Carstairs, Scotland's Railway

Network Rail State of Nature Summary Report 2024

Contents

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1.1 Document Control

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Foreword

In 2018 Network Rail's vegetation management practices were the subject of a government review led by John Varley. One of the resulting recommendations tasked it with demonstrating no net loss of biodiversity across the entire rail estate by 2024. In 2020 Network Rail was able to quantify biodiversity on the rail estate across Britain for the first time in 200 years. In this latest State of Nature report, Network Rail is publishing data that demonstrates that there has been no net loss of biodiversity across the rail estate since that baseline measurement in 2020. But the work cannot stop here, the Varley review in 2018 also resulted in Network Rail committing to biodiversity net gain across the rail estate by 2035.

The individual regional reports provide numerous case studies of ways of working that are becoming business as usual. The development of partnerships 'outside the rail fence' is continuing at pace and the rail industry is raising the profile of biodiversity alongside engineering in line with John Varley's recommendations. And it is natural engineering that looks to offer much opportunity as we press on towards Great British Railways. Nature-based solutions have been showcased in previous State of Nature reports, and this report is no different, from natural flood management on Western route to natural gabions in North West and Central region.

There are many challenges that will face the rail industry over the coming years, from industry restructuring to climate change. The one constant, however, is the opportunity to make a difference. The rail estate is a haven for many protected species, safe from development and agricultural practices and providing connectivity for many isolated species populations. And we are seeing more and more that these species can live alongside a twenty first century railway. All of the Network Rail regions are finding novel, and in some cases 'traditional' ways of delivering a safe efficient railway while at the same time supporting nature's recovery.
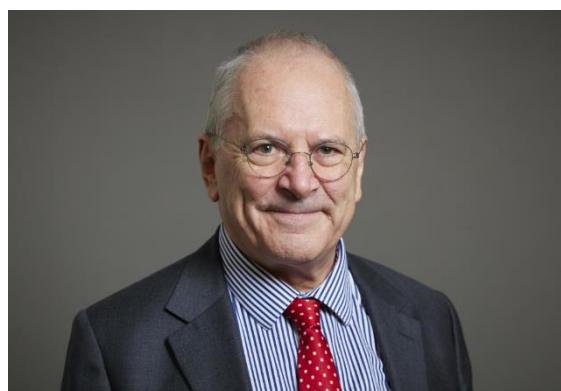
Lord Hendy of Richmond Hill CBE
Minister of State for Rail, Department for Transport
December 2025

2 Introduction

This report, for Network Rail, covers activities that took place in 2024.

This is the fifth annual State of Nature report produced by Network Rail. It is also the means by which we will report on the achievement of our target to demonstrate no net loss of biodiversity by 2024.

Figure 1: *Network Rail's published State of Nature reports 2020-2023*

As with previous years, the appendix to this State of Nature report contains an explanation of the habitat data analysis carried out by the UK Centre for Ecology and Hydrology (UKCEH). That report explains the analysis that has taken place on our dataset providing some statistical confidence to the results. The appendix is also where the regional information is found in full.

3 Executive Summary

3.1 Overview

Network Rail's biodiversity units for the network for this report are 255,432.94. The distribution of those units by the five regions are given in Table 1.

Table 1: *Network Rail biodiversity units 2024*

	Units	Area (ha)
Network Rail	**255,432.94**	**51,608.34**
Eastern	75,053.37	15,793.65
North West & Central	53,907.55	11,336.17
Scotland's Railway	38,358.14	7,506.22
Southern	39,757.04	7,831.93
Wales & Western	48,356.84	9,140.37

The proportion of the significant habitat types found across the estate can be seen in Figure 2.

- Broadleaved woodland
- Coniferous woodland
- Heathland and shrub
- Bracken
- Bog
- Fen
- Lakes
- Grassland
- Sparsely vegetated land
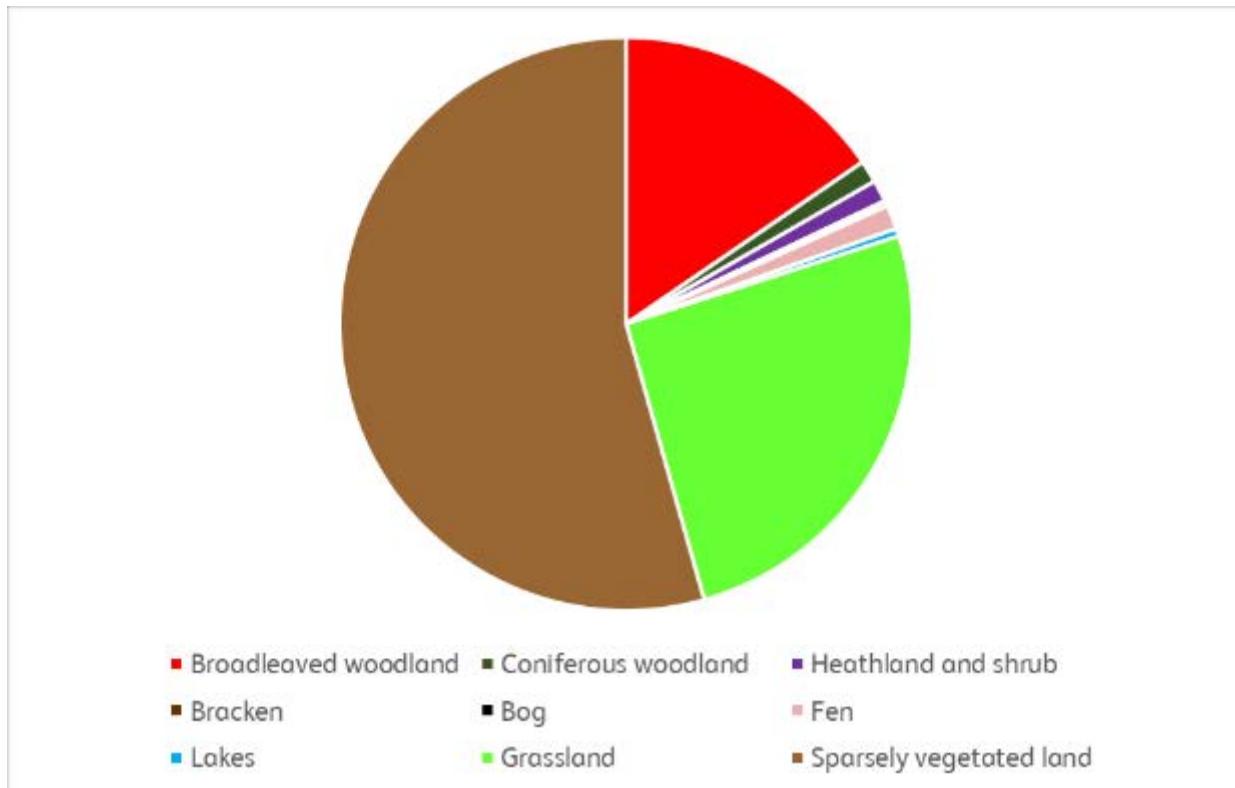
Figure 2: *Proportion of habitat across the rail estate in Britain 2024*

3.2   No net loss of biodiversity

3.2.1   Background

Following the Government's review of Network Rail's vegetation management chaired by John Varley in 2018, the Department for Transport received a recommendation to set out clear policy for delivering for the environment. The policy statement subsequently issued expected Network Rail to achieve no net loss in biodiversity on its existing lineside estate by 2024.

3.2.2   Methodology

Despite now being able to report using six years' data, we are still one to four data points from being able to conduct statistically sound trend analysis. Together with our data suppliers, UKCEH, we have used data from 2019 to 2024 to estimate the stock of habitats within the railway boundary and assess the locations and nature of land cover change occurring across this period. The UKCEH report in the appendix details exactly how the data are assessed, taking in to account the expected error that comes from satellite interpretation of habitats. Because there aren't enough data points, the years 2019-2024 are grouped into two periods: 2019-2021 and 2022-2024. These groups are used to measure how much habitat area estimates vary over time. Although there aren't many years of data, there are enough habitat units at the maintenance delivery unit (MDU) level to give a reliable estimate of overall variance. The final estimates are based on these grouped years, with year-to-year variability used to indicate the uncertainty in total area estimates.

3.2.3   Results

The satellite-derived habitat pixels (10x10metres) for each of the habitat types are extracted for each MDU. The total area for the habitat types is presented in Figure 3 showing all years 2019 to 2024.

Using the two periods of the study, 2019-2021 and 2022-2024, we can consider the statistical significance of changes in the habitat types. The results are shown in Table 2.

The headline changes in habitat are as follows:

- Increases in broad leaved and yew woodland, coniferous woodland and grassland.
- Reductions in sparsely vegetated, fen marsh and swamp, dwarf shrub heath and rivers and lakes classes.
- Coverage of bog remained broadly similar.

Of these changes, only the increase in broad-leaved woodland (+618 hectares) and the reduction in fen, marsh and swamp (-244 hectares) were found to be statistically significant.
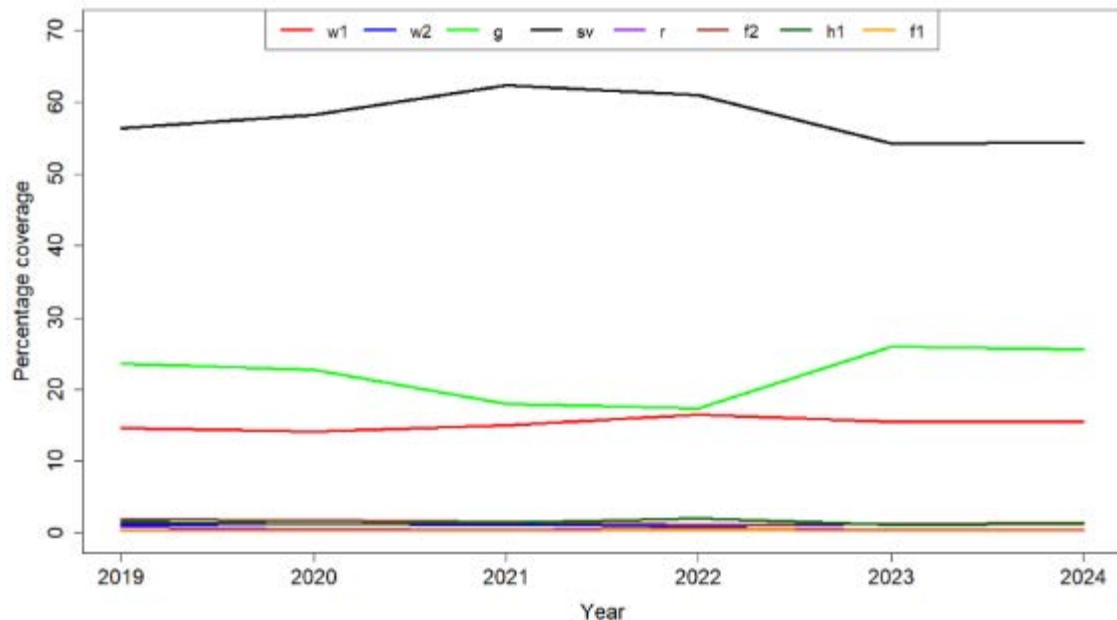

Figure 3: *Land cover class coverages from 2019 to 2024 for broad leaved and yew woodland (w1), coniferous woodland (w2), grassland (g), sparsely vegetated (sv), rivers and lakes (r), Fen marsh and swamp (f2), Dwarf shrub and heath (h1) and bog (f1).*

Table 2: *Total area (km2) of each land cover class for Network Rail land for the reporting periods of 2019-2021 and 2022-2024. Estimates are derived from a statistical model fitted to the data across individual years to enable production of associated confidence intervals and assessment of the significance of change.*

UK-Habitat	2019-2021			2022-2024			Change
	Lower 95% CI	Estimated Area	Upper 95% CI	Lower 95% CI	Estimated Area	Upper 95% CI	
Broad leaved and yew woodland (w1)	72.31	75.26	78.21	78.49	81.44	84.40	Increase
Coniferous woodland (w2)	5.51	6.00	6.48	5.68	6.16	6.65	No Significant Change
Grassland	86.99	110.44	133.89	95.20	118.65	142.10	No Significant Change
Fen marsh and swamp (f2)	7.73	8.76	9.78	5.30	6.32	7.35	Decrease
Dwarf shrub and heath (h1)	5.36	7.25	9.14	5.76	7.65	9.54	No Significant Change
Bog (f1)	0.74	1.25	1.75	1.08	1.59	2.09	No Significant Change
Sparsely vegetated	284.10	304.53	324.96	271.45	291.88	312.31	No Significant Change
Rivers and lakes (r)	1.76	2.60	3.43	1.56	2.39	3.23	No Significant Change

Habitat areas for each of the Network Rail routes are used with the biodiversity metric v3.0 to calculate the total number of biodiversity units for each region and across the Network Rail estate.

Table 3 shows the biodiversity unit data from 2019 to 2024, represented as a bar chart in Figure 4.

