued between £6.2 and £8.4 billion in 2020<sup>7</sup>. However, many services provided by nature aren't factored into traditional economic decision-making.

For example, no value is usually placed on the cost of soil degradation or of habitat loss. Similarly, the impact of deteriorating air quality due to traffic from a new housing development<sup>8</sup> is not normally accounted for.

In addition to these vital services, being in nature has important positive effects on our mental and physical health. Access to green space can lead to a reduced risk of loneliness<sup>9</sup> and living near to green or blue spaces has been linked to reduced anxiety, depression, and risk of developing cardiovascular diseases<sup>10</sup>.

## Restoring nature: A way forward

While the challenges may seem daunting, there are inspiring examples showing that, when given the opportunity, nature can recover surprisingly quickly. In most cases, what would be best for biodiversity would be landscapes in which natural processes are allowed to unfold: a suite of herbivores roaming the landscape extensively, with predators such as wolves and lynxes on the lookout for their next meal; 'environmental engineers' like beavers building dams and creating wetland habitats; and birds and insects thriving.

While there will be opportunities for restoring some natural processes, it's essential to recognise that the area also needs to work for people by producing food and water, providing housing, and supplying energy. Striking a balance will involve a wilder, more interconnected landscape that meets the needs of society while being more hospitable to nature.

Achieving this will mean restoring well-managed natural habitats, including wetlands, rivers, woodlands, scrub, and grassland, at a significant scale. Equally, the remaining landscape should be as wildlife friendly as possible: bustling hedgerows, increased tree cover, wilder gardens, wildflower verges, and designated areas specifically for nature. This will require a collective effort to create a more harmonious existence between people and nature.

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<sup>6</sup> World Economic Forum (2020), *Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy*

<sup>7</sup>

<https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/healthbenefitsfromrecreationnaturalcapitaluk/2022>

<sup>8</sup> For further information and a more detailed explanation of how and why this is the case, see 'The Economics of Biodiversity: The Dasgupta Review' (<https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review>).

<sup>9</sup> Astell-Burt et al. (2022) More green, less lonely? A longitudinal cohort study. *International Journal of Epidemiology*, 51: 99-110.

<sup>10</sup> Maas, J., et al (2006) Green space, urbanity, and health: how strong is the relation? *National Library of Medicine*, 60: 587-92.

Recovering nature also means stopping, minimising, or mitigating harmful activities that lead to pollution, degradation, or fragmentation of habitats. This includes reducing the quantity of pesticides used and the area over which they are applied; curbing the pollution of waterways with nutrients, microplastics and chemicals; enhancing soil health; minimising light pollution; ensuring biodiversity-friendly development; and addressing the impact of 'invasive' non-native species.

The Local Nature Recovery Toolkit sets out the best opportunities for nature recovery locally. This allows us to collectively concentrate resources and investment in the areas that will have the greatest positive impact on nature, all while delivering essential 'ecosystem' services such as flood mitigation, carbon storage, recreational opportunities, and improvements in water quality.

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## The State of the Natural Environment

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This section summarises the state of the natural environment in the Mayoral Combined Authority and North Somerset, including the extent and location of protected sites and priority habitats, notable species, and its context in the wider landscape.

Greater detail on the state of nature can be found in Appendix II: Description of the Natural Environment by Area.

### A very brief summary of the natural environment

The Mayoral Combined Authority and North Somerset pack a lot of variation into a relatively small area, with the range of biological and landscape features shaped by high geological diversity. The area covered by the Toolkit includes a World Heritage site and two National Landscapes; an Estuary that is internationally important for wildlife; the unique and spectacular Avon Gorge; caves harbouring nationally important bat populations; and the largest lake in South West England that supports internationally important wintering bird populations.

The changing landscape includes wildflower-rich limestone hills and grasslands, open, flat landscapes of fields drained by 'rhynes'; wooded hills and ridges; and the largest urban area in the South-West.

Flowing through the heart of the area covered by the Toolkit is the **River Avon**, a tidal river home to rare fish, including migratory populations of Atlantic salmon, critically endangered European Eel, invertebrates, and a beaver population. However, human modification, driven by historic industrialisation, has heavily impacted the river.

At the centre of the area covered by the Toolkit lies **Bristol**, a large urban area with over 400,000 residents. Amidst its urban surroundings, Bristol has several significant nature sites, stretching from the iconic Avon Gorge and Clifton Downs to Stoke Park Estate, the tranquil Frome Valley, Conham Valley River Park, and the natural beauty of the Western Slopes. These areas play host to peregrine falcons, kingfishers, endemic whitebeams, and otters.

To the west and south-west of Bristol is the **Cleve and Failand Ridges and Plateaux**. This wooded landscape includes a number of ancient woodlands and parklands, and hosts important populations of bats, dormice, and a number of scarce fritillary butterflies.

Below these ridges are the **Gordano Valley** and **North Somerset Levels and Moors**, consisting of coastal and floodplain grazing marsh drained by a series of ditches known locally as 'rhynes' and largely grazed by livestock. Before drainage, these areas would have likely been wetland habitat, such as 'reed swamps'. Wading birds such as lapwing, redshank and snipe can be found here, as well as rare invertebrates in well-managed rhynes, water voles and foraging horseshoe bats.

Further South, bordering Somerset, the **Mendip Hills** are a range of limestone hills formed 300 million years ago and are now part of the Mendip Hills National Landscape. Ancient woodland and calcareous grassland give host to a wide variety of fauna and flora, including some endemic species, adder, and significant bat hibernation roosts in the complex of limestone caves.

Turning east, the levels and ridges give way to an **undulating, rural landscape in Bath and North East Somerset**, framed by Bristol Airport to the west, Bristol to the north and Bath to the east. This is a mixed landscape of arable farming and grazing, small woodlands and hedgerows, and foraging bats. Two large lakes are also found here: Blagdon Lake and Chew Valley Lake, the latter of which hosts

internationally important populations of wintering wildfowl. The Chew Valley catchment also supports populations of Atlantic salmon and the critically endangered European eel.

The city of Bath is surrounded by the '**Bathscape**', a world heritage setting that, outside of the city centre, is rural in nature and includes a mix of woodlands, unimproved grassland, riverside meadows and canals, as well as further populations of rare bat species; the steeply sloping **St Catherine's Valley** adjoins the Bathscape to the north and maintains much of this character.

The Bathscape is the southernmost part of the **Cotswolds National Landscape**, which continues northward into Gloucestershire and beyond. North of the Bathscape and St Catherine's Valley is the **Cotswolds Plateau**, the biggest concentration of arable farming in the area covered by the Toolkit, which continues east into Wiltshire. The narrow '**Cotswolds Scarp**' forms the western boundary of the AONB in the Mayoral Combined Authority, retaining some of its semi-natural character of ancient woodlands, wood pasture, scrub and unimproved limestone grassland.

Further west, between the Cotswolds AONB and the M5, and with Bristol to the South and West, lies the **countryside of South Gloucestershire**. This is largely a relatively flat farmed landscape with scattered towns and villages including Yate. **Lower Woods** is one of the largest and most valuable ancient woodlands in the South West, is adjacent to a number of wildflower meadows, commons and mosaic habitats.

Running roughly parallel to the M5 north of Bristol is a ridge, adorned with scattered areas of woodland and copses, extending into Gloucestershire past the Tortworth Estate. Between this ridge and the Severn Estuary lies the **Lower Severn Vale Levels**, a largely rural, low-lying, open floodplain, containing saltmarsh, scattered orchards, reedbeds, and grassland. Similar to the North Somerset Levels and Moors, this area has been drained for agricultural purposes. The Vales extend northwards into Gloucestershire, towards the mouth of the River Severn.

Lastly, the **Severn Estuary** forms the coastline of the area covered by the Toolkit, boasting the world's the second highest tidal range. The Estuary has the second highest tidal range in the world, and is an internationally designated site for its importance to wildfowl and wading birds, including shelduck, gadwall, dunlin, redshank, and curlew, as well as hosting Atlantic salmon and the critically endangered European Eel.

## **Protected sites and priority habitats**

### European-designated Sites

The area covered by the Toolkit includes four Special Areas of Conservation (SACs) between them, designed to protect 220 habitats and approximately 1,000 species of European interest:

#### [Avon Gorge Woodlands SAC](#)

- Designated for its 'Tilio-Acerion forests of slopes, screes, and ravines'
- Home to rare and uncommon trees and plants, including small-leaved lime, rare and endemic whitebeams, and green hellebore.

#### [North Somerset and Mendips Bats SAC](#)

- Primarily designated primarily for its 'Tilio-Acerion forest' at Kings and Urchin's Wood

- Hosts populations of greater horseshoe bats and lesser horseshoe bats, with the designation extending into Somerset.

#### Bath and Bradford-on-Avon Bats SAC

- Home to an ‘exceptionally large’ overwintering population’ of greater horseshoe bats (15% of the UK population) and small numbers of Bechstein’s bats. This designation extends into Wiltshire.

#### Severn Estuary SAC

- Recognised for its estuary, mudflats, and sandflats, as well as Atlantic salt meadows.
- Home to populations of sea lamprey, river lamprey and twaite shad, with the designation extending beyond the area covered by the Toolkit.

There are also two Special Protection Areas (SPAs) in the area covered by the Toolkit, designated for their bird populations:

#### Chew Valley Lake SPA

- Designated for its internationally important numbers of northern shoveler.

#### Severn Estuary SPA,

- Designated for its national and international importance for the breeding, feeding, wintering and migration of rare and vulnerable bird species. This designation extends beyond the area covered by the Toolkit.
- Key species include Bewick’s swan, greater white- fronted goose, Dunlin, redshank, shelduck, and gadwall.

The Severn Estuary is also designated as a Ramsar site, acknowledging its global importance as a wetland site and waterfowl habitat.

#### Nationally-designated Sites

Sites of Special Scientific Interest (SSSIs) are some of our most valuable sites for nature, having been nationally designated based on specific features. They include all Special Protection Areas (SPAs) and Special Areas of Conservation (SACs).