Table 3: *Network Rail biodiversity units 2019 to 2024*

	2019	2020 (baseline)	2021	2022	2023	2024
Network Rail	258,526	255,060	255,501	260,325	254,184	255,433
Eastern	76,346	75,879	75,356	75,715	74,741	75,053
North West & Central	54,035	53,002	53,430	55,450	53,381	53908
Scotland's Railway	38,382	38,652	38,140	40,018	38,725	38,358
Southern	40,234	38,902	40,714	40,244	38,846	39,757
Wales & Western	49,529	48,625	47,860	48,897	48,490	48,357

Figure 4: *Network Rail biodiversity units 2019 to 2024*

3.2.4   Conclusions

The statistical analysis that has been undertaken shows that there is no significant change over the period of measurement. To that end, we are able to demonstrate, from a baseline year of 2020 to 2024, **no net loss of biodiversity across the Network Rail estate**. This result and associated data support a hypothesis that the vegetation management activity and techniques used by Network Rail have no negative impact on the area of habitats on the rail estate. With a target of achieving biodiversity net gain by 2035, this result presents the opportunity to look at work that will have a positive impact on habitats and ultimately biodiversity units. This involves a focus on strategic significance (through habitat management plans (HMPs)) and habitat conditions (through working practices).

3.3 Summary of our work during 2024

3.3.1 Eastern

- Production of the regional Biodiversity strategy reviewed by the Royal Society of Wildlife Trusts
- Started production of our HMPs
- Explored the market for data management systems
- Expanded our team of ecologists to assist with workload, using Wildlife Trust ecologists
- Supported regional vegetation management teams with understanding the biodiversity impacts of their works.

3.3.2 North West and Central

- Delivered several in person briefing sessions from asset engineers to frontline staff on options for nature-based solutions and biodiversity risk management.
- Begun development of an automated Habitat Management Plan system.
- Begun rollout of our organisational newt district level licence, delivered by Nature Space. This included several compensation ponds to be dug at the Ravensclough site.
- Begun investigating the potential to use non-operational land as a potential habitat bank and natural capital opportunities.
- Promoted international collaboration with the Japanese government who visited the M62 Railway bridge project to learn about biodiversity enhancements and nature-based solutions.

3.3.3 Scotland's Railway

- Enhanced relationships with and supported National Trust for Scotland, RSPB Scotland and Forth River's Trust with the planting of over 9,760 trees and thorny shrubs. This created around 7 hectares of woodland and 400 metres of natural boundary.
- Removed approximately 2 hectares of Rhododendron near the Glenfinnan Viaduct and on the approach to Beasdale Station where the line sits within Beasdale Special Area of Conservation.
- Completed Synthetic Aperture Radar survey of 3,220 metres of earthworks with beaver presence in the area to identify burrowing risk and gauge the size of the voids.
- Developed a strong portfolio of potential projects and opportunities with a growing list of charities and public bodies to support the Control Period (CP) 7 programme. This includes the development work on the Dalmuir wetland with Scottish Canals.

3.3.4 Southern

- Cross-functional working group set up to discuss development of HMPs and biodiversity net gain.
- Collaboration with Eastern region to develop templated HMPs to facilitate specific management of the lineside estate.
- The region celebrated World Environment Day with an installation at Victoria Station… bringing a real tree to commuters for the week. Network Rail and Tree Council engaged with thousands of people of all ages raising the profile of trees and trains.

Figure 5: *World Environment Day at Victoria Station*

- Seven additional railway nature sites added to the Southern region portfolio. The work on, now, 57 sites also included removal of invasive species at eight sites.
- Region-wide process for managing habitats regulations and SSSIs.

3.3.5 Wales and Western

- Great Crested Newt District Level Licence procured via NatureSpace in September 2024 for the Region's landholdings in England.
- Ecologists working in Wales route have created template Precautionary Method Statements that link with their internal database.
- Trials have been undertaken to improve survey techniques which have a lower impact on wildlife but also use the technology to gain safe access. This has included use of drones for checking trees for potential to support bat roosts, using thermal imaging for nighttime surveys and footprint tunnels for monitoring dormice.

3.3.6 National

- Rail Live 2024 was the first time that sustainability had played a part in the Network Rail stand at the show attended by thousands of rail professionals over two days. As well as answering questions amongst the trees, experts from Network Rail and The Tree Council led biodiversity walks around the Long Marston site for staff including CEO Andrew Haines.
- In June, Network Rail and The Tree Council were Highly Commended in the UK Green Business Awards 2024 in the Nature-based project of the year.
- However, in September this partnership for people, wildlife and the planet was the Community Engagement winner at the BIG Biodiversity Challenge 2024. The judges

commented that together we'd "shown impressive community engagement by hosting events on tree planting and care, and distributing trees locally. Their hedgerow projects have boosted species diversity. With 179 planned community projects, this initiative is clearly replicable."

Figure 6 (l-r): *Andrew Haines (Network Rail CEO) on a biodiversity walk at Rail Live 2024; The Network Rail Sustainability stand at Rail Live 2024; Network Rail and the Tree Council at the UK Green Business Awards 2024.*

3.4 Summary of case studies

3.4.1 Eastern

- **Joint working** – the Eastern region regional team collaborated with the TransPennine Route Upgrade (TRU) to understand where habitat improvements o the Eastern estate could deliver biodiversity benefit. The work helped both the project and the region to identify the key internal stakeholders and processes for successful delivery.

- **Partnership delivery** – one of the many sites of special scientific interest (SSSI) within Eastern region is at Clarborough Tunnel. Specialist conservation work is required to help Network Rail achieve government biodiversity targets. A relationship with Nottinghamshire Wildlife Trust has benefitted both organisations, local communities and the environment at Clarborough.

- **Local initiatives, national benefits** – having been approached by Thames Chase Community Forest, the region was able to undertake a GIS mapping-based feasibility assessment to find areas suitable for tree planting by the community forest – these areas will be planted during the 2025/26 planting season.

3.4.2 North West and Central

- **Nature-based solutions** – recognising the drive to use more nature-based solutions (NbS) to support the railway, the region has used a number of approaches. Harbury cutting SSSI is being managed by a bespoke grazing scheme. Whilst trials are taking

place with drainage colleagues to investigate the potential for using living willow to replace rock armour and steel gabion baskets.

Figure 7: *Living willow used to reduce scour*

- **Tree retention techniques** – A number of trees deemed hazardous to operational railway were reduced to compliance before being ring barked to prevent regrowth which may later impact rail. The standing trees were then further damaged to create additional habitat niches.

- **Protected species training** – working in partnership with a local bat charity, frontline staff were given the opportunity to get up close and personal with a number of different protected species. The increased levels of awareness have resulted in an increase in the reporting of environmental risks.

Figure 8: *Protected species training*

3.4.3   Scotland's Railway

- **Cohabiting with Eurasian beaver** – RAM Drainage and Lineside assisted with a Synthetic Aperture Radar trial to detect burrowing near Gleneagles where we have a long-standing relationship with a family of beavers. This work was aimed to learning to cohabit with this keystone species and better understand some of the risks they might pose to the network through their natural behaviours.

- **Rhododendron control on the Mallaig Line** – working in conjunction with adjacent landowners and our regulator NatureScot to protect native rainforest habitat on the MLG2. Approximately 2 hectares of Rhododendron were cut and treated in 2024

- **Partnership working with Forth River's Trust** – a continuation of a riparian woodland creation project on the Scottish Central Mainline near Blackford, Perthshire. Nearly 7 hectares of woodland created offering improved habitat for native species and potential flood alleviation and erosion control on an ELR with high risk of flooding in climate change modelling.

3.4.4   Southern

- **Habitat management best practice** – working at the railway nature sites, management to improve the condition has included treatment of invasive species and management of the habitat structure. This habitat management also included laying hazel coppice stools to improve connectivity between sites.

- **Stakeholder relationships** – as part of the Great Crested Newt Organisational Level Licence, teams in Southern region are working with the Newt Conservation Partnership in collaboration with numerous landowners and managers across the routes. Colleagues are informed by expert advice and guidance from the Million Ponds Project Toolkit and Amphibian Habitat Management Handbook.

3.4.5   Wales and Western

- **Nature-based solutions** – NbS have been identified as an alternative to engineered solutions at a location in Devon. A number of different solutions are being developed including leaky dams high up in the catchment which will slow the flow of water to Hele level crossing on the main line to the north of Exeter.

Figure 9: Hele and Bradninch Level Crossing when in flood (2012)

- **Vegetation management and mitigation** – Teams in Wales were able to demonstrate following a public enquiry that tree management for safety reasons could be undertaken and still take account of biodiversity requirements. The work engaged the local delivery unit staff and has provided a test case for future work.

3.4.6 National achievements

- Tasked with creating a series of biodiversity films, the Network Rail Film Unit travelled from Cornwall to Scotland via Dorset, Kent and Northamptonshire to capture experts from across the rail and environment industries. Subjects included rare trees and plants, challenges with deer and squirrels and a forward look to the impact beavers may have on the railway.
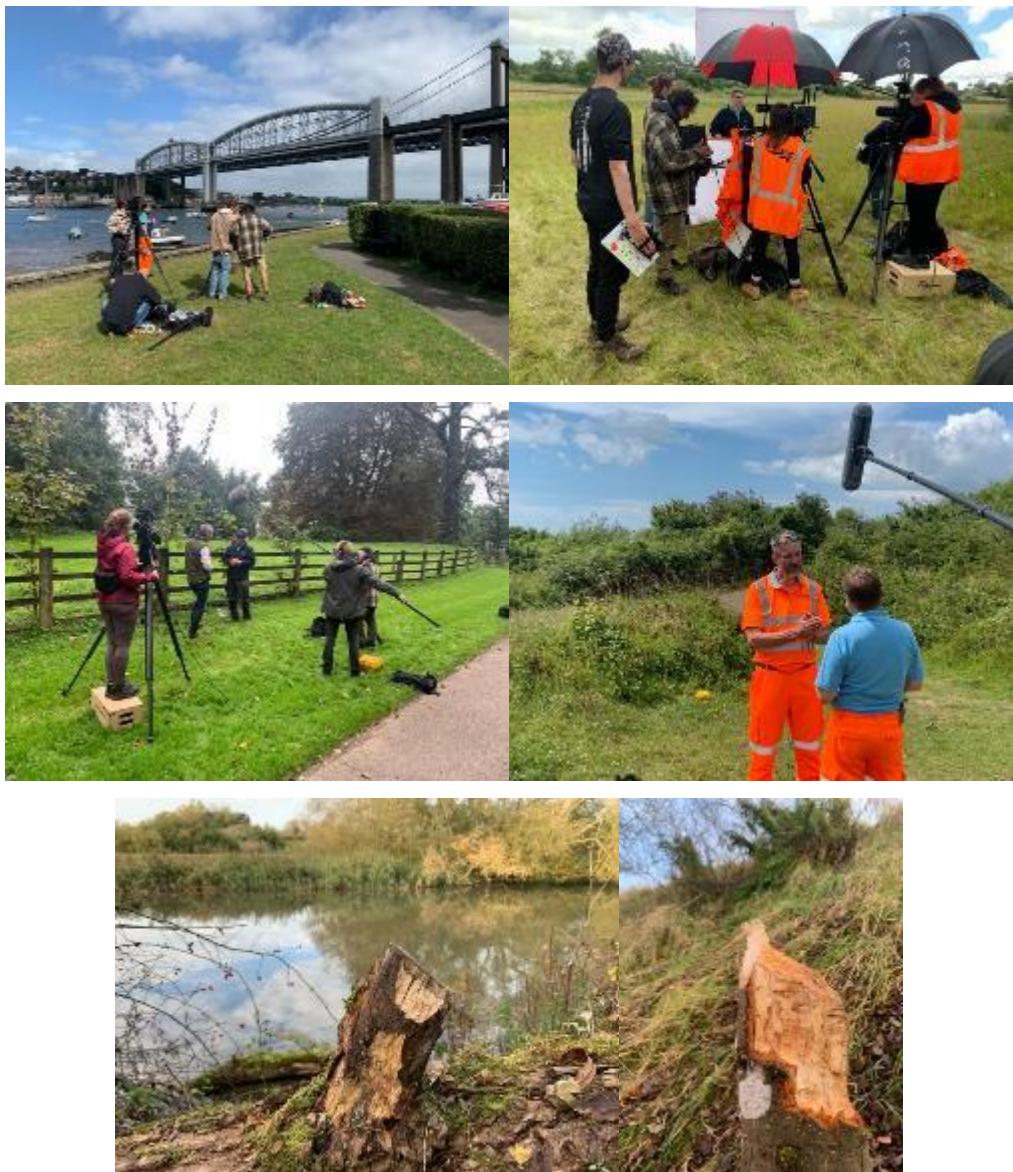
Figure 10: *The Film Unit in Cornwall, Northamptonshire, Dorset, Kent and Scotland*

3.5   Future action

3.5.1   Regions

- Eastern

    o Produce Route Biodiversity Action Plans, HMPs, Intervention Guides, Biodiversity Asset Plans and Sectional Asset Plans.

    o Screen through all available parcels to establish which are best to begin delivering biodiversity gains, carry out site visits and create the plans to deliver biodiversity benefits to help the Region meet its CP7 targets

- North West and Central

    o Producing the Habitat Management Plans (HMP) template and briefed for future use by asset engineers and maintenance teams.

    o Deliver practical examples of nature-based solutions on the railway that deliver operational or cost efficiencies.

    o Map available non-operational land within NR ownership and investigate potential for use as an internal habitat bank.