In the area covered by the Toolkit, SSSIs cover over 13,000 hectares, with most of this located offshore in the Severn Estuary (marine habitat). Onshore, including mudflats, there is approximately 5,043 hectares of SSSI, accounting for 3.8% of the land in the area covered by the Toolkit.

Our largest sites, aside from the Severn Estuary, are:

- Chew Valley Lake (576 ha)
- Lower Woods (283 ha)
- Crook Peak to Shute Shelve Hill (263 ha)
- Blagdon Lake (222 ha)
- Ashton Court (210 ha).

According to the most recent data available, only 46% of the ‘SSSI units’ in the area covered by the Toolkit are in favourable condition, which drops to 38.5% when we exclude sites primarily designated

for their geological value. 21% of sites are in 'unfavourable – recovering' condition, 27.4% in 'unfavourable – declining', and 5.3% in 'unfavourable – no change'.

Of particular concern is the number of units in 'unfavourable – declining' condition. Over half of the units in this condition are part of Tickenham, Nailsea and Kenn Moors SSSI<sup>11</sup>.

However, the outlook becomes more positive when considering the *area* of SSSIs in favourable condition. Approximately, 65.36% of the surveyed SSSI area (excluding those offshore) is in favourable condition with:

- 17.58% in 'unfavourable – recovering' condition
- 6.54% in 'unfavourable – declining', and
- 10.52% in 'unfavourable – no change'.

This compares favourably to the national average, where only 37.9% of the area of SSSIs is in favourable condition<sup>12</sup>.

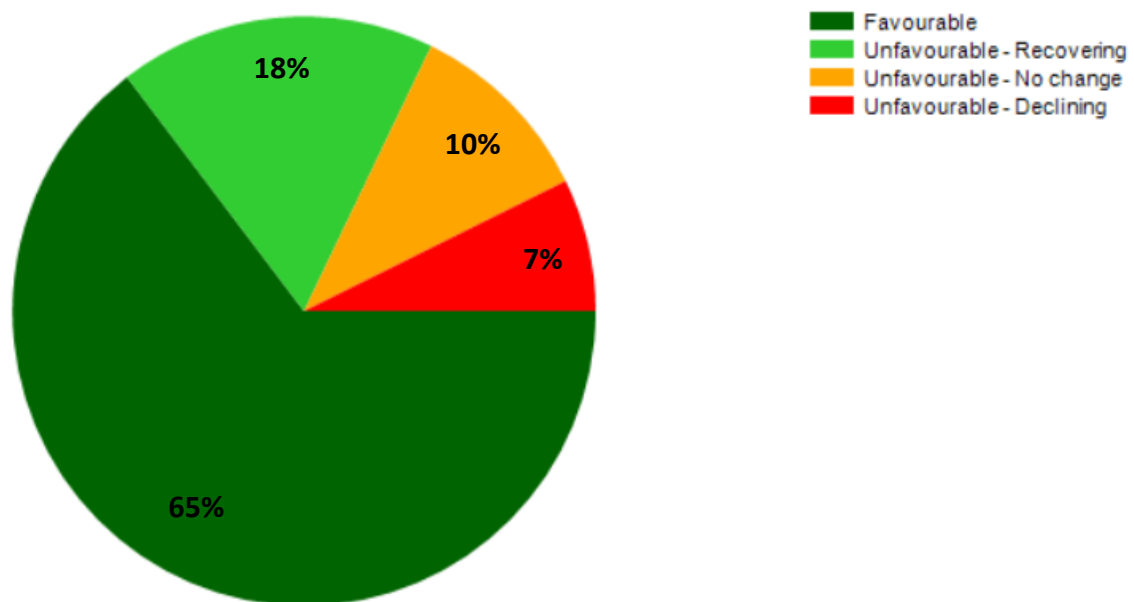


Figure 2 - The status of Sites of Special Scientific Interest (SSSIs) in the area covered by the Toolkit

<sup>11</sup> Notably, more than 82% of the sites in 'unfavourable – declining' condition fall under the habitat type 'Standing open water and canals'.

<sup>12</sup> <https://www.gov.uk/government/statistics/england-biodiversity-indicators/1-extent-and-condition-of-protected-areas--2>

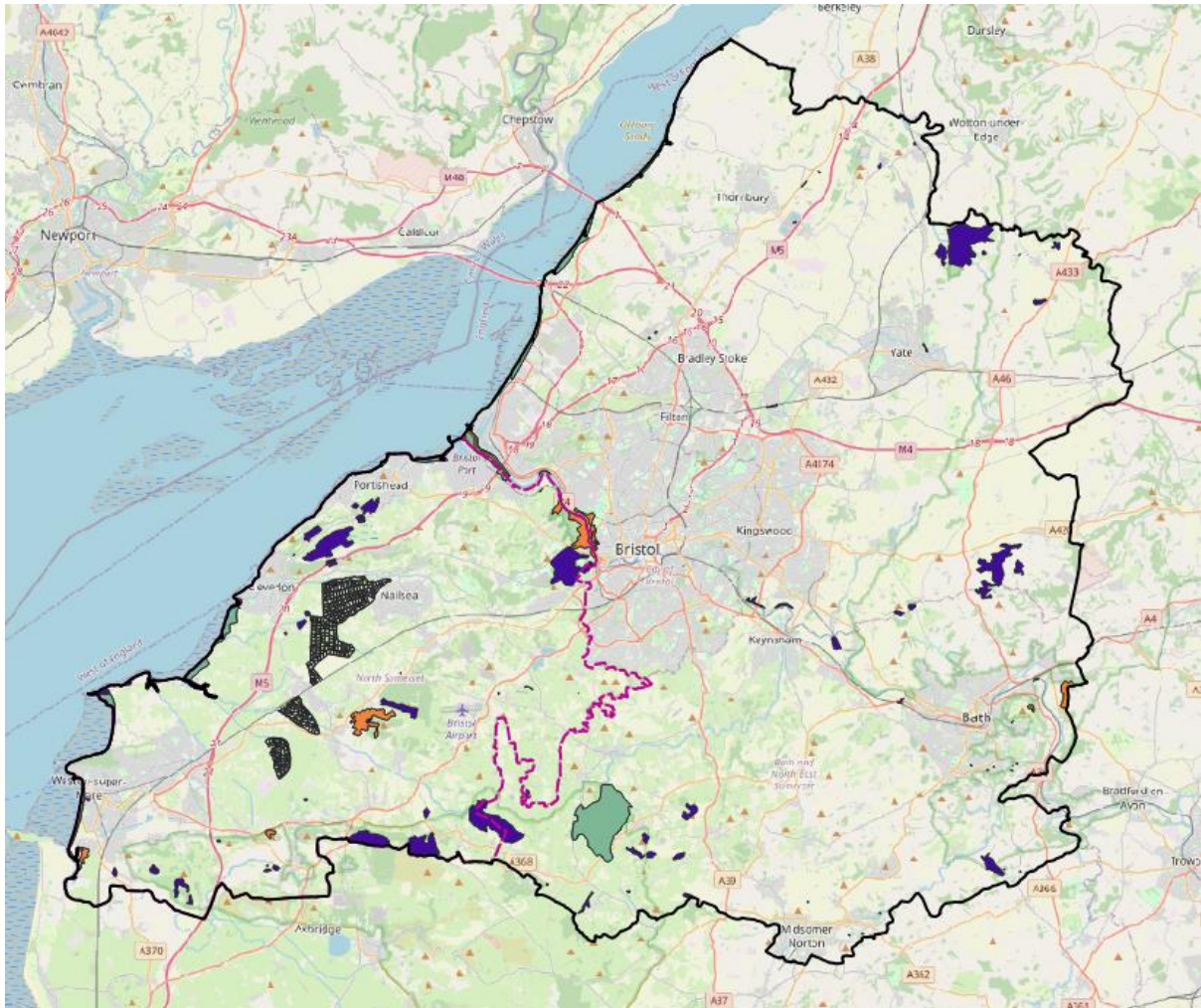


Figure 3: Location of internationally (SPA and SAC) and nationally (SSSI) designated nature sites in the area covered by the Toolkit; SPAs are shown in green, SACs in orange, and SSSIs in purple. The boundary between the Mayoral Combined Authority and North Somerset is shown as a purple dashed line.

### SNCIs and Local Nature Reserves

Beyond its internationally and nationally designated sites, there are numerous areas recognised for their wildlife at a regional or local level. These sites are known as ‘Sites of Nature Conservation Interest’ (SNCIs) or ‘Local Nature Reserves’.

Excluding the off-shore Severn Estuary, which covers over 12,500 hectares, **more than 20,000 hectares** the area covered by the Toolkit are designated as SNCIs or Local Nature Reserves, equivalent to **over 15% of the land area**.

While this includes all the sites designated as SSSIs, which are all recognised as SNCIs, it still accounts for an additional 11.3% of the area covered by the Toolkit that is recognised for its value for wildlife.

Unfortunately, our understanding of the condition of sites designated as SNCIs or Local Nature Reserves (but not as SSSIs) is limited due to historical gaps in monitoring. However, it is expected that the majority of these will have not been lost and at least still retain some of their value to wildlife.

## Trees and Woodland

In the area covered by the Toolkit, woodlands cover approximately 10,607 hectares, constituting 8% of the total land area. This is below the England-wide figure of 10%. Of this woodland, 2,090 hectares (1.6%) is protected ancient woodland, with a further 689 hectares (0.5%) of Planted Ancient Woodland Sites (PAWS), which retain ecologically rich soils and could be restored.

Overall, 45% of woodlands are managed.<sup>13</sup> Managed woodlands (especially semi-natural broadleaved woodlands) tend to be of greater value to wildlife due to the greater diversity of structure and age of trees.

The most extensive wooded areas are found along the ridges to the southwest of Bristol, stretching from Portishead and Clevedon, through Failand and south to Congresbury and Wrington, including a number of ancient woodlands. The northern slopes of the Mendips and the landscape surrounding Bath also have a significant amount of woodland. Lower Woods, on the border with Gloucestershire, stands out as the single largest area of ancient woodland in the area covered by the Toolkit.

Beyond these woodlands, much of the tree cover in the area covered by the Toolkit is distributed among individual trees, small copses, parklands, wood pasture, and hedgerows. Overall, our best estimate suggests the area covered by the Toolkit has a tree canopy cover of 14.9%<sup>14</sup>.

Traditional orchards are also an important priority habitat locally and are scattered throughout, although their extent is far reduced compared to historical records.

For more in-depth information on our trees and woodlands, including a summary of the challenges facing trees and woodlands and opportunities to address them, please refer to the [Forest of Avon Plan](#).

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<sup>13</sup> National Forest Inventory, 2019

<sup>14</sup> Calculated using Forest Research Urban Canopy Cover Tool (2022).



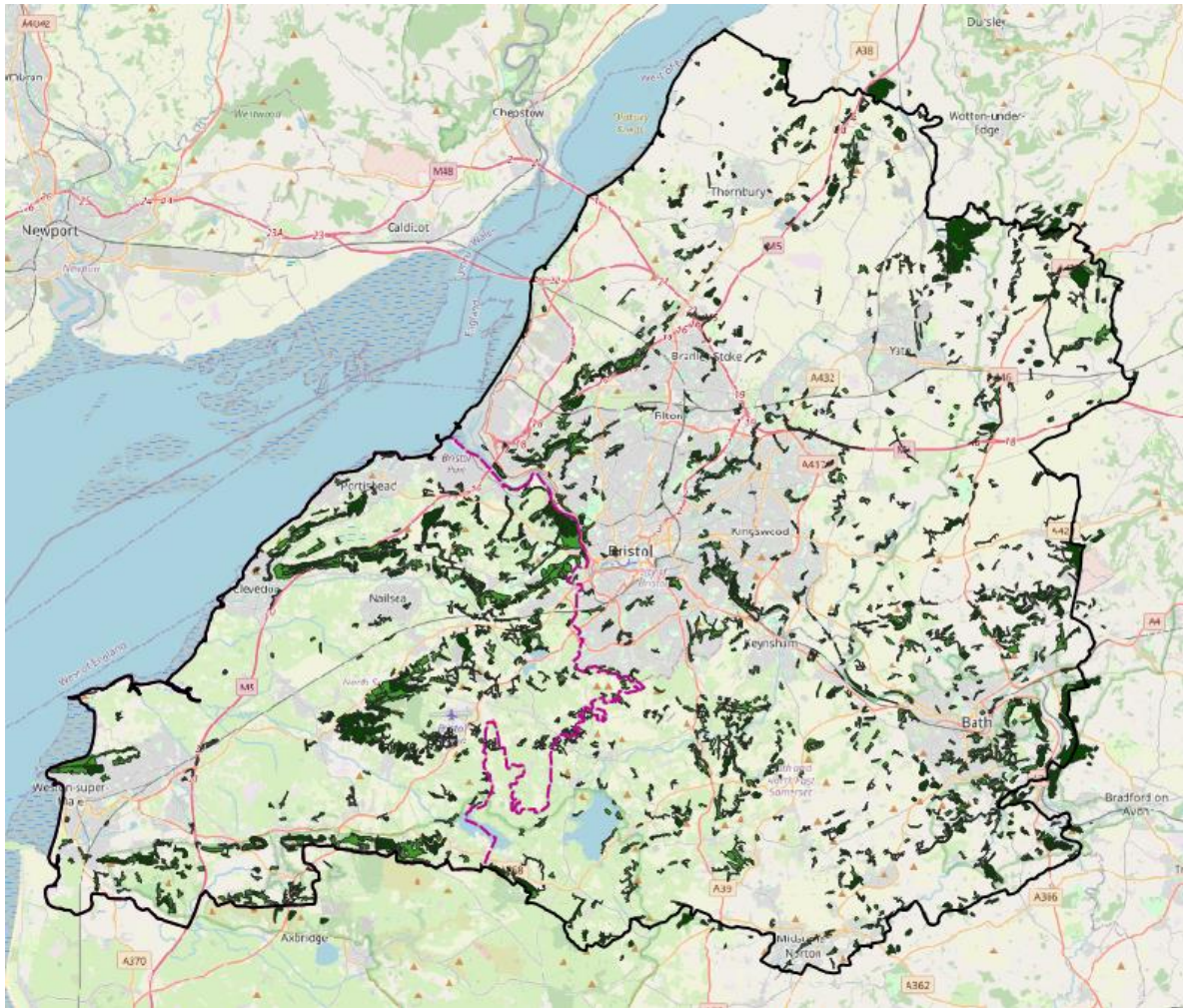


Figure 4 - Map of woodlands in the area covered by the Toolkit. Ancient semi-natural woodland is shown in dark green, and other woodland in lighter green. The boundary between the Mayoral Combined Authority and North Somerset is shown as a purple dashed line.

### Grassland and other open habitats

In 2016, the West of England Nature Partnership (WENP) mapped the best areas of grassland across the Mayoral Combined Authority and North Somerset. These areas are defined as those exceeding 0.5 hectares in size with a high number of plant species, such as lowland calcareous grassland, lowland dry acid grassland, and lowland meadows.

According to this mapping, the area covered by the Toolkit has just over 5,000 hectares of 'core grassland', equivalent to approximately 3.8% of its area. However, this figure is uncertain as much of this grassland will not have been surveyed for potentially decades, and it is also likely that there are grasslands that have not been mapped.

Despite these challenges, the mapping of core grassland sites provides valuable insights into key areas of grassland habitat in the area covered by the Toolkit. Notable locations include north of Bath, around Lower Woods, around Chew Valley Lake, the North Somerset Levels and Moors including the Gordano Valley, and parts of the Lower Severn Vale Levels.



A significant amount of this grassland is calcareous grassland, which occurs where there are underlying limestone soils. Where there are non-limestone soils, there is predominantly 'neutral' grassland, such as lowland meadows.

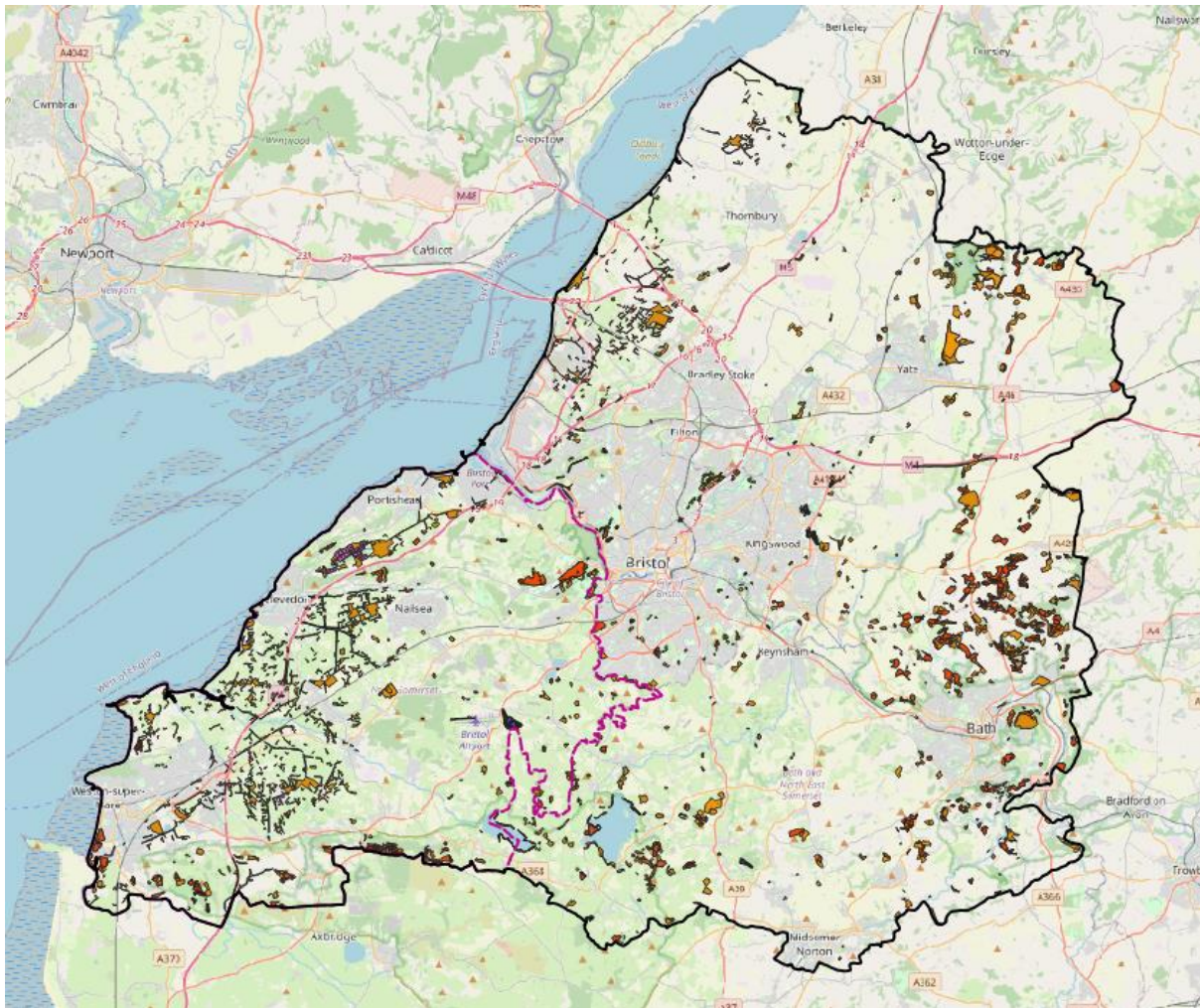


Figure 5 - Combined map of priority habitat grassland and 'core grassland' (as mapped through the West of England Nature Recovery Network) in the area covered by the Toolkit. The boundary between the Mayoral Combined Authority and North Somerset is shown as a purple dashed line.

We do not have historical figures for grassland in the Mayoral Combined Authority or North Somerset. However, given the scale of the loss of grassland habitats nationally, we can expect the current extent of grassland to be much lower than at the start of the 20<sup>th</sup> century.