- Scotland's Railway

    o The production of HMPs forms a key milestone within the Scotland's Railway Climate Action Plan Biodiversity Delivery Plan, and we will monitor and report on progress throughout CP7. Habitat data for all sites in the vegetation management portfolio were captured in 2024. These will be developed into detailed plans as ecological resource grows and the ESMapp tool is piloted and suitability confirmed.

    o It is the region's ambition that 10 Nature Sites are created on the network in CP7. Work in this space will commence in year 2 at Barnhill Orchard on the Scottish Central Mainline between Perth and Dundee. With assistance from a local shepherd, Works Delivery and Perth Delivery Unit, we will use sheep to graze the invasive non-native species (INNS) for the next three to five years. When the INNS are under control we can look at improving the orchard habitat further and opening the area up to the public. It is hoped we can find a strategic partner to take over the management of this site and deliver some social value as well as biodiversity wins.

- Southern

    - The development of HMPs will continue to be a priority into 2025. These are being developed on two levels:

        - regional level HMPs focusing on the main habitat types across Southern

        - site specific plans for priority habitats which includes our Railway Nature Sites and legally protected sites such as SSSIs.

    - We will undertake baseline surveys / biodiversity accounting for our priority habitats.

- Wales and Western

    - HMP development alongside delivery of an ecology database.

    - A focus on nature partnerships and, in Wales, working with groups to deliver on Area Statement requirements from Natural Resources Wales.

    - Continued identification and delivery of NbS working in collaboration with the regional Weather Resilience and Climate Change Adaptation team.

3.5.2 National

- Review the State of Nature reports format to reduce the length (from approximately 160 pages in length) and enable inclusion of additional information about HMPs and nature-based solutions.

- Return to Rail Live and expand the Network Rail site to incorporate more aspects of sustainability on to the stand, especially circular economy and social value.

- Develop guidance to enable colleagues to complete and submit high quality protected species licence applications. This will reduce authorisation delay and improve relationships with the environmental regulators.

- Work with the Weather Academy to develop and launch training on nature-based solutions

4   Appendix

An Estimate of the Network Rail UK-Habitats Account 2024

Prepared for Network Rail

Christopher Marston, Clare Rowland, Peter Henrys, Richard Pywell

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NetworkRail

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An Estimate of the Network Rail UK-Habitats Account 2024

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**UK Centre for
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1. Executive Summary

Assessment of the coverage and distribution of UK-Habitats stocks within the Network Rail (NR) land holdings is key to supporting NR in realising its nature conservation objectives. The extensive nature of the rail infrastructure, difficulties in accessing the lineside to undertake ground survey due to safety issues, and the logistics and resources required, means that network-wide ground survey is unfeasible to achieve this monitoring on an annual basis. Here, monitoring habitat stocks via Earth observation using satellite sensors is applied as a practical, repeatable and cost-effective approach to assessing habitat stocks and change in habitats, overcoming many of the limitations of ground-based survey. Here we use a reproduced version of the UK Land Cover Maps (LCM) 2024 10 m classified pixel product to estimate the stock of UK-habitats within Network Rail (NR) land holdings. This further extends the five-year time period (2019 to 2023) of previous analysis conducted, to assess the locations and nature of land cover change occurring between 2019 and 2024. All subsequent references to LCM2024 refer to the LCM2024 version reprocessed for this project, not the publicly released LCM2024 10 m classified pixel product (Rowland et al., 2025).

Previous released versions of the UKCEH LCMs have differed slightly in their production methodology under a programme of continuous improvement, introducing some inconsistencies when assessing change over time using these data products. Here, LCM2024 is reproduced using an identical methodology to the LCMs 2019-2023 versions previously reproduced for habitat stock assessment on Network Rail land holdings, removing this inconsistency. The overall accuracy of LCM2024 is 81.4%.

Comparison of the overall stock of land cover types on NR land holdings from 2019 to 2024 indicates small changes in the extent of habitats mapped by the Land Cover Map, including habitats considered to be of high nature conservation value. The headline changes in habitat are as follows: increases in broad leaved and yew woodland (+0.88% of total NR land holdings area), coniferous woodland (+0.09%) and grassland (+2.04%). Reductions were observed in sparsely vegetated (-1.94%), fen marsh and swamp (-0.51%), dwarf shrub heath (-0.27%) and rivers and lakes (-0.27%) classes. Coverage of bog (-0.01%) remained broadly similar. Of these changes, only the increase in broad-leaved woodland and the reduction in fen, marsh and swamp was found to be statistically significant.

It must be noted that the majority of NR's land holdings are linear and less than 20 m wide, containing a heterogeneous mix of land cover and vegetation types. This presents a number of challenges for detection in change of habitats because most of these linear features are below pixel resolution. The rail network also often runs through cuttings and this make the presence of shadows a problem for land cover mapping. These narrow heterogeneous areas are correspondingly at higher risk of misclassification than more homogenous areas typically found in the broader

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landscape. The limitations in using two static land cover classifications to determine change must also be acknowledged. This principally is a consequence of misclassification in the earlier and/or later classifications which could falsely be interpreted as real-world change, plus the increased susceptibility of narrow heterogeneous features, such as the NR land holdings assessed here, to misclassification. Accordingly, although the 10 m LCMs can be used to assess broad-scale land cover stocks (acknowledging the limitation above), it is generally not recommended that a time series of 10 m land cover classifications is used to monitor land cover change in this manner.

The 10 m LCMs represented the best available option for satellite land cover mapping in the period 2019-2024. However, the recent advent of widely available, multiband high- and medium-resolution satellite and airborne data potentially offer an improved solution to overcoming the issues of mixed pixels on this linear infrastructure. UKCEH has recently explored the capabilities of higher resolution land cover mapping at 3 m resolution using multi-spectral and multi-temporal satellite data which offers improved detection and discrimination of smaller habitat patches. For highly heterogeneous locations such as many of those contained within the NR land holdings, this resolution of pixel (or higher) should offer improved classification performance and increase accuracy in land cover stock and change assessment in the future.

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2. Introduction

This report outlines assessment of the coverage of UK-Habitats within the Network Rail (NR) land holdings for 2024, building on previous analysis assessing habitat stock and change therein between 2019 and 2023. Assessment is based upon a series of annual land cover classifications produced for each year within this period based on a similar methodology used to produce the UKCEH Land Cover Map products (Marston *et al.*, 2023). Whereas production methods for the UKCEH LCMs 2019 to 2024 differed under a programme of continuous development, the LCM production here is modified to apply an identical methodology for all classifications across this time period, removing this potential source of variability. The land cover classification schema is also mapped to the UK Habitat Classification (UKHab) schema. The land cover classifications produced will aid NR in understanding the area coverage and distribution of trackside land cover types in support of NR realising its nature conservation objectives. This document describes this work and details of outputs.

A key factor and limitation in assessment of trackside vegetation is that the majority of NR land holdings are narrow, the trackside vegetation can be heterogeneous, and the frequency of cuttings mean that shade can be a problem. The Sentinel-2 satellite imagery that is the principal input into LCM production has a spatial resolution of 10 m, therefore an individual pixel within this imagery corresponding to a NR land holding location is likely to comprise a mix of different habitat types (Figure 1). Consequently, these mixed pixels have an increased susceptibility to misclassification. When comparing change between two land cover classifications for these mixed locations, the increased likelihood of misclassification in either of the two compared land cover classifications in turn can further reduce the reliability of the mapped land cover changes.

Figure 1. Left shows small length of NR land holdings against aerial photography; right against 10m resolution Sentinel-2 data.

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3. Methodology

Quantification of the area of UK-habitats on Network Rail land is based on the reproduced UKCEH Land Cover Map 10 m classified pixel product for 2024. A key factor to note is that the methods underlying LCM production have been development over a number of years to target identified misclassifications and progressively improve classification accuracy. Consequently, using the published versions of the UKCEH LCMs to assess land cover change is discouraged as differences in methodological production between LCMs could add an additional source of variability into the land cover change analysis. To remove this inconsistency and potential source of error, the version of LCM2024 utilised within this analysis has been reprocessed using an identical production methodology to the series of LCM products for 2019 to 2023, which have previously been provided to Network Rail. Section 3 outlines the production methodology of LCM2024, extraction of land cover statistics for NR land holdings, assessing change in land cover presence compared to 2019 to 2023, and quantification of uncertainty in land cover change estimates.

3.1 Land cover map production

3.1.1 Seasonal Composite Images

Seasonal composite images for classification were derived from Google Earth Engine. Sentinel-2 surface reflectance values were resampled to 10 m pixel resolution and median reflectance was computed for four time periods: January-March, April-June, July-September, and October-December, using ten Sentinel-2 bands 2, 3, 4, 5, 6, 7, 8, 8a, 11, and 12 (after Carrasco et. al., 2019), see Table 1. There were occasional gaps in the seasonal composite images due to persistent cloud in an image compositing period which were represented by null data. The classification algorithm used will tolerate partially complete spectral information, so we were able to produce land cover for the whole of the UK without the need to manually fill gaps.

Table 1. Sentinel-2 spectral bands and spatial resolutions.

Sentinel-2 Band	Central wavelength (µm)	Resolution (m)
Band 1 - Coastal aerosol	0.443	60
Band 2 - Blue	0.490	10
Band 3 - Green	0.560	10
Band 4 - Red	0.665	10
Band 5 - Vegetation red edge	0.705	20
Band 6 - Vegetation red edge	0.740	20
Band 7 - Vegetation red edge	0.783	20
Band 8 - Near infra-red	0.842	10

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Band 8A - Vegetation red edge	0.865	20
Band 9 - Water vapour	0.945	60
Band 10 - Short wave infrared - cirrus	1.375	60
Band 11 - Short wave infrared	1.610	20
Band 12 - Short wave infrared	2.190	20

3.1.2 Context Rasters

Spectral confusion can occur between different land cover types that have similar spectral properties. For example, bare rock in the littoral coastal zone lack significant vegetation, so too do exposed mountain rocks and sealed urban surfaces. Spectrally these surfaces can appear very similar when viewed in satellite imagery, and extra detail is required to differentiate them. We used 10 m context rasters to resolve a range of confusion types. The 10 m context rasters used were:

1. Height, derived from the NEXTMap® terrain product from Intermap® Solutions.
2. Aspect, derived from the NEXTMap® terrain product from Intermap® Solutions.
3. Slope, derived from the NEXTMap® terrain product from Intermap® Solutions.
4. Distance from the nearest building, derived from Ordnance Survey open data.
5. Distance from road, derived from Ordnance Survey open data.
6. Distance from tidal water, derived from Ordnance Survey open data.
7. Distance from freshwater, derived from Ordnance Survey open data.
8. A foreshore binary mask, derived from Ordnance Survey open data.
9. A woodland binary mask, derived from Ordnance Survey open data.
10. A saltmarsh binary mask, derived from Environment Agency, Scottish Government and Natural Resources Wales open data.

3.1.3 Classification Scenes

For Great Britain, a grid of tiles based on a modified version of the Ordnance Survey 100 x 100 km tile grid was created (Figure 2). In total, 32 classification scenes were classified comprising full coverage of the Great Britain land surface. Each classification scene was trained and classified independently. The approximate 100 x 100 km tile size was chosen as this provides a manageable size for processing. Moreover, if regions were much larger, phenological variation due to climatic difference across a classification scene could begin to degrade results. Some tiles such as those encompassing the Western Isles, Orkney and Shetland, and Cornwall and the Scilly Isles are larger. These are intentionally enlarged to avoid a sparsity of training data due to the extensive presence of sea in these tiles. Occasionally where tile extents are modified to include specific areas overlap between adjacent tiles do occur. Calculation of land cover data for Network Rail land focused on Great Britain only, with no analysis performed for Northern Ireland.

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An Estimate of the Network Rail UK-Habitats Account 2024
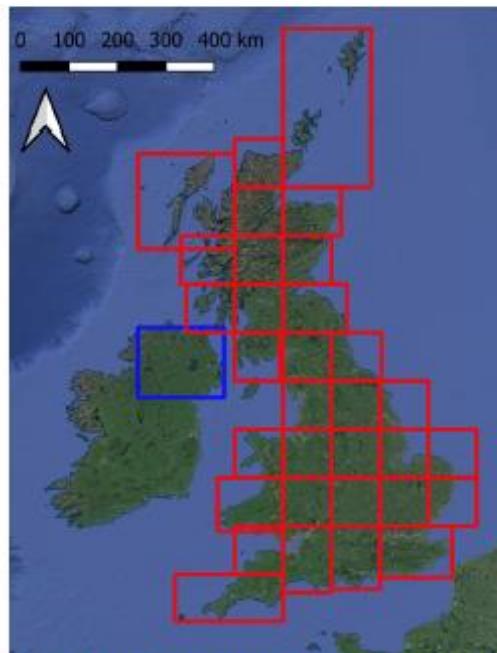
Figure 2. Tiles used for selecting Sentinel-2 Seasonal Composite Images for Great Britain (red) and Northern Ireland (blue).