In addition to sites mapped as grassland, there are other 'open' habitats that are valuable to nature, including scrub and mosaic habitat. These are less well mapped, and the distinction between 'grassland' and other open habitats is not always clear-cut.

### The freshwater environment

The freshwater environment encompasses rivers, lakes, streams, rhynes (ditches), ponds and wetlands.

The majority of the area covered by the Toolkit is part of the Bristol Avon Catchment, covering the entire area where water flows into the River Avon. The Catchment extends to the western part of



Wiltshire, the southern part of Gloucestershire, and parts of Somerset. The very southwestern corner of North Somerset, including Weston Super Mare, is within the Brue and Axe catchment.

As well as the SSSI-designated Chew Lake and Blagdon Lake, our rivers and streams are all crucial and irreplaceable habitats for freshwater wildlife that cannot be found elsewhere.

Unfortunately, in 2022 only 14% of waterbodies within the Bristol Avon catchment had 'good ecological status' under the Water Framework Directive (WFD). Only four of these 'good' waterbodies are in the area covered by the Toolkit, with the other nine elsewhere in the catchment. None of the water bodies in the catchment achieved high ecological status, owing to physical modification and elevated phosphate and nitrate levels.



Figure 6 - Map of the Bristol Avon Catchment and its main rivers (Source: Bristol Avon Catchment Partnership)

### Coastal and wetland priority habitats

Other priority habitats in the area covered by the Toolkit are associated with the Severn Estuary and coast, and with wetland habitats. Valuable **coastal saltmarsh**, **mudflats** and **coastal grazing marsh** are found in intertidal zones in the protected Severn Estuary, and there is also a small amount of 'maritime cliff and slope' between Portishead and Weston-super-Mare.

There is a significant extent of **lowland fen** and **purple moor grass and rush pastures** in the Gordano Valley, and **reedbeds** on the fringes of Chew Valley Lake and Blagdon Lake.

There is also a large amount of **floodplain grazing marsh** mapped, largely in the North Somerset Levels and Moors and Lower Severn Vale Levels. However, the vast majority of this will have been agriculturally improved and of little value to wildlife. It is difficult to ascertain exactly where the remaining floodplain grazing marsh is concentrated without field surveys.

## Iconic, notable, and important species

### Bats

Both the Mayoral Combined Authority and North Somerset are renowned for their diverse bat populations, boasting many nationally scarce or rare species. They are home to 15 of the UK's 18 bat species, with at least one more suspected to be present. Notable species include:

- The rare **Greater Horseshoe Bat**, whose nationally important populations are restricted to the South West of England and South Wales
- The **Lesser Horseshoe Bat**, slightly more widespread across Wales and Western England
- **Bechstein's Bat**, in the UK exclusively found in Southern Wales and parts of Southern England
- The **Barbastelle Bat**, an incredibly rare species in the UK

It is worth noting that all these species are at the edge of their range in the area covered by the Toolkit.

Despite bat populations making a comeback in recent decades, their populations were severely depleted over the 20<sup>th</sup> Century. The greater horseshoe bat population has declined by over 90% in the last 100 years<sup>15</sup> owing to a combination of roost disturbance, habitat loss from agricultural intensification, and the use of pesticides leading to a decline in their invertebrate prey.

### Other mammals

The woodlands southwest of Bristol and the Mendip Hills AONB host populations of the elusive **hazel dormouse**. A seriously endangered species, the hazel dormouse is also found in Lower Woods and scattered locations in the area covered by the Toolkit.

Recently, a population of **beavers** has established itself on the River Avon and its tributaries. Once hunted to extinction in the UK in the 16<sup>th</sup> century, the beaver's resurgence is a result of carefully planned introductions and trials. Now the UK is home to more than 400 beavers, some wild and others in trialled enclosures.

The reappearance of beavers offers an opportunity to restore the UK's lost ecosystems. Acting as 'ecosystem engineer's, beavers will coppice trees and shrub species to build dams, and dig 'beaver canal' systems<sup>16</sup> leading to new wetland ecosystems and connecting rivers to their floodplains. This ripple effect benefits a myriad of species, from fish and water voles to otters and dragonflies. Beavers can also play a role in reducing downstream flooding, purifying water, and even sequestering carbon.

### Fish

The area covered by the Toolkit, which is part of the Bristol Avon Catchment, is home to both **Atlantic salmon** and the critically endangered **European eel**. Both of these species are migratory, with the European Eel completing a quite spectacular lifecycle that spans the rivers and estuaries of the UK and the Sargasso Sea.

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<sup>15</sup> Bat Conservation Trust (2010). Greater horseshoe species factsheet

<sup>16</sup> <https://www.wildlifetrusts.org/saving-species/beavers>

The European Eel has been classified as critically endangered by the IUCN, its populations having declined by over 90% since 1970. The reasons behind this decline are complex and not fully understood, likely encompassing various factors including overfishing, parasites, migration barriers, changes in ocean patterns, and pollution.<sup>17</sup>

Fisheries statistics, published annually by the Environment Agency, show that salmon are 'at risk' in 86% of the rivers in England<sup>18</sup>. Climate change, overfishing, poor water quality, and in-river barriers are all contributing to their decline. In July 2022, a UK salmon stock assessment report estimated that populations are at their lowest levels on record<sup>19</sup>.

Other notable fish species in the Catchment include **Atlantic mackerel, common sole, and sea lamprey**, all of which are species of principal importance in England. A list of all the fish species recorded in the Catchment can be found in the Bristol Avon Fish Recovery Strategy (Table 1).

### Birds

The area covered by the Toolkit is a stronghold for wildfowl and wading birds, with key habitats including the Severn Estuary, Chew Valley Lake, Blagdon Lake, and wetland habitats on the Lower Severn Vale Levels and the North Somerset Levels and Moors.

The Severn Estuary hosts internationally important populations of **Bewick's swan, white-fronted goose, shelduck, gadwall, dunlin and redshank**, alongside nationally important numbers of many other birds such as **curlew and wigeon**<sup>20</sup>.

The Chew Valley Lake has internationally important populations of **shoveler** and **gadwall**, among other wildfowl and waders, and is also regularly visited by **osprey** and **hobbies** in summer.

The Mendip Hills, with its diverse mix of calcareous grassland, woodland, heath and scrub, serves as a key habitat for threatened and scarce species including the **Dartford warbler** and **nightjar**. The arable-dominated plateau of the Cotswolds national landscape is also a stronghold for the red-listed **corn bunting**.

### Amphibians and reptiles

Despite worrying declines in amphibians, the area covered by the Toolkit still supports extensive populations of frogs, toads, and newts. The annual closing of Charlcombe Lane in Bath to protect migrating toads is a brilliant testament to this.

South Gloucestershire, in particular, is a stronghold for the **great-crested newt**, a highly protected species. These newts require specific habitats, including stagnant water bodies such as large ponds, for breeding, as well as woods and cover-rich habitats outside the breeding season.

The area covered by the Toolkit is also home to four common reptiles: the **adder, grass snake, slow worm, and viviparous lizard**. Populations of adder are largely concentrated in south, especially the Mendip Hills.

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<sup>17</sup> <https://www.iucnredlist.org/species/60344/152845178>

<sup>18</sup> <https://www.gov.uk/government/publications/salmonid-and-freshwater-fisheries-statistics-2022/salmonid-and-fisheries-statistics-for-england-and-wales-2022>

<sup>19</sup> CEFAS, Environment Agency and Natural Resources Wales (2022), Salmon Stocks and Fisheries in England and Wales in 2021

<sup>20</sup> <https://asera.org.uk/features/birds/>

## Invertebrates

Uncommon fritillary butterflies, including the **small pearl-bordered fritillary** and the **dark green fritillary**, inhabit the Mendip Hills, woodlands southwest of Bristol, and the area around Bath. The **marsh fritillary**, once scattered across the area covered by the Toolkit, is now an uncommon sight; however, there have been recent sightings near Bath. The threatened **Duke of Burgundy**, once found in the Mendip Hills, is thought to have vanished, likely due to a loss of suitable habitat.

Other scarce butterfly species including the **white-letter hairstreak**, found breeding on elm trees in the southwest, can be found scattered across the area covered by the Toolkit, whilst the **grizzled skipper** is now confined to the Mendip hills and woodlands south west of Bristol.

The **chalkhill blue**, last recorded in 2017, is limited to the calcareous grasslands in southern England and other scatterings of habitats. The rare **small blue** is similarly limited, found only where its sole foodplants, kidney vetch, is growing, including next to Odd Down Park and Ride.

The **silky wave moth** is only found in three UK locations, including the Avon Gorge, feeding on common rockrose on limestone slopes.

Another rare species, the **western wood-vase hoverfly**, is dependent on rot holes in old trees, especially horse chestnut, and has also only been recorded in three UK locations since 1990. One location is West Bristol's Tickenham Ridge which Buglife has now designated as an 'Important Invertebrate Area'.

Wetland habitats, including the North Somerset Levels and Moors and the Lower Severn Vale Levels, host nationally scarce invertebrates such as **great silver water beetle** and **hairy dragonfly**. The River Avon has a strong population of the nationally rare **scarce chaser dragonfly** and the **white-legged damselfly**.

## Plants

There are a number of rare plant species in the area covered by the Toolkit, including a handful of endemic species that are only found locally. The Avon Gorge is a hotspot for these and endemic plants with seven species of endemic whitebeam – the **Avon, Bristol, Wilmott's, Robertson's, Houston's, Observatory, and Leigh Woods whitebeams** – and the rare **Bristol onion, Bristol rock cress**, and **Honewort**. The Gorge also boasts the largest known English population of the critically endangered **service tree**.<sup>21</sup>

Outside of the Gorge, the rare **Lodden Pondweed** can be found growing in the River Avon between Bristol and Dundas Aqueduct, whilst **Bath asparagus**, another nationally rare plant, is found most commonly around the city of Bath as well as Cleve Wood near Hanham.

Ditches and wetlands in the North Somerset Levels and Moors are home to several scarce aquatic plants including:

- **Frogbit**,
- **fennel-leaved pondweed**,
- **sharp-leaved pondweed**,
- **cotton grass**,
- **marsh pennywort**,

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<sup>21</sup> <https://avongorge.org.uk/wildlife-and-geology/rare-plant-fact-files/>

- yellow sedge,
- rootless duckweed,
- fen pondweed,
- greater spearwort,
- whorled water-milfoil, and
- numerous species of stonewort.

### Fungi

Fungi are a crucial component of ecosystems, vital to plant and, by extension, animal life. Unfortunately, there is a lack of data on the abundance and distribution of fungi in the the area covered by the Toolkit.

We do know that important ‘waxcap grasslands’, which are long-established and unimproved, will have declined significantly over the past century due to agricultural improvement or having been ploughed up.

More generally, a diversity of fungi will be present in long-established habitats such as ancient woodlands and grasslands.

### **Context in the wider landscape**

It is essential that we view our environment in a broader regional and national context. To gain a comprehensive perspective, national mapping of habitat networks is a valuable starting point. While not as detailed as regional mapping, it allows us to examine ecological networks on a larger scale.

Natural England’s habitat network mapping identifies the extent and location of Habitat Networks for 18 priority habitats based primarily on the priority habitat inventory. The mapping identifies priority zones for habitat restoration-creation, restorable habitat, fragmentation action, and network enhancement and expansion.

Furthermore, neighbouring regions, such as Gloucestershire and Somerset, have conducted their own ecological network mapping. Although Wiltshire has yet not done so, we have also studied these regional mappings to validate findings derived from the Natural England mapping. Adjustments have been made as necessary to ensure accuracy.

Looking at this evidence together, we can identify key cross-border areas crucial for preserving nature:

- **Mendip Hills:** Straddling the border between with Somerset, it serves as a core area in the Somerset Nature Recovery Network. The southern side of the Hills, situated in Somerset, boasts extensive open calcareous grassland compared to the more wooded northern slopes in the the area covered by the Toolkit.
- **Cotswolds Scarp:** Extending north from Hawkesbury Upton into Gloucestershire where it broadens and becomes well-wooded.
- **Severn Vale Levels:** Stretching north alongside the Severn Estuary into Gloucestershire, it maintains its low-lying, open floodplain nature.

- **St Catherine’s Valley:** Located near the Wiltshire border, with valleys running east toward the River Avon in Wiltshire, providing a vital mosaic habitat connection north of Colerne Airfield and towards Upper Castle Combe.
- **River Avon:** A natural ecological corridor running through the the area covered by the Toolkit into Wiltshire.

Panning out, the Big Chalk is a plan to connect calcareous landscapes across Southern England, from the South Coast to the Midlands. This ambitious project presents one of the best opportunities for nationwide nature recovery and facilitating wildlife’s adaptation to climate change.

Much of the area covered by the Toolkit is within the Big Chalk area due to its calcareous soils, with the Mendip Hills serving as the western outpost of calcareous grassland in the country. Mapping shows high potential for lowland calcareous habitats within the Cotswolds and Mendip Hills in particular, as well as south of Bristol<sup>22</sup>.

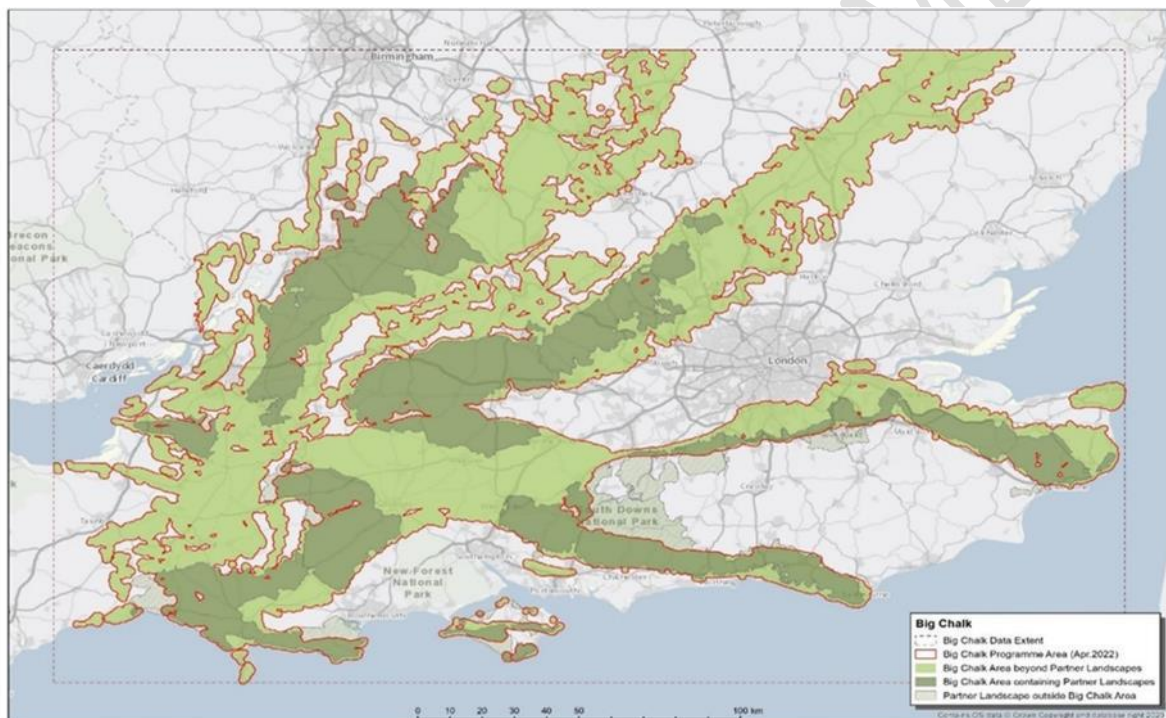


Figure 7 - Map of the Big Chalk area. Taken from <https://www.cotswoldsaonb.org.uk/looking-after/big-chalk/>.

<sup>22</sup> Cotswolds National Landscape (2022), The Rationale Behind Big Chalk



## Challenges and Opportunities

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### Overview

This section summarises the challenges facing nature locally, and the opportunities that exist to restore nature and to deliver other environmental services (e.g. flood management or carbon sequestration) through nature recovery.

Much greater detail on the challenges facing nature and opportunities for nature recovery can be found in Appendix II: Description of the Natural Environment by Area.

For more detailed information on the reasons behind the decline of nature in the UK, please refer to the most recent [State of Nature Report](#). Most of the information in the State of Nature Report will be relevant locally.

### What has caused the decline in nature?

A variety of interconnected factors have contributed to the decline in nature. These include changes in land use and management, the use of pesticides and pollutants, modifications to waterways, the presence of invasive non-native species, and the impact of climate change.

#### Habitat loss and degradation

The primary driver of wildlife decline in the UK and locally is thought to be the loss and degradation of habitats. Since the Second World War, the intensification and expansion of farming, coupled with urban development, has resulted in a significant loss of spaces that are essential for nature to thrive.

One striking statistic is that the UK lost 97% of its lowland meadows between the 1930s and 1980s<sup>23</sup>, evident in the scarcity of species-rich grassland remaining locally. Additionally, the removal of scrub and hedges, overgrazing, and inadequate woodland management and protection (only 7% of the UK's woodland is in good ecological condition<sup>24</sup>) have all contributed to nature's decline.

The UK has also lost 75% of its wetlands since 1700<sup>25</sup>, largely through drainage for agriculture. This loss of wetland habitat has continued into the 20<sup>th</sup> and 21<sup>st</sup> centuries, compounding our already diminished levels of biodiversity.

Additionally, our soils, rich in biodiversity and crucial for plant, fungi, animal, and human health, face threats from degradation, compaction, and contamination. Many of the biological processes and functions supported by soils are thought to be at risk.<sup>5</sup>

The mix of urban and rural areas in the the area covered by the Toolkit has meant both urbanisation and intensive farming have contributed to local habitat loss. Urban areas such have both expanded and become less nature-friendly than they were in the early 20<sup>th</sup> Century<sup>26</sup>.

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<sup>23</sup> <https://meadows.plantlife.org.uk/>

<sup>24</sup> Woodland Trust (2019), State of the UK's Woods and Trees

<sup>25</sup> Fluet-Chouinard, E., Stocker, B.D., Zhang, Z. et al. 2023. Extensive global wetland loss over the past three centuries. Nature 614: 281-286

<sup>26</sup> Research from Butterfly Conservation has shown that butterflies have declined by 69% over a 20-year period in urban areas.

Simultaneously, surrounding farmland, predominantly used for grazing but with a significant area of arable farming, has diminished in value for wildlife. Our remaining habitats have been further divided by the expansion of our transport network, notably the M4, M5, and M32.

Further population growth and associated development of housing and infrastructure in the area covered by the Toolkit is likely to place further pressure on nature in the coming years and decades, with development particularly concentrated around the northern and eastern edges of Bristol and adjacent to Weston-super-Mare.

### Pesticides

The use of pesticides has played a crucial role in significantly increasing farming yields and improving food security over the past 75 years. However, this has come at a substantial cost to wildlife.

In the 1960s and 1970s, the widespread use of now-banned pesticides led to alarming declines in birds of prey and songbirds. More recent generations of pesticides, such as neonicotinoids, are also toxic to insects and other invertebrates on land and in water<sup>27</sup>. Consequently, the populations of animals and plants that rely on these insects for food and pollination could be affected by declining numbers of insects.

While the total weight of active pesticide ingredients has decreased since the 1990s, the total application area and frequency of use have both increased. The toxicity of pesticides has also increased, potentially offsetting the decline in weight applied, and a greater variety of pesticides are now used on a single crop<sup>28</sup>.

The use of 'natural' techniques such as integrated pest management, which can reduce the need for pesticides by, for example, attracting natural predators of crop pests, alongside the use of novel technologies allowing the more targeted application of pesticides or robotic removal of weeds could help to reduce the quantity of pesticides applied in the future.