3.1.4 Bootstrap Training

Bootstrapping is used to refer to a self-starting process that proceeds without external input. UKCEH have developed an automatic training process for land cover/habitat classification that does not require a fresh collection of field-gathered data for classifier training, and we have named the process bootstrap training. Land cover and habitat change is usually gradual. Transitions from one land cover or habitat to another typically occurs over a number of years. Therefore recent habitat/land cover maps can be a valuable source of training data for a new map if the original maps are accurate and the update interval of the new map is short relative to target dynamics. When this is true, land cover observations from the historic maps can be used to sample the current satellite image to produce training observations. These can then be used by a Random Forest (RF) classifier to yield a classification result, which contributes to the bootstrap for the next map and so forth. Because the historic maps give wall-to-wall coverage they provide a very large number of training observations, which is the key to learning success. Machine-learning algorithms, such as RF, rely on the majority signal to assign class membership, so when the bootstrap training set is very large if a minor proportion have changed class (are

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incorrect) over the refresh interval since these will have little influence on the dominant signal.

The bootstrap training dataset for UKCEH LCM2023, for example, came from UKCEH LCM2020, LCM2021 and LCM2022 classified pixel products. We filtered these land cover products retaining only pixels with >80% probability and which were classified as the same land cover class across all three years. Figure 3 gives an example of a bootstrap training dataset and resulting classification result. Crop rotations resulting in land cover change between arable and improved grassland classes within the preceding three-year period, means that in some areas this method is less well suited to producing training data for these classes. Consequently, training data for arable and improved grassland classes was instead sourced from the UKCEH Land Cover® plus: Crops data for the respective year. For each year for which a land cover classification is produced an identical method was applied, with the years from which training data is sourced changed on a rolling basis to harvest training data from the three preceding years.
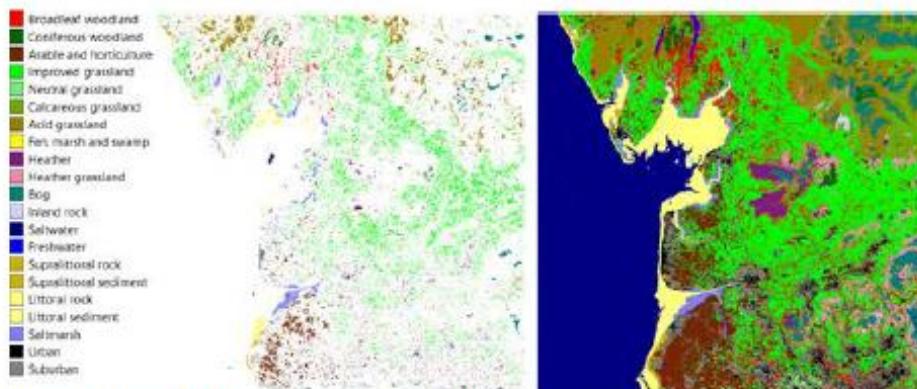
Figure 3. UKCEH Land Cover classes (left), a bootstrap training set (centre) and the resultant RF land cover classification (right).

3.1.5 Random Forest classification

Random Forest (RF) classification (Breiman, 2001) is a supervised learning technique that uses a training set of known observations to derive an empirical relationship which is then used to predict the membership of unknown observations. Bootstrap training pixels were placed into labelled bags and from each bag 10,000 samples, with replacement were drawn to train the RF classifier. The RF classifier subsequently yields the 10 m land cover classification. Sampling with replacement ensures that all land cover classes have an equal number of pixel observations for training the RF, this balances learning. Without balanced learning, the signal of rarer classes will be weak and susceptible to domination from commoner classes, causing misclassification. The classification software used for UKCEH LCMs is bespoke and was developed by UKCEH scientific staff. It integrates the Weka (Frank *et. al.* 2016)

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machine learning suite with a PostGIS geospatial database and GDAL tools (https://gdal.org/).

Once the classifications are generated, a series of minor knowledge-based corrections were applied. These included reclassification of misclassified arable pixels to improved grassland in urban green space areas (as denoted by the OS Open Greenspace data set), and of coastal classes being misclassified inland using a coastal mask.

3.2 Product validation

The accuracy of the reproduced LCM2024 was validated using 30,906 validation reference points distributed across Great Britain and covering all 21 LCM classes. The reference data is a composite data set, derived from the GB countryside survey (Wood *et al.*, 2017), open-source National Forest Inventory data, Rural Payment Agency data and a set of bespoke LCM validation points generated from manual image interpretation and field collection (see Marston *et al.*, 2023 for details). These were intersected with each of the land cover classifications to determine correspondence. The validation data used is drawn from the full national extent of the LCM and is not specific to only NR land holding areas.

3.3 Translating from UKCEH land cover classes to UK-Habitats

The 10 m pixel LCMs use the UKCEH land cover class schema which are based on UK Biodiversity Action Plan broad habitats (Jackson *et al.*, 2000); these were translated to UK-Habitats (UKHab). UK-Habitats are a hierarchical schema (UK Habitat Working Group, 2018) with direct analogues to UKCEH Land Cover (Table 2). There are three exceptions: (1) UK-Habitats do not have a saltwater class, with this UKCEH LCM class assigned instead to UK-Habitat 'Rivers and Lakes, r'. (2) UK-Habitats do not have a class for a heather-grassland mosaic, with this UKCEH LCM class assigned instead to 'Acid grassland, g1'; (3) UKCEH LCM classes littoral sediment and saltmarsh and both mapped to UKHabs class t2a (Coastal saltmarsh). Converting the UKCEH land cover product to UK-Habitats is achieved by cross-referencing using Table 2.

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Table 2. Conversion of UKCEH Land Cover Map classes to UK-Habitat classes.

	UKCEH Land Cover	LCM class ID	UK-Habitat	UK-Hab ID
Grassland			Grassland	g
	Acid grassland	7	Acid grassland	g1
	Calcareous grassland	6	Calcareous grassland	g2
	Neutral grassland	5	Neutral grassland	g3
	Improved grassland	4	Modified grassland	g4
Woodland			Woodland	w
	Deciduous woodland	1	Broad leaved and yew woodland	w1
	Coniferous woodland	2	Coniferous woodland	w2
Heath, shrub				h
	Heather grassland	10	No corresponding habitat	g1
	Dwarf shrub and heath	9	Dwarf shrub and heath	h1
Wetland				f
	Bog	11	Bog	f1
	Fen	8	Fen, marsh and swamp	f2
Croplands				c
	Arable	3	Arable and horticulture	c1
Urban				u
	Suburban	21	Built up areas and gardens	u1
	Urban	20	Developed land, sealed surface	ulb
Rivers and lakes				r
	Freshwater	14	Rivers and lakes	r
Sparsely vegetated land				s
	Inland rock	12	Inland rock	s1
	Supralittoral rock	15	Supralittoral rock	s2
	Supralittoral sediment	16	Supralittoral sediment	s3

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Marine inlets and tidal				t
	Littoral rock	17	Littoral rock	t1
	Littoral sediment	18	Coastal saltmarsh	t2a
	Saltmarsh	19	Coastal saltmarsh	t2a
	Saltwater	13	No corresponding habitat	r

The land cover classifications are not trained on lineside habitats due to their high land cover heterogeneity and narrow size, instead being trained on areas of homogenous land cover found in the wider landscape outside NR land holdings. Consequently, trackside mixed pixels occurring within NR land holdings which often include areas of low or no vegetation cover such as track bed, along with vegetation in trackside areas, can be misclassified as a number of land cover class typified by a mix of seasonally vegetated and non-vegetated surfaces such as arable and horticulture. To overcome this issue, a new sparsely vegetated class was created which merged land cover classes exhibiting similar low-vegetation characteristics. The classes merged into this sparsely vegetated class are arable and horticulture (c1), inland rock (s1), supralittoral rock (s2), supralittoral sediment (s3), littoral rock (t1), coastal saltmarsh (t2a), developed land, sealed surface (u1b), and built-up and gardens (u1). Similarly, a further grouping of spectrally similar modified (g4), neutral (g3), calcareous (g2) and acid (g1) grassland classes was performed to form a single grassland class. Subsequent analysis utilised these merged sparsely vegetated and grassland classes.

3.4 Regional statistics

Regional statistics describing land cover proportions in both UK-Habs and UKCEH LCM schemas for NR land holdings were generated. The land cover information produced for 2024 was extracted for each of the 42,696 Maintenance Delivery Units (MDU) areas. This identified for each MDU which land cover types are present within the MDU boundary, and how many pixels of the respective land cover classes are present. These statistics are extracted using the UKCEH LCM classification schema and are then mapped to the equivalent UK-Habs classification scheme. The results are provided as a ESRI shapefile representing MDU boundaries with an attribute count for each habitat type, and have also been summarised in excel files (provided alongside this report, see section 6: Deliverables). Additional attributes are included providing pixel counts for the merged sparsely vegetated and grassland classes.

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3.5   Quantifying Uncertainty in Estimates

As the areas of habitat derived from the land cover map are the result of a classification model applied to satellite imagery, there is inevitably uncertainty in the classification. Therefore, to enable a robust assessment of change in habitat classes, the uncertainty in the areal estimates produced needs to be quantified. Essentially, this allows separation of what is genuine change from differences resulting from uncertainty. Uncertainty here results from the classification error that arises within each of the land cover maps – where one land class may be incorrectly assigned to another. Whilst the validation and assessment work undertaken shows that the true classification rate is high, and therefore misclassification and error is relatively low, it still exists and could make a difference to total area estimates if ignored. Mechanisms to quantify the uncertainty in the total area estimates are hence needed. To do so relies on making use of some additional information. There are two statistically optimal ways in which additional information could be used to quantify uncertainty.

The first approach is to use associated ground-truth data alongside the classification information within a Bayesian data assimilation approach. This is exemplified in both Henrys and Jarvis (2019) and Levy et al. (2018), whereby all information is combined in a unified model of land use change that allows for each data source to have different characteristics, but that the overall change has to be consistent. This approach is based on the assumption that different data are providing a different view of the same phenomenon observed through different processes with different uncertainty potentially associated with each. In combining the rich information together estimates of habitat extent, along with the associated uncertainty can be derived. The second option makes use of detailed ground-based information to produce a robust classification matrix. This, in turn, can then be used to quantify the error associated with total counts across the different classes. Recent work by Spence et al. (2025) has demonstrated how this approach can be used to quantify uncertainty associated with classification of counts. Fundamentally, this approach relies on the classification matrix and hence good data to provide a robust assessment of this. Both of the statistically optimal approaches therefore rely on robust, extensive and representative ground-truthed data on land use.

In lieu of high quality and extensive ground-truthed information available that could be used in either approach outlined above, an alternative approach is needed. In this case, we use the information across years as the replicated estimates from which uncertainty estimates can be derived. In this approach the information across years 2019-2024 is grouped into two classes: 2019-2021 and 2022-2024 each of which represents a period of 3 years. The data across the years is then used to quantify the variability in the areal estimates. Whilst the number of replicates (years of data) is not large, the number of areal units (MDUs) is large enough to provide a good estimate of the variance in the total area if we assume that this is consistent. The overall estimates derived are therefore obtained by grouping individual years into groups, and using the inter-annual variability as a measure of the overall uncertainty associated with the total area estimates.

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4. Results

4.1 Land cover classification accuracy assessment

Accuracy assessment of the land cover classifications produced for 2024 was performed using a validation dataset comprising 30,906 validation locations. The overall accuracies of the classifications are given in Table 3, with full correspondence matrix presented in Appendix 1. Note that these accuracy assessments were performed on the full GB land cover classifications using the UKCEH Land Cover Map classes, not specifically for the classified areas corresponding to the NR land holdings.

Table 3. Accuracy assessment of the 2024 land cover classification.

Year	Overall accuracy (%)	95% confidence intervals (%)	Kappa coefficient
2024	0.814	0.810, 0.819	0.780

4.2 Land cover extraction

The number of pixels of each land cover class are extracted for each MDU. These statistics are summarised to give overall land cover figures for the NR land holdings for 2024. Figures are presented as total area (km²) of each land cover type (Table 4), and as a percentage of the overall NR land holdings area (Table 5 and Figure 4), with equivalent statistics from 2019 to 2023 also displayed for comparison.

Table 4. Total area (km²) of each land cover class for Network Rail land for 2019 to 2024.

UK-Habitat	2019	2020	2021	2022	2023	2024
Broad leaved and yew woodland (w1)	75.20	73.05	77.54	84.83	79.77	79.74
Coniferous woodland (w2)	6.03	6.22	5.74	5.52	6.47	6.49
Grassland	121.42	116.93	92.98	89.82	134.17	131.96
Fen marsh and swamp (f2)	9.64	9.10	7.53	5.67	6.30	7.00
Dwarf shrub and heath (h1)	8.13	6.31	7.31	10.13	6.09	6.72
Bog (f1)	1.29	1.26	1.20	2.31	1.22	1.23
Sparsely vegetated	290.71	300.69	321.93	314.7	279.8	280.70
Rivers and lakes (r)	3.67	2.52	1.86	3.11	2.25	2.25
Total	516.09	516.09	516.09	516.09	516.09	516.09

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Table 5. Percentage coverage of each land cover class for Network Rail land for 2019 to 2024.