### Pollution

Although industrial pollution has declined since the early 20<sup>th</sup> Century, other forms of pollution have intensified. The amount of fertilisers used in farming, while significantly reduced since the late 1980s, continues to harm our waterways<sup>29</sup>.

More targeted use of fertilisers and better management of livestock manure, as well as nature-based solutions that absorb pollutants before they reach waterways, could help to reduce pressure on rivers and streams.

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<sup>27</sup> Pisa, L.W., Amaral-Rogers, V., Belzunces, L.P. et al. Effects of neonicotinoids and fipronil on non-target invertebrates. *Environ Sci Pollut Res* 22, 68–102 (2015).

<sup>28</sup> Goulson D, et al. (2018). Rapid rise in toxic load for bees revealed by analysis of pesticide use in Great Britain. *PeerJ*, 6: e5255.

<sup>29</sup> Defra (2019). The British survey of fertiliser practice – fertiliser use on farm crops for crop year 2018. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/806643/fertiliserusereport2018-06jun19.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/806643/fertiliserusereport2018-06jun19.pdf).



## Challenges facing freshwater environments

Our freshwater environment, including rivers, streams, lakes, and wetlands, has been affected by a unique combination of pressures beyond those previously mentioned:

- **Pollution:** Notorious problems such as pollution run off from farms and urban areas, and sewage discharge into rivers, harm river ecosystems and can kill freshwater wildlife.
- **Waterway modifications** include straightening, dredging, and realignment of rivers for quick water disposal to the sea; installing weirs for milling and navigation; and using culverts to facilitate development. These alterations can change the freshwater ecosystem and create barriers for fish migration, a common issue in British rivers, including the Bristol Avon and its tributaries. 99% of British rivers have artificial barriers obstructing fish migration.
- **Pharmaceuticals and microplastics** are present in increasing concentrations in freshwater environments, and we do not fully understand the impacts this is having on wildlife.
- **Drought and water abstraction** for domestic and industrial use can lead to streams drying up and oxygen levels falling, in turn depleting or killing fish populations.
- **Invasive species** such as the American mink and American signal crayfish have significantly impacted native species, while invasive Himalayan balsam degrades riverbanks and increases soil erosion.

Rivers have endured significant habitat degradation, reduced biodiversity, diminished water storage and retention, impaired groundwater infiltration, reduced floodplain connectivity, and compromised water quality.

**Due to these pressures, only 12% of waterbodies in the Bristol Avon catchment achieved Good Ecological Status (GES) in 2021 under the Water Framework Directive;** Figure 8 shows a map of the classification of water bodies across the area covered by the Toolkit.

As the impacts of climate change become more severe, we can expect more frequent droughts in the future. Extended periods of low rainfall result in reduced flows in rivers and streams, leading to lower oxygen levels in the water and more concentrated pollution. This can have devastating effects on river ecology, including mass die-offs of invertebrates and fish. The Summer of 2022 offered a glimpse of what this will look like, with the EA being forced to take emergency action to rescue fish in severely dry sections of rivers<sup>30</sup>.

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<sup>30</sup> <https://environmentagency.blog.gov.uk/2022/08/11/environment-agency-takes-action-to-rescue-fish-during-dry-weather/>

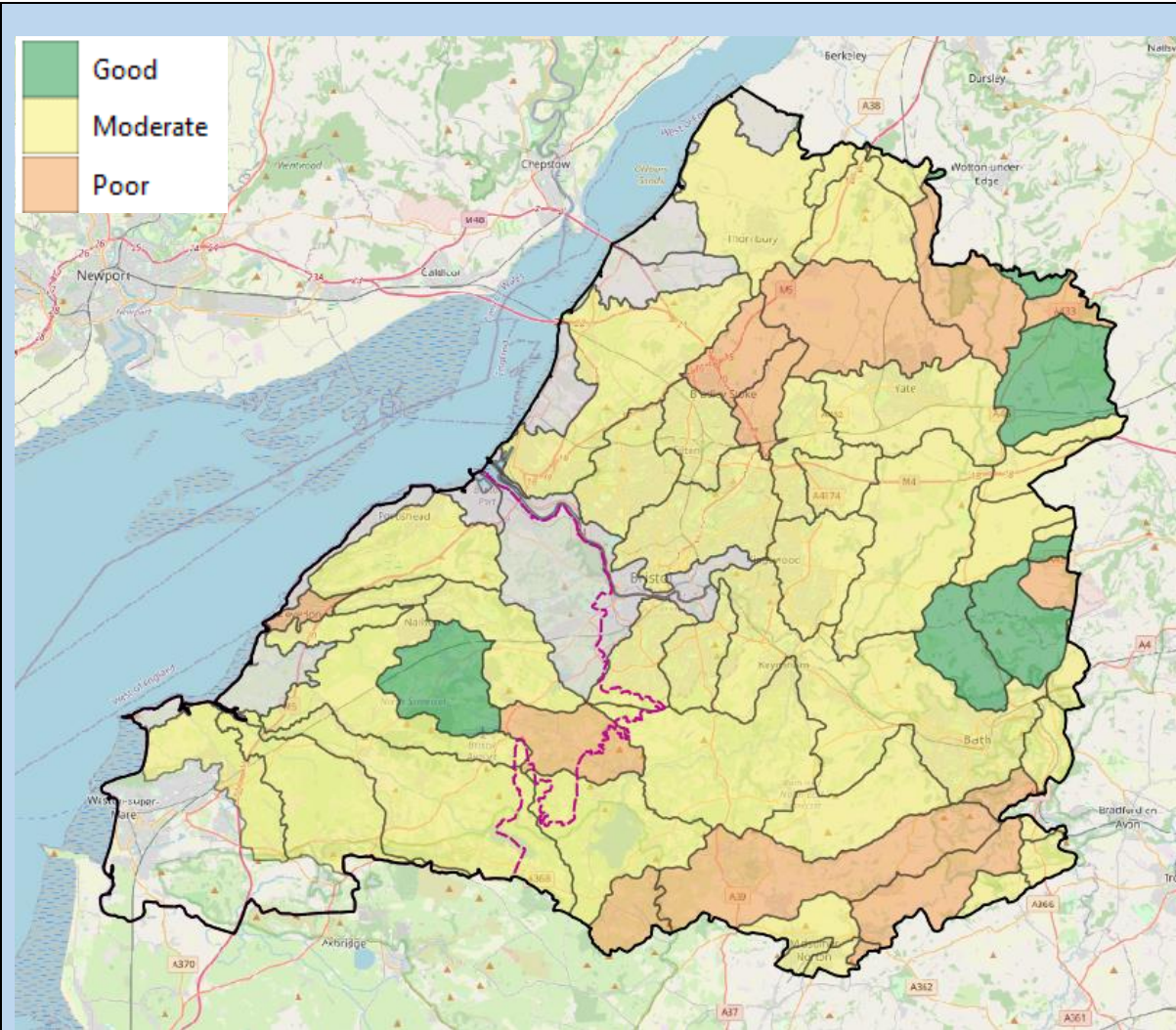


Figure 8 - Ecological classification of water body sub-catchments in the area covered by the Toolkit under the Water Framework Directive (WFD). Water bodies without a classification are shown in grey. Note also that the southwestern-most part of North Somerset is part of a different catchment, and its classification is not shown here. The boundary between the Mayoral Combined Authority and North Somerset is shown as a purple dashed line

**Case study: North Somerset Levels and Moors**

The North Somerset Levels and Moors exemplify the impacts of pollution on the freshwater environment. The vast majority of waterways designated as SSSIs are in ‘unfavourable’ condition due to a mix of agricultural and urban pollution, which has adverse effects on the unique mix of plants and invertebrates in the ditches, locally known as ‘rhyes’.

Light pollution is now recognised as a significant driver of insect loss<sup>31</sup>, and is a significant issue in parts of the area covered by the Toolkit due to the relatively high amount of built-up land. Figure 9 shows the hotspots for light pollution locally, which located in built-up areas of homes and industry.

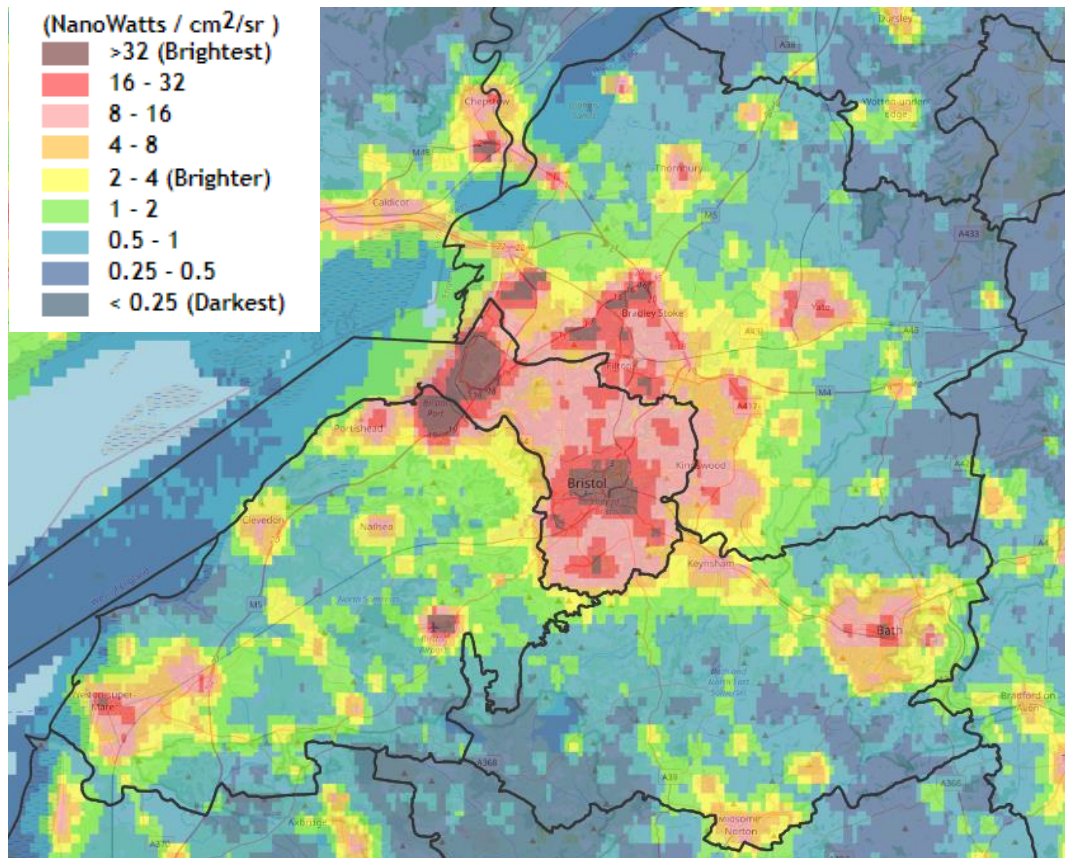


Figure 9 - map of light pollution in the area covered by the Toolkit, and surrounding areas. Note that the areas of light pollution are concentrated around built-up areas, including the Avonmouth industrial area and Bristol Airport. Screenshot taken from the [CPRE's interactive map of light pollution](#) on 24/01/2024.

Additionally, the scale of the environmental impact of microplastics and forever chemicals is yet to be fully understood.

#### Invasive species and diseases

**Invasive species**, such as Rhododendron Ponticum, Himalayan Balsam, American signal crayfish and the grey squirrel, all of which are present in the area covered by the Toolkit, are altering our ecosystems and continue to spread<sup>32</sup>. Some of the most damaging invasive species locally are listed below.

- **Himalayan balsam** is present across many of our rivers and streams; as well as outcompeting native species, it can lead to erosion of river banks when it dies back over

<sup>31</sup> Biological Conservation (2020). Light Pollution is a driver of insect declines. <https://doi.org/10.1016/j.biocon.2019.108259>.

<sup>32</sup> On average, 10–12 new non-native species become established in the UK each year, with 10-20% of these causing serious adverse impacts. State of Nature Report, 2019

winter. Removing it would benefit native biodiversity, and efforts to do so would need to begin upstream of rivers and tributaries to avoid it reestablishing downstream.

- **Floating pennywort** (*hydrocotyle ranunculoides*) is present on the North Somerset Levels and Moors and, if allowed to spread, could have highly detrimental effects on freshwater habitats by choking waterways and depleting oxygen levels. Removal of existing populations, while potentially expensive, would avoid much higher costs in the future.
- **Rhododendron Ponticum** and **Cherry Laurel** (*Prunus laurocerasus*) are two particularly troublesome invasive species in woodland, which shade out native woodland species and present the growth of woodland flora and/or a sub-canopy. They are present throughout the area covered by the Toolkit, but particularly in woodlands in and to the west of Bristol. **Lawson's cypress** is another species damaging to woodland ecology that is present in some important woodlands.
- **Muntjac deer** have been recorded throughout the area covered by the Toolkit and are particularly damaging to woodland ecology due to their grazing and browsing habits.
- **Grey squirrel** is a common species in woodlands, parks and gardens. It is a damaging species to woodland ecology and native trees by, for example stripping bark off of young trees, and is difficult to manage due to its widespread extent across the country.
- **Signal crayfish** (*Pacifastacus leniusculus*) is found in the majority of waterways in the area covered by the Toolkit and is a major threat to the native white-clawed crayfish, which it preys on. It can also destabilise river banks and preys on invertebrates, harming in-river ecology further. This is another species that is hard to manage, but 'ark' sites where white-clawed crayfish is still present can be protected by avoiding the introduction of signal crayfish.
- **American mink** has been recorded in waterways throughout the area covered by the Toolkit and is particularly problematic on the low-lying North Somerset Levels and Moors and the Lower Severn Avon Vales, where it preys on the endangered water vole. Control programmes could help to manage populations of this species.

Other potentially damaging invasive species, including Japanese knotweed and giant hogweed, are present in isolated sites and deemed to be under control.

Additionally, introduced diseases threaten the survival of our native plants and animals. **Ash dieback** is a particular problem locally due to the high proportion of ash in many of our woodlands. There is little or nothing that can be done to stop the further spread of the disease, but only felling ash trees when there is a material safety risk will maximise the number of trees that survive, and allowing natural regeneration of woodlands where possible will minimise the damage to wildlife.

As a silver lining, in some instances the opening up of woodlands caused by the death of ash trees may be of some benefit to wildlife.

### **Accounting for the impact of climate change**

A summary of the impacts of climate change on nature and how this can be mitigated is presented below. A more detailed version of this section can be found in Appendix III: Further Information on Climate Change.



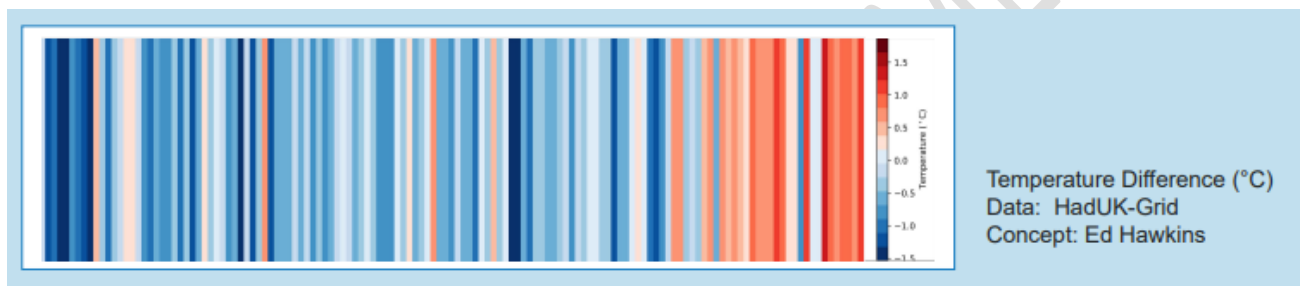
## Introduction

Climate change is one of the greatest drivers of change of terrestrial, freshwater, and marine habitats in the UK over the last 50 years.<sup>33</sup>

Since pre-industrial times global average temperatures have risen by about 1C and the knock-on effect of global change on the UK are captured in the Met Office's annual State of the UK Climate report for 2022.<sup>34</sup>

The West of England climate stripe below shows us how annual temperatures have increased over nearly 150 years, with many of the hottest years occurring in the last few decades. Each stripe shows whether a specific year was hotter (red) or colder (blue) than an average year over the period 1981-2000.

**Figure 1: West of England climate stripe (1884 to 2020) (Credit: Met Office)**



Our warming climate and resulting changes to the climate system are already having dramatic impacts on nature. Compromised ecological needs, impacts on geographical range, disruption to food webs and life cycles, and erosion of habitat health will increasingly cause population decline in species and threaten their survival.<sup>35</sup> Climate change also interacts with other drivers of ecological change such as intensive agriculture or urbanisation, placing additional stresses on the natural environment.

## Climate projections

Currently the world is on track for a temperature rise of nearly 3C by the end of the century based on existing national policy commitments to cut greenhouse gas emissions. Even keeping temperature rises below 2C will be challenging.

The IPCC's watershed special report in 2018 presented the stark reality of the differences between a 1.5C and 2C world, where half a degree significantly worsens risks for human and natural systems.

[Summary for Policymakers — Global Warming of 1.5 °C \(ipcc.ch\)](https://www.ipcc.ch/summary-for-policymakers/global-warming-of-1-5-c/)

The national climate projections for the UK (UKCP18) provide the most recent scientific evidence on how climate change could affect the country for a range of climate futures, with headline findings in the table below ([ukcp18 headline findings v4 aug22.pdf \(metoffice.gov.uk\)](https://www.metoffice.gov.uk/ukcp18/headline-findings-v4-aug22.pdf)).

<sup>33</sup> [State of Nature 2023 - report on the UK's current biodiversity](#)

<sup>34</sup> [State of the UK Climate - Met Office](#)

<sup>35</sup> [Adaptation and the nature emergency - Climate Change Committee \(theccc.org.uk\)](#)

Table 1 - UKCP18 headline findings

Warming trend	All areas of the UK will be warmer by the end of the 21 <sup>st</sup> century.
Seasonal change	Increased chance of warmer, wetter winters & hotter, drier summers.
Extreme weather	Increased frequency and intensity of extreme weather events.
High temperatures	Hot summers becoming more common, with increased hot summer days and more frequent hot spells.
Rainfall changes	Overall trend is for drier summers, alongside future increases in the intensity of heavy summer rainfall events. Changing seasonality of heavy rainfall, more intense hourly rainfall extremes, and increased winter rainfall.
Coastal inundation	Increases to extreme coastal water levels, largely driven by sea level rise. Additional changes to storm surges cannot be ruled out.
Soil moisture	Decreased soil moisture during summers, consistent with lower rainfall.
Snow decline	Almost 100% decrease in lying snow by the end of 21st century.

There is a significant challenge in both the monitoring and understanding the impact of climate change on our natural world, and stress testing nature recovery proposals across the range of possible climate futures. How well nature adapts to climate change impacts is dependent on multiple, inter-connected factors. We need to grow our monitoring systems and evidence base to understand better both the state of our environment today, and the co-benefits of interventions.

The profile of hazards which the UK faces is also changing not only in the frequency, severity, and duration of more familiar extreme weather events such as flooding but the growing threat of wildfire and uncertainties in the spread of pests, diseases, and invasive non-nature species.

### Climate change risks

The UK Climate Change Risk Assessment (UKCCRA3) identified threats to terrestrial and freshwater habits and species from multiple hazards as one the eight priority risks facing the country. Three other priority risk areas concern soil health, natural carbon stores & sequestration, and crops, livestock, and commercial trees.

This means that half of the country's priority risks are linked in some way to the wellbeing of our natural environment.

The risk assessment also highlights how climate change could affect ecosystems through the exceedance of thresholds and the triggering of tipping points, changing them in a way which modifies their functions and services. The impacts will inevitably be more pronounced with 4C of global warming, compared to 2C.