UK-Habitat	2019	2020	2021	2022	2023	2024
Broad leaved and yew woodland (w1)	14.57	14.15	15.02	16.44	15.46	15.45
Coniferous woodland (w2)	1.17	1.21	1.11	1.07	1.25	1.26
Grassland	23.53	22.66	18.02	17.40	26.00	25.57
Fen marsh and swamp (f2)	1.87	1.76	1.46	1.10	1.22	1.36
Dwarf shrub and heath (h1)	1.57	1.22	1.42	1.96	1.18	1.30
Bog (f1)	0.25	0.24	0.23	0.45	0.24	0.24
Sparsely vegetated	56.33	58.27	62.38	60.98	54.22	54.39
Rivers and lakes (r)	0.71	0.49	0.36	0.60	0.44	0.44
Total	100.00	100.00	100.00	100.00	100.00	100.00

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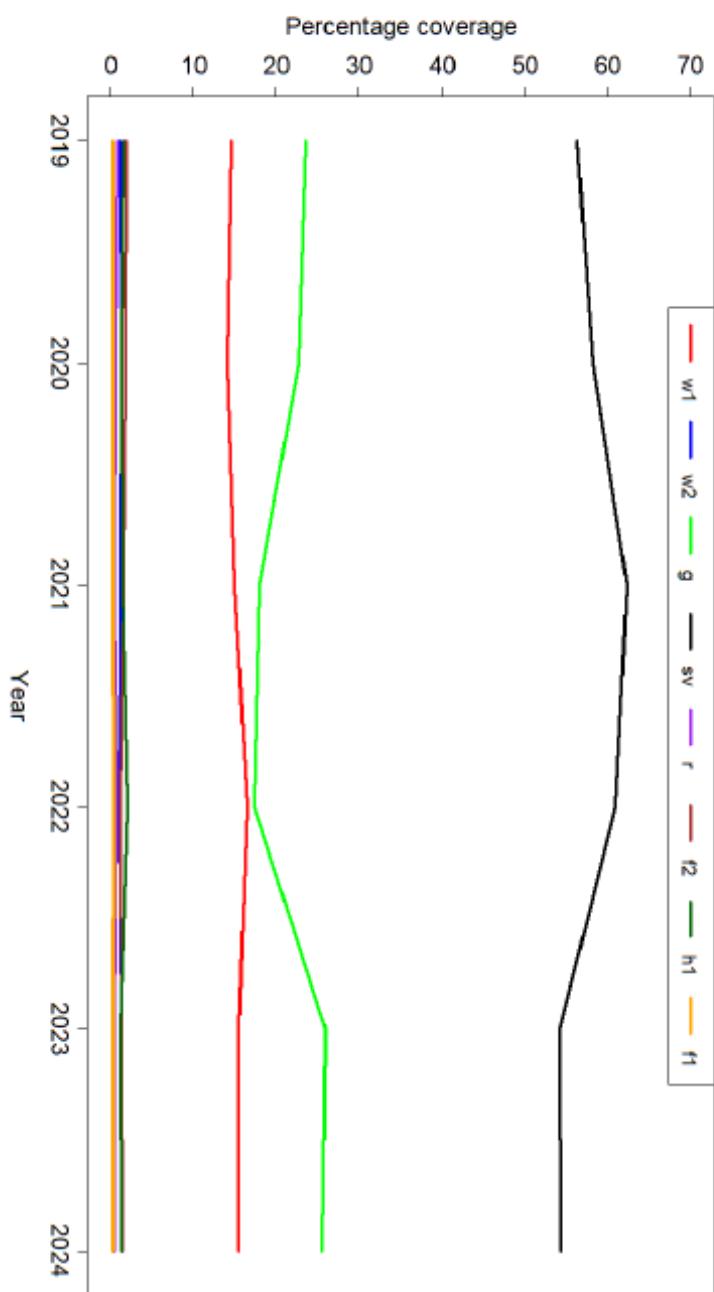
Figure 4. Land cover class coverages from 2019 to 2024 for broad leaved and yew woodland (w1), coniferous woodland (w2), grassland (g), sparsely vegetated (sv), rivers and lakes (r), Fen marsh and swamp (f2), Dwarf shrub and heath (h1) and bog (f1).

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4.3 Incorporating uncertainty

The repeated areal estimates across years were included within a statistical model to estimate the total area in each UK-habitat category across the years 2019-2021 and 2022-2024. Separate models were fitted for each of the UK- habitat categories and the error in habitat area was assumed to be approximately normally distributed – that is, the observed area of each habitat based on the pixel-based classification of each MDU was equal to the true habitat coverage plus some random, normally distributed error centred on zero. The repeats across individual years were used to estimate the standard deviation of this error, but years were grouped to enable separate estimates of extent and an estimate of change. The approach therefore allowed for quantification of confidence bounds on the estimated areas in each of the two periods and therefore an ability to consider the significance of change in areal extent for each of the habitat categories. The results are shown in Table 6 below.

Table 6. Total area (km²) of each land cover class for Network Rail land for the reporting periods of 2019-2021 and 2022-2024. Estimates are derived from a statistical model fitted to the data across individual years to enable production of associated confidence intervals and assessment of the significance of change.

UK-Habitat	2019-2021			2022-2024			Change
	Lower 95% CI	Estimated Area	Upper 95% CI	Lower 95% CI	Estimated Area	Upper 95% CI	
Broad leaved and yew woodland (w1)	72.31	75.26	78.21	78.49	81.44	84.40	Increase
Coniferous woodland (w2)	5.51	6.00	6.48	5.68	6.16	6.65	No Significant Change
Grassland	86.99	110.44	133.89	95.20	118.65	142.10	No Significant Change
Fen marsh and swamp (f2)	7.73	8.76	9.78	5.30	6.32	7.35	Decrease
Dwarf shrub and heath (h1)	5.38	7.25	9.14	5.76	7.65	9.54	No Significant Change
Bog (f1)	0.74	1.25	1.75	1.08	1.59	2.09	No Significant Change
Sparsely vegetated	284.10	304.53	324.96	271.45	291.88	312.31	No Significant Change
Rivers and lakes (r)	1.78	2.60	3.43	1.56	2.39	3.23	No Significant Change

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5. Discussion

The methods described here provide an estimate of UK-Habitats within NR owned land for 2024, further extending the time series of assessment from 2019 to 2023 as performed under previous project work. Across all categories, the area coverage of each land cover class varied year to year, with no monotonic increases or decreases observed. Taking the change across the start and end of the LCM series (i.e. the 2019 results from previous project work and the 2024 results produced here) increases in the coverage of broad leaved and yew woodland, coniferous woodland, and grassland are observed. Correspondingly, reductions were observed for the sparsely vegetated, fen marsh and swamp, dwarf shrub heath, and rivers and lakes classes. However, when the year to year variation is used as a proxy for the associated classification uncertainty within a statistical model, we see that the only significant changes between the 2019-2021 and 2022-2024 periods are an increase in the area of broad leaved and yew woodland and a decrease in the area of fen marsh swamp. Other changes are deemed to be not statistically significant.

The estimated overall accuracy of LCM2024 when assessed at the national level using the UKCEH LCM 21-class nomenclature is 81.4%. These 10 m classifications provide good broad-scale characterisation of habitats and land cover across Network Rail land holdings, however the majority of Network Rail land is characterised by narrow track-side strips with some landscape features being simply too small to be reliably identified with 10 m pixels. A 10 m pixel can potentially include areas of track bed, bankside vegetation (potentially a mix of different vegetation types) as well as extending into adjacent areas outside the Network Rail land holdings which could comprise multiple land cover types depending on location. A consequence of this mixed pixel effect is an increased susceptibility to misclassification. 10 m pixel land cover maps can achieve good estimations of assets at regional and national levels, but have limitations for more local, direct estimates. For small and narrow features, direct estimates with higher resolution satellite imagery or airborne imagery are required to enable improved separation of habitat patches which, at 10 m resolution, can only be observed as mixed pixels (Figure 5). UKCEH are currently investigating the potential of national-scale 3 m resolution satellite data to improve the characterisation and mapping of habitat stocks. However, in contrast to Sentinel-2, these satellite data are not free, so costs and benefits will have to be carefully considered. The acquisition of multi-spectral high-resolution sensors for the Network Rail helicopter also offers potential for greatly improved mapping accuracy for limited areas of interest, but will require further development of methods.

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Figure 5. Comparison of a) 10 m and b) 3 m satellite imagery for a stretch of the West coast main line, Milton Keynes.

Accurately assessing land cover change in the UK remains challenging due to the relatively small area of many UK land cover parcels, and the relatively small scale of much of the change that occurs. Although here the time-series of LCMs have been reproduced to maintain an identical production methodology across the full time series of land cover classifications, removing any influences that may have resulted from differing methodologies, misclassification occurring in both the input land cover classifications still impacts land cover change assessment. The susceptibility of Network Rail land holdings given their small size, heterogeneous nature, (where multiple land cover types comprise the area of a single pixel) and susceptibility to shading further limits the capabilities of this method to detect specific locations of genuine change and to identify the nature of that change. These can potentially result in areas of change being incorrectly identified, when the change in land cover class results from misclassification in one (or both) of the input classifications. Historically it has been recommended that the UKCEH LCMs are not used for change detection for this reason (Fuller, Smith and Devereux, 2003), and it is important to understand the limitations of these methods and datasets when producing summary statistics for a region, to avoid inferring incorrect conclusions of change occurring whereas this is actually a consequence of false detections.

It was not possible here to validate land cover change vectors due to lack of reference data availability. It should also be noted that while some land cover changes can occur abruptly such as the loss of trees, other change vectors occur over a longer period and are more difficult to detect. For example, change to woodland will only be detected when enough trees have reached a level of maturity that woodland is the predominant spectral signal for the given location in the satellite data. This can depend on woodland type, planting density and the proficiency of woodland

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management, and may take many years from initial planting. Similarly, some land cover classes are difficult to differentiate in the field and from 10 m resolution EO data, and particularly susceptible to inter-class confusion given their spectral similarity. Consequently, whilst the 10 m land cover classification data are useful in providing an overview of the land cover trends, they are not currently sensitive enough to confidently detect the relatively small levels of change in many land cover classes over relatively short time periods (5 years or less). It is likely that future development of higher resolution 3 m (and higher resolution) land cover classification methods could improve capabilities and accuracies of these activities. Should high quality reference data be available, it would also be possible to undertake a full assessment of the uncertainty in the classification and incorporate this within a unified statistical model of change.

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6. Deliverables

Table 7. Data set deliverables.

File name	Description	File size
NR_1km_buffer_clip_LCM2024.tif	LCM2024 rerun clipped to NR land holdings with 1km buffer. EPSG:27700, 10 m pixels, 1 band. Display using the lcm_style_raster.qml QGIS symbology file.	43mb
NR_1km_buffer_clip_LCM2024_UKHab.tif	LCM2024 rerun clipped to NR land holdings with 1km buffer. EPSG:27700, 10 m pixels, 1 band. Here, LCM classes freshwater and saltwater are collapsed into a single class, as are acid grassland and heather grass. Display using the ukhab_style_raster.qml QGIS symbology file.	43mb
pixel_count_NR_Ownership_MDU_Routes_2024.shp	Zipped MDU shapefile containing extracted land cover statistics for 2024. Includes attributes for the number of pixels of each land cover class for the respective MDU for both LCM and UKHab classification systems.	31mb (.zip)
NR_MDU_summmary_LCM2024.csv	Summary statistics spreadsheet 2024.	47kb
lcm_style_raster.qml	A QGIS symbology for displaying the revised land cover classification as UKCEH LCM classes.	4kb
ukhab_style_raster.qml	A QGIS symbology for displaying the revised habitat map as UK-Habitats classes.	4kb

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7. Acknowledgements

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Appendix 1 – Land cover classification correspondence matrices

Table 8. Classification correspondence matrix for the 2019 land cover classification. Land cover class codes are: 1 = broadleaved woodland, 2 = coniferous woodland, 3 = arable, 4 = improved grassland, 5 = neutral grassland, 6 = calcareous grassland, 7 = acid grassland, 8 = fen, 9 = heather, 10 = heather grassland, 11 = bog, 12 = inland rock, 13 = saltwater, 14 = freshwater, 15 = supra-littoral rock, 16 = supra-littoral sediment, 17 = littoral rock, 18 = littoral sediment, 19 = saltmarsh, 20 = urban, 21 = suburban, UA = Users Accuracy, PA = Producers Accuracy, OA = overall accuracy. Accuracy assessment is performed using the LCM class schema.