These risk thresholds could actually be closer to today's climate when taking into account the cumulative impact of multiple environmental stressors. ([UKCCRA Technical Report Chapter 3: Natural Environment & Assets](#)).

The impact of sustained severe weather conditions, consecutive extreme events and/or record breaking seasons poses significant risks for our natural environment. A distinct type of event known as Low Likelihood High Impact (LLHI) events are named in the UKCCRA3 to highlight the severe threat posed by 'infrequent high magnitude events' which occur for more extreme climate change projections, including:

- Severe & sustained drought over large proportion of the UK.
- Combined negative effects of abnormal/exceptional seasonal variations.
- Sustained storm conditions throughout a season or longer period (coastal habitats).

Species that are adapted to a particular climate may also find their geographical range changes along with the climate, with a northwards shift to be expected in general. For example, the figure below shows that much of the south and east of the UK would become unsuitable for bluebells with a 2C rise in temperature.

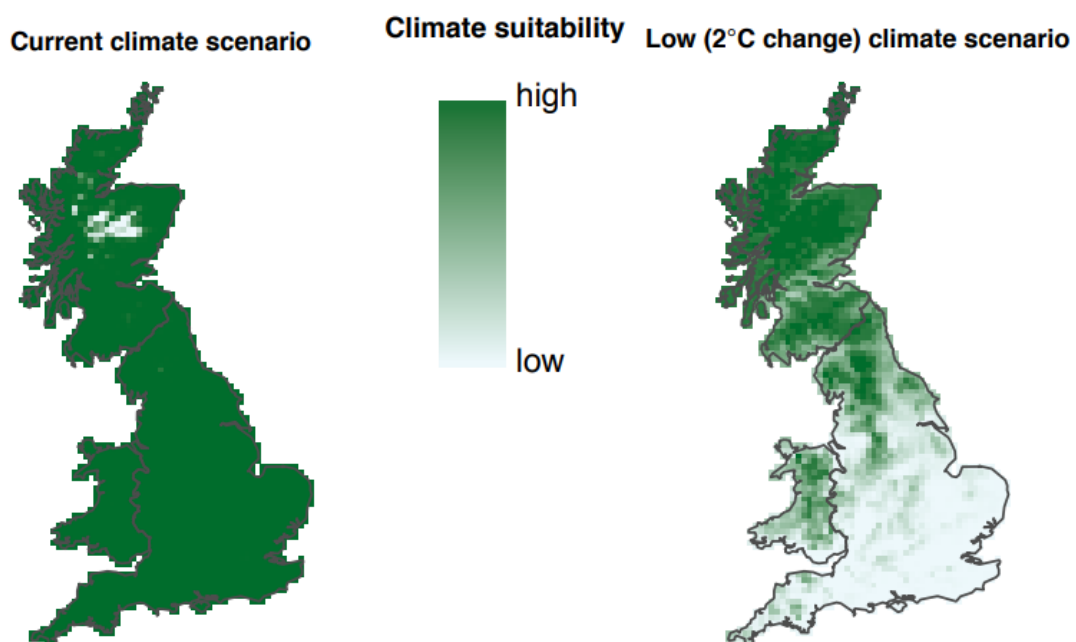


Figure 10 - projected change in potential bluebell distribution with 2C temperature rise (Credit: Natural England Climate Change Adaptation Manual - Evidence to support nature conservation in a changing climate - NE546 (naturalengland.org.uk))

### Adapting to climate change

The UKCCRA3 identifies the following key ecosystem service relationships, illustrating the clear cross-cutting benefits of using nature to mitigate climate risk while also delivering wider environment benefits:

- Soil integrity including slope stability
- Water purification & regulation
- Fluvial/pluvial flood hazard alleviation
- Coastal flood & erosion hazard alleviation

- Food & fibre (outputs from agricultural & forestry systems)
- Carbon storage
- Green & blue infrastructure
- Cultural interactions
- Natural control of pests, pathogens & non-native invasive species

The natural environment acts as critical infrastructure, where continued delivery of ecosystem services for human populations is dependent upon its own intrinsic resilience.

There are, therefore, two key ways that action for nature recovery needs to account for climate change impacts (CCC report):

1. **Nature-Based Solutions to support climate and nature goals:** using ecosystem and habitat restoration to mitigate climate impacts such as drought, flooding and extreme heat through the natural processes and ecosystem services which nature provides.
2. **Support nature to adapt to climate change:** reducing the impact of climate change on biodiversity and increasing resilience through building a resilient network, accounting for range-shifts and controlling the spread of pests, diseases, and invasive non-native species.

Restoring functioning, natural ecosystems, such as re-naturalised rivers and extensive grazing systems, will help mitigate climate impacts and improve nature's resilience to climate change. Continued delivery of ecosystem services is also dependent upon the natural environment being in a healthy state.

Specific measures may be needed to ensure ecosystems are resilient in the face of climate change, particularly for vulnerable habitats such as rivers, saltmarsh and standing water.

The most important response to climate change for mobile species, such as birds and mammals, is to ensure an ecologically connected landscape, so that they are able to move to new climate spaces as needed. However, for less mobile species, particularly plants, specific measures may be needed to increase the chances of survival for those that are rare, vulnerable and/or iconic, such as the bluebell.

## Restoring natural processes

In recent years, there has been increasing awareness of the effectiveness of 'ecosystem-led' conservation in recovering nature. This aims to recreate natural processes that would have existed before human intervention, such as renaturalisation of rivers or 'natural' grazing regimes.

These approaches can be both more cost-effective, as they often require less human intervention in the long-term, and better for biodiversity. Generally, these approaches lead to dynamic and shifting habitat 'mosaics', which in turn leads to a more diverse range of wildlife.

Some natural approaches are relatively simple, such as leaving fallen trees in woodland or letting ancient woodland expand naturally. Others, such as reconnecting rivers to their floodplain or recreating natural grazing processes, are more ambitious but can be hugely effective in recovering nature.

Opportunities for recreating natural processes locally include:



- Restoring rivers to a more natural state by re-meandering, reconnecting rivers to floodplains, creating in-river habitat diversity, and restoring riparian habitat.
- Protecting the existing population of beavers so that they can restore natural processes to rivers and streams, for example, by creating leaky dams.
- Restoring lowland peatlands so they are better able to absorb carbon.
- Managing woodland so that it has greater diversity, including open areas and a shrub layer, or introducing grazing animals in larger woodlands.
- Letting existing woodland (especially ancient woodland) natural regenerate.
- Using a mix of free-roaming, grazing herbivores at a low density to create dynamic scrub mosaic or wood pasture.
- Restoring saltmarsh habitat through managed realignment of flood defences, where this is in line with the relevant Shoreline Management Plan.
- Reintroducing missing 'keystone' species, such as pine marten, that can restore natural processes and manage invasive species.

However, not all of these opportunities will be appropriate everywhere. For example, river restoration is only appropriate where it will not risk flooding of properties, and the impact of any species reintroductions would need to be carefully thought through.

In many locations, land use will restrict the opportunities for restoring natural processes. This is particularly true for built-up areas and farmed land, although there are still plenty of opportunities for nature recovery in these locations.

## Nature-Based Solutions

Nature-based solutions (NBS) are defined by the International Union for Conservation of Nature (IUCN) as 'actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits'.

More succinctly, NBS are solutions to a problem faced by society that are provided by the natural environment. These can range from the carbon stored in peatland, to flood management provided by wetlands, to the cooling and shading from urban trees.

Providing nature-based solutions, therefore, offer both a way of resourcing nature recovery and of ensuring nature recovery maximises other benefits.

There is an increasing demand from the public and private sector for nature-based solutions on both a regulatory and voluntary basis. Standards (such as the biodiversity net gain metric, the Woodland Carbon Code and Peatland Carbon Code) and markets (such as the Bristol Avon Catchment Market) are being set up to help deliver nature-based solutions in a verifiable and measurable way.<sup>36</sup>

Some of the opportunities for nature-based solutions are summarised below.

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[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1147397/nature-markets.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147397/nature-markets.pdf).

- **Natural flood management (NFM)** is the management of flood risk through protecting, restoring and emulating natural processes. This can include the re-naturalisation of rivers (e.g. re-meandering, in-channel improvements and the use of leaky dams), the creation and restoration of wetland habitat, restoring natural flood plains, targeted woodland creation, and improving soil structure through changes in agricultural practices. More information on NFM can be found on the [Catchment Based Approach website](#).
- **Carbon sequestration** is an increasingly important service provided by nature. Most habitat restoration will offer some opportunities for carbon sequestration, but the most effective means of storing carbon are through woodland creation, wetland creation, and restoration of coastal habitats such as saltmarsh and mudflats.
- **Improvements to water quality** is a hot topic, with many of our waterbodies in a poor state for wildlife due to pollution from agricultural, domestic and industrial sources. Well-placed nature-based solutions, such as wetland habitat and riparian buffer strips, can be effective in improving water quality. Where interventions will have the greatest impact depends on land use, the location of sources of pollution, topography, soil type and the flow of water.
- There is a strong and increasing evidence base on the benefits of nature to people's **health and wellbeing**. Numerous studies show the importance of interacting with nature for our health and wellbeing, reducing the risk of physical ailments, such as cardiovascular diseases, and poor mental health. Increasing people's access to and engagement with nature, as well as recreational opportunities, can help to improve people's health and reduce the burden on our healthcare system.
- **Urban nature-based solutions** offer opportunities to improve the resilience and liveability of cities and towns, as well as residents' health and wellbeing. Street trees and vegetation can improve air quality, reduce heating, provide shade and improve the aesthetic of urban areas; and sustainable urban drainage systems (SuDS) can help reduce flood risk and mop up pollutants. Greening streets can also support businesses and the local economy by reducing staff sickness, increasing staff retention, and increasing patronage.
- Nature can also make a positive contribution to **food production**. This includes increasing the population of beneficial pollinators through habitat creation both on-farm (e.g. wildflower strips) and off-farm (e.g. scrub and grassland restoration); and increasing populations of predators of crop pests through wild field boundaries and areas set aside from production.