Classified	Reference 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total	UA
1	1593	133	9	4	1	0	6	1	6	2	1	0	0	1	0	0	0	0	0	0	7	1764	90.3
2	50	569	0	0	0	0	6	0	2	3	0	0	0	1	0	0	0	0	0	0	0	632	90.0
3	18	4	9261	193	6	4	14	7	3	7	17	0	0	1	0	1	0	0	0	15	21	9574	96.7
4	145	5	789	4701	143	149	378	20	19	172	61	0	0	1	3	24	0	0	0	5	104	6720	70.0
5	2	0	4	84	403	2	18	0	3	4	0	0	0	0	0	0	0	0	0	5	0	523	77.0
6	17	0	8	13	2	811	21	0	0	1	0	0	0	0	0	0	0	0	0	0	0	873	92.9
7	1	0	14	56	6	49	894	0	34	129	40	0	0	0	0	0	0	0	0	0	1	1224	73.0
8	9	0	1	5	2	0	0	556	1	1	3	0	3	0	0	0	0	0	0	0	0	582	95.5
9	10	2	3	2	1	2	53	1	809	119	238	0	0	0	0	3	0	0	0	0	1	1241	65.2
10	6	5	5	8	0	15	162	0	45	277	105	0	0	0	0	0	0	0	0	0	0	628	44.1
11	0	1	0	2	0	0	14	0	10	43	634	0	0	1	0	0	0	0	0	0	0	705	89.9
12	1	7	188	17	0	1	20	0	4	3	3	136	0	1	1	0	0	0	0	86	10	480	28.3
13	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	0	0	0	0	51	94.1
14	1	0	0	1	1	0	1	1	0	0	1	0	0	440	0	0	0	1	0	1	0	449	98.0
15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	29	3	7	8	0	1	0	49	59.2
16	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	162	0	17	1	0	0	183	88.5
17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	0	77	18	0	0	0	107	72.0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	185	0	0	0	193	95.9
19	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	3	165	0	0	178	92.7
20	1	0	4	4	0	0	0	0	0	0	0	0	0	0	1	15	0	4	0	2194	492	2715	80.8
21	8	0	5	13	0	0	0	0	3	0	0	7	0	0	0	1	0	0	0	120	1926	2083	92.5
Total	1862	726	10292	5103	567	1033	1585	596	937	764	1107	144	49	449	45	211	87	243	167	2422	2565	30954	OA=
PA	85.6	78.4	90.0	92.1	71.1	78.5	56.4	93.3	86.3	36.3	57.3	94.4	98.0	98.0	64.4	76.8	88.5	76.1	98.8	90.6	75.1		83.6

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Table 9. Classification correspondence matrix for the 2020 land cover classification. Land cover class codes are: 1 = broadleaved woodland, 2 = coniferous woodland, 3 = arable, 4 = improved grassland, 5 = neutral grassland, 6 = calcareous grassland, 7 = acid grassland, 8 = fen, 9 = heather, 10 = heather grassland, 11 = bog, 12 = inland rock, 13 = saltwater, 14 = freshwater, 15 = supra-littoral rock, 16 = supra-littoral sediment, 17 = littoral rock, 18 = littoral sediment, 19 = saltmarsh, 20 = urban, 21 = suburban, UA = Users Accuracy, PA = Producers Accuracy, OA = overall accuracy. Accuracy assessment is performed using the LCM class schema.

Classified	Reference 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total	UA
1	1588	141	10	4	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	8	1762	90.1
2	52	562	0	0	0	0	4	1	5	1	0	0	0	0	0	0	0	0	0	0	0	628	89.5
3	16	7	9411	222	8	11	9	5	6	5	6	0	0	0	0	1	0	0	0	22	23	9760	96.4
4	162	3	573	4679	143	147	375	21	23	202	95	0	0	1	0	3	1	1	0	0	94	6550	71.4
5	1	0	3	75	404	1	14	1	0	3	0	0	1	0	0	0	1	0	0	0	2	504	80.2
6	11	0	5	15	1	800	21	0	6	1	0	0	0	0	0	0	0	0	0	0	0	854	93.7
7	2	1	1	62	6	55	908	0	26	138	42	0	0	0	0	0	0	0	0	0	0	1244	73.0
8	7	0	4	3	2	0	0	556	1	2	4	0	0	3	0	0	0	0	0	0	0	583	95.4
9	9	2	4	1	2	0	48	0	805	115	243	0	0	0	0	0	0	0	0	0	0	1229	65.5
10	3	3	7	1	0	2	173	0	50	262	79	0	0	1	0	0	0	0	0	0	0	601	43.6
11	0	3	11	0	0	4	14	0	10	30	634	0	0	0	0	0	0	0	0	0	0	696	91.1
12	2	4	0	12	0	1	16	0	0	0	2	136	0	0	0	0	0	6	1	73	9	516	26.4
13	0	0	0	0	1	0	0	0	0	0	0	0	47	0	0	0	0	0	0	0	0	53	88.7
14	1	0	0	1	1	0	0	2	0	0	0	0	0	440	0	0	0	1	0	0	0	446	98.7
15	0	0	0	0	1	0	1	0	0	0	0	0	0	0	31	4	6	4	0	0	0	46	67.4
16	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	159	6	14	0	0	0	180	88.3
17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	78	24	3	0	0	114	68.4
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	186	0	0	0	193	96.4
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	163	0	0	175	93.1
20	1	0	7	0	0	0	0	0	0	0	0	0	0	0	1	12	0	4	0	2196	0	2686	81.8
21	7	0	15	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	128	1967	2134	92.2
Total	1862	726	10292	5103	567	1033	1585	596	937	764	1107	144	49	449	45	211	87	243	167	2422	2565	30954	
PA	85.3	77.4	91.4	91.7	71.3	77.4	57.3	93.3	85.9	34.3	57.3	94.4	95.9	98.0	68.9	75.4	89.7	76.5	97.6	90.7	76.7	OA =	84.0

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Table 10. Classification correspondence matrix for the 2021 land cover classification. Land cover class codes are: 1 = broadleaved woodland, 2 = coniferous woodland, 3 = arable, 4 = improved grassland, 5 = neutral grassland, 6 = calcareous grassland, 7 = acid grassland, 8 = fen, 9 = heather, 10 = heather grassland, 11 = bog, 12 = inland rock, 13 = saltwater, 14 = freshwater, 15 = supra-littoral rock, 16 = supra-littoral sediment, 17 = littoral rock, 18 = littoral sediment, 19 = saltmarsh, 20 = urban, 21 = suburban, UA = Users Accuracy, PA = Producers Accuracy, OA = overall accuracy. Accuracy assessment is performed using the LCM class schema.

Classified	Reference 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total	UA
1	1611	146	12	10	1	0	3	1	4	0	0	0	0	0	0	0	0	0	0	1	9	1803	89.4
2	43	559	1	0	0	0	3	1	5	4	0	0	0	0	0	6	0	0	0	1	0	620	90.2
3	19	1	9331	214	9	3	15	8	3	11	2	0	0	0	0	6	0	1	0	10	19	9656	96.6
4	128	2	640	4647	142	120	354	16	18	181	91	2	0	1	0	24	0	0	0	0	66	6436	72.2
5	1	0	6	73	401	1	16	1	0	3	1	0	0	0	2	0	0	0	0	0	1	504	79.6
6	16	0	10	20	2	823	22	0	1	0	0	0	0	0	0	0	0	0	0	0	0	893	92.2
7	4	1	14	74	5	75	948	0	24	158	33	0	0	0	0	0	0	0	1	0	0	1337	70.9
8	7	0	5	4	1	0	0	554	1	0	0	0	0	0	0	0	0	0	1	0	0	577	96.0
9	5	5	3	5	1	0	36	1	798	110	220	0	0	0	0	0	0	0	0	0	0	1183	67.5
10	5	4	11	0	0	0	157	0	60	262	100	0	0	0	0	0	0	0	0	0	0	602	43.5
11	0	0	2	0	0	0	4	0	12	27	653	0	0	0	0	0	0	0	0	0	0	707	92.4
12	10	0	0	0	0	0	17	0	7	3	11	137	0	1	0	1	0	1	0	59	14	546	25.1
13	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	0	0	5	0	0	0	55	89.1
14	0	0	0	1	0	0	0	0	0	0	0	0	0	441	0	0	0	4	0	0	0	450	98.0
15	0	0	0	0	2	0	0	0	0	0	0	0	0	0	31	5	8	2	0	0	0	48	64.6
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	159	0	4	0	1	0	175	90.9
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	73	30	0	0	1	116	62.9
18	0	0	1	0	0	0	0	0	0	1	0	1	0	5	2	3	4	183	1	0	0	191	95.8
19	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	165	0	0	176	93.8
20	1	5	10	5	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	2208	422	2657	83.1
21	12	0	19	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	140	2033	2222	91.5
Total	1862	726	10292	5103	567	1033	1585	596	937	764	1107	144	49	449	45	211	87	243	167	2422	2565	30954	
PA	86.5	77.0	90.7	91.1	70.7	79.7	59.8	93.0	85.2	34.3	59.0	95.1	100.0	98.2	68.9	75.4	83.9	75.3	98.8	91.2	79.3		OA = 84.2

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Table 11. Classification correspondence matrix for the 2022 land cover classification. Land cover class codes are: 1 = broadleaved woodland, 2 = coniferous woodland, 3 = arable, 4 = improved grassland, 5 = neutral grassland, 6 = calcareous grassland, 7 = acid grassland, 8 = fen, 9 = heather, 10 = heather grassland, 11 = bog, 12 = inland rock, 13 = saltwater, 14 = freshwater, 15 = supra-littoral rock, 16 = supra-littoral sediment, 17 = littoral rock, 18 = littoral sediment, 19 = saltmarsh, 20 = urban, 21 = suburban, UA = Users Accuracy, PA = Producers Accuracy, OA = overall accuracy. Accuracy assessment is performed using the LCM class schema.

Classified	Reference 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total	UA
1	1660	174	5	22	1	0	3	0	4	3	2	2	0	4	0	0	0	0	0	6	11	1897	87.5
2	33	656	0	0	0	8	0	0	6	2	0	2	0	1	0	0	0	0	0	1	0	707	92.8
3	24	7	9655	130	7	0	8	0	6	2	3	0	0	0	0	1	0	1	0	20	10	9888	97.6
4	156	7	710	5095	189	91	274	20	4	149	59	2	0	14	0	24	0	0	0	20	47	6857	74.3
5	11	7	1	154	436	1	16	21	0	3	0	0	1	2	0	0	0	0	1	1	0	657	66.4
6	30	2	15	15	1	886	16	0	1	0	0	1	0	8	0	0	0	0	0	1	0	957	92.6
7	11	4	15	84	9	59	1154	0	13	187	35	0	1	0	0	0	0	0	0	0	0	1572	73.4
8	6	0	3	2	2	0	13	555	1	1	0	0	0	8	0	1	0	0	1	0	0	580	95.7
9	5	3	0	0	1	2	0	1	870	1	0	0	0	1	0	0	0	0	0	0	1	1237	70.3
10	11	2	4	2	0	10	120	0	42	256	49	0	0	1	0	0	0	0	0	0	0	500	51.2
11	0	2	1	1	0	1	34	2	0	40	827	0	0	0	0	0	0	0	0	0	0	904	91.5
12	0	2	2	1	1	2	0	0	0	0	0	166	0	1	0	0	0	0	0	2	1	176	94.3
13	0	0	0	0	1	0	0	0	0	0	0	0	71	0	0	0	0	0	0	0	0	93	76.3
14	8	0	0	0	0	0	0	8	1	1	0	1	0	551	0	0	0	0	0	2	11	567	97.2
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	6	1	7	0	1	0	61	65.6
16	0	0	0	0	0	0	0	1	0	0	0	0	0	0	6	174	6	26	0	0	11	184	94.6
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	93	4	0	0	0	138	67.4
18	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7	5	4	191	2	0	3	213	89.7
19	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	4	171	0	1	193	88.6
20	7	0	8	0	0	0	0	0	0	0	0	7	0	2	1	0	0	0	0	2385	290	2726	87.5
21	70	0	6	11	0	0	0	0	1	0	0	1	0	11	0	11	0	3	1	221	2621	3000	87.4
Total	2033	864	10419	5592	654	1052	1646	624	964	774	1170	184	82	592	57	226	105	260	175	2652	2982	33107	
PA	81.7	75.9	92.7	91.1	66.7	84.2	70.1	88.9	90.3	33.1	70.7	90.2	86.6	93.1	70.2	77.0	88.6	73.5	97.7	89.9	87.9	OA = 86.1	

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Table 12. Classification correspondence matrix for the 2023 land cover classification. Land cover class codes are: 1 = broadleaved woodland, 2 = coniferous woodland, 3 = arable, 4 = improved grassland, 5 = neutral grassland, 6 = calcareous grassland, 7 = acid grassland, 8 = fen, 9 = heather, 10 = heather grassland, 11 = bog, 12 = inland rock, 13 = saltwater, 14 = freshwater, 15 = supra-littoral rock, 16 = supra-littoral sediment, 17 = littoral rock, 18 = littoral sediment, 19 = saltmarsh, 20 = urban, 21 = suburban, UA = Users Accuracy, PA = Producers Accuracy, OA = overall accuracy. Accuracy assessment is performed using the LCM class schema.

Classified \ Reference	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total	UA
1	1590	175	4	19	2	0	2	2	4	0	1	1	0	0	0	0	0	0	0	1	12	1819	87.4
2	32	652	1	0	0	0	2	4	4	3	1	1	0	0	0	0	0	0	0	1	0	705	92.5
3	23	1	8857	405	2	1	10	3	0	6	23	0	0	0	0	0	0	0	0	15	10	9363	94.6
4	230	10	1014	5223	167	147	389	24	20	192	82	4	0	13	1	34	1	1	0	21	54	7627	68.5
5	10	8	6	167	467	0	5	18	2	2	1	0	0	1	0	0	0	0	1	1	3	765	61.1
6	33	6	7	18	1	832	5	0	6	0	0	2	0	0	0	0	0	1	0	1	0	911	91.3
7	9	4	14	91	4	59	1050	19	19	187	31	1	0	1	0	0	0	0	0	0	0	1470	71.4
8	8	0	2	3	18	0	0	566	0	5	5	9	0	9	0	0	0	0	1	0	0	595	95.1
9	4	0	2	0	2	2	19	0	840	77	190	0	0	0	0	0	0	0	1	0	0	1142	73.6
10	2	4	1	0	2	9	25	0	42	274	93	5	0	3	0	0	0	0	0	0	1	567	48.3
11	0	1	1	1	1	1	0	1	21	28	742	0	0	1	1	0	0	0	0	0	0	816	90.9
12	0	0	5	3	1	1	21	0	0	2	0	164	0	4	0	0	1	0	0	3	0	187	87.7
13	0	0	0	0	0	0	0	0	0	0	0	0	62	1	0	0	0	12	0	0	0	75	82.7
14	0	0	0	0	0	0	0	0	0	0	0	4	0	541	0	0	0	12	1	0	2	560	96.6
15	0	0	0	1	0	0	0	0	3	0	0	1	0	0	44	5	6	8	0	1	2	74	59.5
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	166	0	5	0	1	1	177	93.8
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	90	6	0	0	0	140	64.3
18	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	5	6	179	2	0	0	212	84.4
19	0	0	0	0	1	0	0	1	0	0	0	0	0	7	0	1	0	7	171	0	0	190	90.0
20	7	0	12	12	2	0	0	0	0	0	0	3	0	5	0	10	2	5	1	2368	303	2730	86.7
21	2	0	12	2	2	0	0	0	0	0	0	0	0	2	5	1	2	1	0	239	2593	2982	87.0
Total	2033	864	9937	6074	654	1052	1646	624	964	774	1170	184	82	592	57	226	105	260	175	2652	2982	33107	
PA	78.2	75.5	89.1	86.0	71.4	79.1	63.8	90.7	87.1	35.4	63.4	89.1	75.6	91.4	77.2	73.5	85.7	68.9	97.7	89.3	87.0	OA =	83.0

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Table 13. Classification correspondence matrix for the 2024 land cover classification. Land cover class codes are: 1 = broadleaved woodland, 2 = coniferous woodland, 3 = arable, 4 = improved grassland, 5 = neutral grassland, 6 = calcareous grassland, 7 = acid grassland, 8 = fen, 9 = heather, 10 = heather grassland, 11 = bog, 12 = inland rock, 13 = saltwater, 14 = freshwater, 15 = supra-littoral rock, 16 = supra-littoral sediment, 17 = littoral rock, 18 = littoral sediment, 19 = saltmarsh, 20 = urban, 21 = suburban, UA = Users Accuracy, PA = Producers Accuracy, OA = overall accuracy. Accuracy assessment is performed using the LCM class schema.

Classified	Reference 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total	UA
1	1599	152	13	9	1	0	6	1	3	5	0	0	0	0	0	0	0	0	0	0	10	1799	88.9
2	41	542	0	1	0	0	6	1	5	5	0	0	0	0	0	0	0	0	0	0	6	607	89.3
3	10	4	8708	194	2	9	8	7	13	2	4	1	0	0	0	0	0	0	0	0	13	8995	96.8
4	155	7	1168	4655	128	158	426	20	31	226	154	1	0	4	3	1	0	0	0	4	99	7270	64.0
5	5	0	14	61	415	0	12	2	0	2	0	3	0	0	0	0	0	0	0	0	0	514	80.7
6	17	0	12	22	2	797	16	2	0	0	0	0	0	0	0	0	0	0	0	0	0	866	92.0
7	3	7	22	88	9	16	895	0	47	155	34	0	0	0	0	0	0	0	0	0	0	1311	68.3
8	7	0	2	2	4	0	0	554	1	1	4	0	0	0	0	0	0	0	0	0	0	579	95.7
9	4	2	10	4	0	1	34	1	769	96	200	0	0	0	0	0	0	0	0	0	0	1120	68.7
10	4	5	5	4	0	14	152	50	16	245	97	0	0	0	0	0	0	0	0	0	0	578	42.4
11	1	2	0	2	0	3	16	0	5	24	610	1	0	0	0	1	0	0	0	0	0	674	90.5
12	4	5	0	24	2	0	12	0	0	4	2	135	0	2	0	1	1	0	0	79	12	578	23.4
13	1	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	9	0	0	0	0	57	84.2
14	0	0	1	0	0	0	1	1	0	0	0	0	0	439	0	0	0	0	0	0	0	448	98.0
15	0	0	0	0	2	0	0	0	0	0	0	0	0	0	30	3	9	0	1	0	0	55	54.5
16	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	155	0	0	1	0	0	171	90.6
17	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	3	74	4	1	0	0	113	65.5
18	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	4	177	0	1	0	188	94.1
19	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	29	165	0	0	175	94.3
20	1	0	2	6	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	2164	434	2619	82.6
21	9	0	6	18	0	0	0	0	0	2	0	7	0	0	10	0	0	0	0	149	1994	2189	91.1
Total	1862	726	10255	5092	567	1033	1585	596	937	764	1107	144	49	449	45	211	87	243	167	2422	2565	30906	
PA	85.9	74.7	84.9	91.4	73.2	77.2	56.5	93.0	82.1	32.1	55.1	93.8	98.0	97.8	66.7	73.5	85.1	72.8	98.8	89.3	77.7	OA =	81.4

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Eastern Region State of Nature Report 2024

Contents

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1.1 Document Control

Version number	Approved by Date	Description	Prepared by	Reviewed by	Authorised by
1		Draft Report	Abbie Wood	Alistair Huntly	

2   Foreword

This document is the State of Nature report for the Eastern Region, covering activities that took place in 2024.

It also reviews the state of nature on the Region's estate and explores whether any insights can be made to determine the Region's trajectory to success.

This report will highlight achievements made in the Region to improve biodiversity. Examples range from work with habitats and species to improving processes and decision making, resulting in tangible benefits for biodiversity.

The Eastern Region is Network Rail's largest Region, with over 6,000 kilometres of track within 15,688 hectares of land. This extensive estate passes through national parks and areas of outstanding beauty amongst other environmentally protected sites; this includes over 60 sites of special scientific interest (SSSI).

The Region's size poses challenges, but also immense opportunity. The Region is taking steps towards understanding this opportunity and is positioning itself to maximise the benefits for biodiversity, not just within its estate, but across the landscape of which it forms a part.

Figure 1 – Eastern Region, broken down into the four different Routes.

3 Executive Summary

3.1 Overview

The Eastern Region is the largest region within Network Rail, passing through National Parks, Areas of Outstanding Beauty and environmentally protected sites, including 56 Sites of Special Scientific Interest. There are approximately 76000 biodiversity units across the Region from which we aim to achieve no net loss and then biodiversity net gain by 2035.

A total of 13 habitat types were recorded, two of which were of 'very high' value, including fen and blanket bog.

The most common habitat by area remains 'sparsley vegetated land' at 58 %, with 'Modified Grassland' at 26 %.

Over the past year the Region has sought to protect and safeguard species including peregrines, willow tits, invertebrates, and hazel dormice; examples are presented in this report.

The Region is now in collaboration with the Wildlife Trusts Consultancies and will deliver ecological support through the partnership. A team structure is in place to embed ecological expertise at both Region and Route levels. A programme of works has been agreed and is underway in which the Wildlife Trust will be/have delivered stakeholder engagement events, a biodiversity inventory, Route Biodiversity Action Plans, Habitat Management Plans and Sectional Asset Plans. These tools will form the Region's plan for its lineside habitats and will help the region in meeting its biodiversity net gain ambitions.

3.2 Summary of ambitions for biodiversity management

We want to be in the position where we understand the biodiversity on our estate. Like all our assets, we want to know what it is, where it is, what health it is in, and we want to have a plan for it. We have started this journey with the help of The Wildlife Trusts by bringing in the resource and expertise to take stock of what we have on our estate and what is around us in the wider landscape. We then want to have systems and processes in place to allow us to make informed decisions and plans for our biodiversity that will lead to meaningful gains. We have started development of our Route Biodiversity Action Plans and Habitat Management Plans created for all four Routes within Eastern Region. Ultimately, this will allow us to be responsible custodians of an important asset, upon which so much depends, at a critical point in time.

3.3   Summary of achievements for biodiversity management

The key to achieving a 10 % biodiversity net gain lies in developing a clear understanding of what this target should look like in practice. To support this, the Region has secured funding for the remainder of the control period and engaged a team of Wildlife Trust ecologists and Engagement Managers. A comprehensive programme is now underway, combining strategic stakeholder engagement with robust data collection to inform opportunity mapping across the estate.

As part of this work, feasibility studies have been completed to identify land parcels suitable for delivering biodiversity net gain and to estimate the associated costs. Importantly, this feasibility assessment has enabled the Region to define its Department for Transport (DfT) biodiversity net gain target in a way that is consistent with industry best practice. This approach provides clarity for Routes, allowing them to plan and budget effectively for delivery.

The methodology underpinning this process is set out in the Region's Biodiversity Strategy, which establishes a transparent framework for decision-making and prioritisation. By embedding this approach, the Region is ensuring that biodiversity net gain is delivered in a structured, measurable, and cost-efficient manner, aligned with both regulatory requirements and national conservation objectives..

3.4   What further action will we take?

In addition to progressing the projects, plans, and initiatives outlined in this report, the Eastern Region will take the following actions over the next year to strengthen biodiversity management and ensure compliance with Network Rail standards:

- Develop Route Biodiversity Action Plans (RBAPs): These plans will set out the Region's biodiversity model, including clear objectives and measurable targets for each Route. RBAPs will provide a shared vision for all disciplines, guiding decision-making and investment to achieve biodiversity outcomes.
- Complete Habitat Management Plans (HMPs): HMPs will cover 100 % of the Region's estate as required by Network Rail standards, bringing the Region into full compliance. Each plan will provide clear, practical instructions for designing detailed site-level biodiversity interventions.
- Produce Biodiversity Asset Plan and Sectional Asset Plan templates: These templates will enable teams to create and hand over plans in a consistent, compliant format aligned with relevant processes and standards.
- Create Intervention Guides: These guides will support teams in selecting best-practice techniques for habitat creation and restoration, ensuring interventions deliver maximum ecological benefit.
- Peer review and publish a Regional Biodiversity Strategy: This strategy will set out how the Region will meet its biodiversity targets, aligning with national policy and Network Rail's long-term sustainability goals.

- Screen land parcels for biodiversity opportunities: The Region will identify priority sites for delivering biodiversity gains, conduct site visits, and prepare plans to achieve CP7 targets.
- Advance biodiversity data management systems: Work will continue to explore solutions for capturing, storing, and interrogating biodiversity data, alongside tools for sharing plans across the business.
- Strengthen partnerships and stakeholder engagement: The Region will seek new collaborations to deliver biodiversity initiatives and ambitions wherever possible.
- Support capital projects and programmes: Provide guidance and resources to help projects plan and deliver biodiversity net gain targets effectively.

4 State of nature in the Eastern Region

4.1 Biodiversity metric calculation for the region

Network Rail's national biodiversity baseline was captured by the Centre for Ecology and Hydrology (CEH), the methods and results of which were published in the first State of Nature Report 2020/21. This was repeated in 2021 but with an improvement to the way satellite data were interpreted, and habitat areas were calculated.

Since the first report was published in 2020, a continuous programme of improvement has changed how data is processed for each new report. As a result, it can be difficult to directly compare findings across different reports. However, each time a change was made, the entire dataset was updated using the same methods. This means that the baseline was adjusted each time, allowing the data within each report to be assessed consistently.

This approach has also been applied in the current report, using an enhanced method of data analysis to resolve previous inconsistencies in habitat classification. Historically, the model often misidentified 12 habitat types (many unique to the railway environment) leading to confusion in reporting. These have now been consolidated into two broader categories: 'Grassland' and 'Sparsely Vegetated'. As a result, the total number of habitats reported has been reduced from 27 in earlier reports to 13 in the 2023 and 2024 editions. Of these, five habitats representing high-distinctiveness broadleaved woodland and forest subcategories were estimated using proportional allocation, bringing the total number of habitats detected by the model to eight. No further changes to habitat classification have been introduced in 2024.

The results for the biodiversity metric calculation are presented in Table 1–2 and Figure 1 below.

4.2 Region habitat types

Habitats are used as a proxy for biodiversity when biodiversity calculations are undertaken. The type of habitat, its condition and its distinctiveness are all considered, together with its significance in the landscape. Certain habitats are known to support more species than others, and it is a habitat's potential to support species (i.e., the biodiversity associated with it) relative to other habitats, which is expressed numerically, as a 'biodiversity unit'. A biodiversity unit is therefore a relative unit of account for biodiversity and not a measure of biodiversity itself.

Habitats are therefore very important to understand the amount of biodiversity likely to be present within a given area and a summary of habitats recorded for the Eastern Region and their associated biodiversity units are presented in Table 1, below.

Table 1: The total areas, Biodiversity Units (BUs) and distinctiveness for each habitat across the time series available.

Habitat	Distinctiveness	2019		2020		2021		2022		2023		2024	
		Area Ha	BUs	Area Ha	BUs	Area Ha	BUs	Area Ha	BUs	Area Ha	BUs	Area Ha	BUs
Other woodland; broadleaved	Medium	1932	15454	1928	15420	2001	16008	2140	17117	2006	16050	1948	15588
Wet woodland	High	20	244	20	243	21	253	23	270	21	253	21	246
Lowland mixed deciduous woodland	High	20	244	20	243	21	253	23	270	21	253	21	246
Upland oakwood	High	20	244	20	243	21	253	23	270	21	253	21	246
Lowland beech and yew woodland	High	20	244	20	243	21	253	23	270	21	253	21	246
Upland mixed ashwoods	High	20	244	20	243	21	253	23	270	21	253	21	246
Other coniferous woodland	Low	87	349	77	309	71	285	65	259	82	326	103	412
Upland Heathland	High	46	556	49	588	46	549	93	1119	13	162	62	743
Blanket bog	Very High	5	83	1	23	4	64	14	227	5	78	2	34

Habitat	Distinctiveness	2019		2020		2021		2022		2023		2024	
		Area Ha	BUs	Area Ha	BUs	Area Ha	BUs	Area Ha	BUs	Area Ha	BUs	Area Ha	BUs
Fens (upland and lowland)	Very High	295	4722	272	4347	211	3375	135	2165	176	2818	192	3080
Ponds (Non-Priority Habitat)	Medium	164	1314	128	1026	98	780	135	1082	104	834	108	868
Modified grassland	Low	3815	15259	3388	13552	2747	10989	2933	11730	4445	17779	4042	16166
Sparsely vegetated	Low	9347	37389	9849	39395	10511	42042	10166	40664	8857	35427	9233	36932
Total		15794	76346	15794	75879	15794	75356	15794	75715	15794	74741	15794	75053

Table 1 above shows that the reported areas for high-distinctiveness habitats, specifically blanket bog and fen, fluctuate in a way that is unlikely to reflect real changes on the ground. In 2024, blanket bog accounted for just 0.01 % (2 hectares) and fen for 1.22 % (192 hectares) of the total area surveyed in the region. Accurately identifying and classifying these habitats at scale remains particularly challenging when working within the narrow, linear corridors typical of national infrastructure. This supports the conclusion that, although the changes in these habitats appear significant, the model's current accuracy level is not yet sufficient to have full confidence in the changes recorded for them.

Woodland remains one of the most biodiverse habitat types recorded across our estate. It is also one of the habitats most frequently subject to active management, particularly where vegetation could impact the safe operation of the railway. As such, woodland is where our biodiversity impacts (both positive and negative) are most likely to be observed. While the removal of woodland may initially result in a reduction in biodiversity, this is often offset over time as the cleared areas transition into other valuable habitats, most commonly grassland. In many cases, past vegetation management has allowed natural succession to take place, with these transitional habitats eventually reverting to woodland over several years, contributing to a dynamic and cyclical landscape.
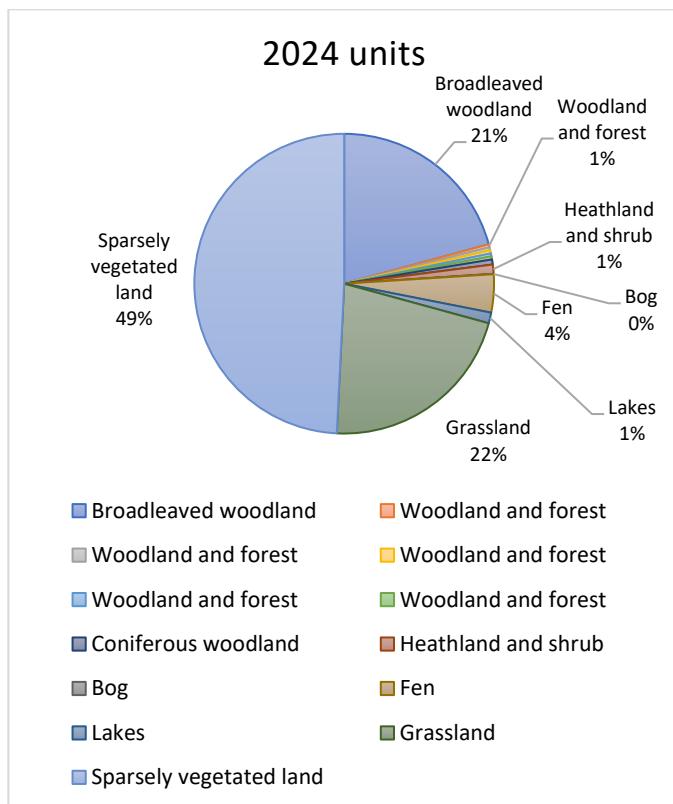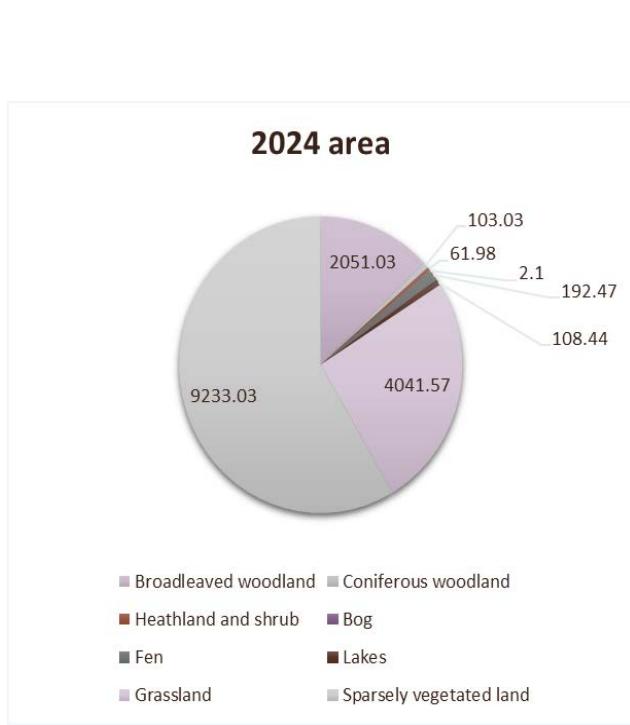
Figure 2: *Piechart showing national habitat proportions and their associated biodiversity units*

The model provides a broad-scale overview of three habitat types that together account for 97 % of all habitats recorded in the region. These are: sparsley vegetated habitats (58 %), modified grassland (26 %), and other broadleaved woodland (12 %). Broadleaved woodland and sparsley vegetated habitats have reduced by 1 % respectively compared to 2023. Modified grassland has increased by 4 %. Although sparsley vegetated habitats cover more than half of the total area, they are considered 'low value' in terms of ecological distinctiveness and contribute only 49 % of the total biodiversity units. This result highlights a clear opportunity for enhancement. By improving the quality and diversity of these widespread but lower-value habitats, there is significant potential to deliver measurable biodiversity gains across the estate.

Table 2: Number of Biodiversity Units (BUs) and the average BU / Ha for each year from 2019–2024.

Year	BUs	Average BU/Ha
2019	76346	4.8
2020	75879	4.8
2021	75356	4.8
2022	75715	4.8
2023	74741	4.7
2024	75053	4.75

While the total area (hectarage) of habitat recorded annually in the region has remained consistent, the associated biodiversity units (BUs) have shown a gradual decline over the time series, with a cumulative loss of 1,015 BUs. Between 2019 and 2022, the average number of biodiversity units per hectare remained stable at 4.8 BU/ha, before showing a decrease in 2023 and a slight increase to 4.75 BU/ha in 2024.

However, the current dataset is constrained by both its limited scale and short temporal coverage. The small sample size and narrow timeframe restrict the ability to draw robust conclusions about long-term biodiversity trends at a regional level. Natural variability and background noise within the data further obscure patterns, making it challenging to distinguish genuine ecological trajectories from short-term fluctuations (see figure 3).
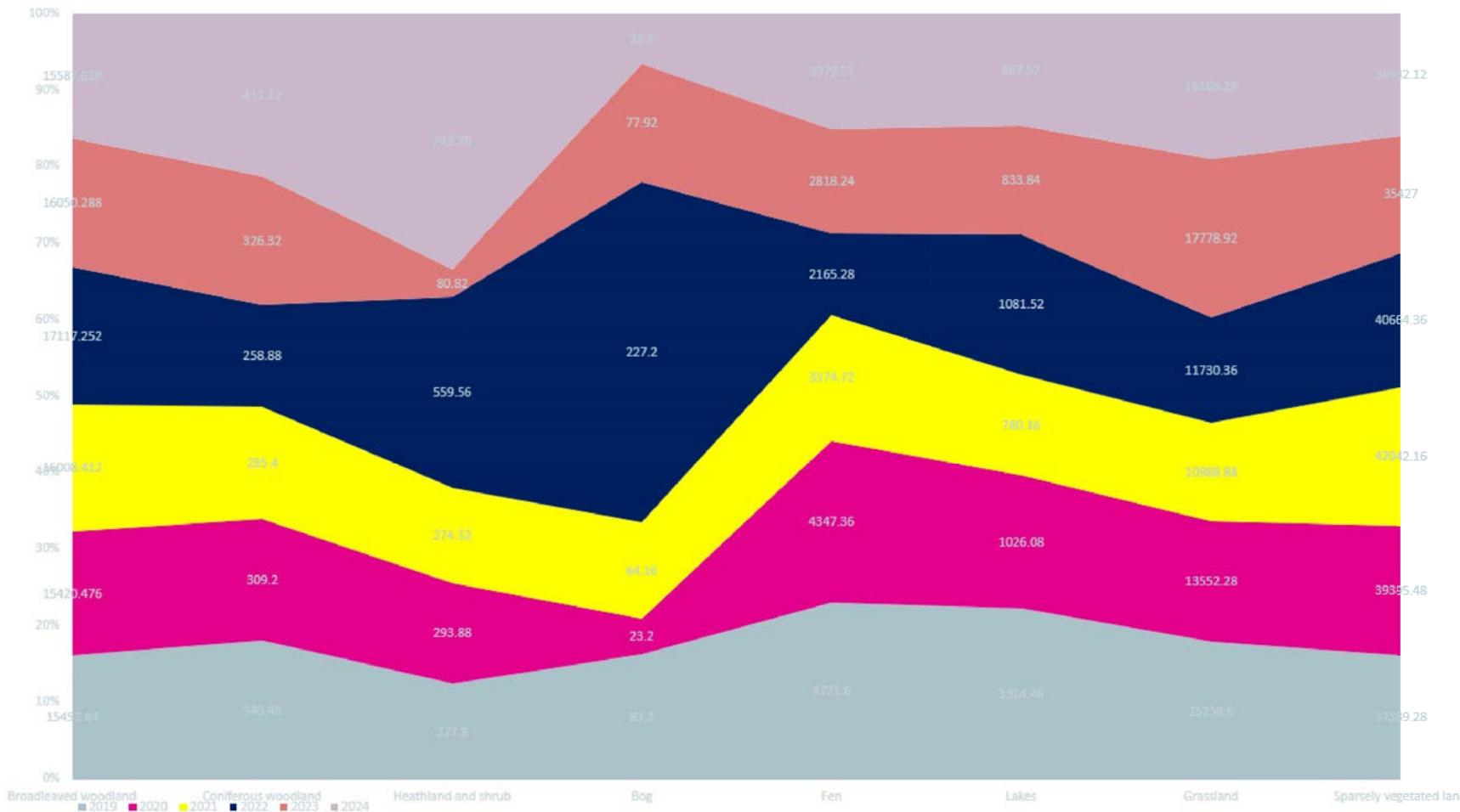
Figure 3: Habitat distribution (biodiversity units) 2019 - 2024

Natural variability and background noise are likely responsible for the variations observed above, underscoring the need for a more comprehensive dataset to support reliable trend analysis.

4.3   Priority species/habitats on the region

The Eastern Region is vast and contains many important species and habitats. Below are some of the important species, species groups and habitats we seek to protect.

Peregrine (Falco peregrinus)

The world's fastest animal calls some of our most iconic structures 'home'. We continue to work with our supply chain, ornithological specialists, statutory agencies, and conservation groups to safeguard these birds, whilst undertaking critical works to maintain our structures.

Invertebrates

Many of our old sidings have developed into Priority Habitats that support National Priority species, such as the dingy skipper (*Erynnis tages*) and small heath (*Coenonympha pamphilus*). We continue to work with conservation organisations and our supply chain to understand how we can safeguard rare butterflies and deliver biodiversity gains in these habitats.

Hazel dormice

The Region continues to work with the Nottinghamshire dormouse group, by facilitating access for surveys to keep track of breeding success and population numbers. This year recorded use of nest boxes by dormice installed in a hedgerow by the group.
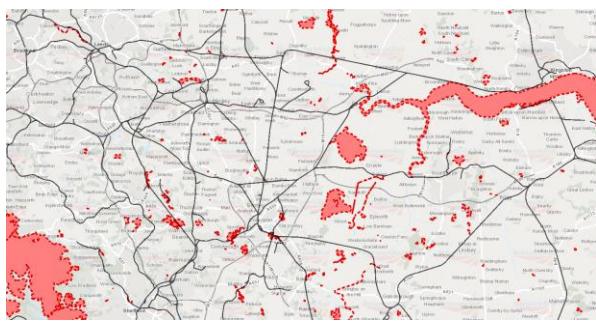
SSSIs

The Eastern Region Environment Team continue to work with Natural England to ensure all SSSIs that exist within our estate have up-to date Site Management Statements. We continue to communicate their importance to the wider business.

4.4   Invasive species on the region

The presence of invasive non-native invasive species (INNS) can only be recorded where identified, most commonly through lineside inspection or survey. This means the true extent of areas infested within our estate and their impact on biodiversity is unknown.

Figure 4. Himalayan balsam on the York Malton Scarborough (YMS) line.

Traditional methods of detection and treatment are currently underway, until better alternatives become available. In the Eastern Region, treatment of INNS is currently focussed on Japanese knotweed (*Reynoutria japonica*) and giant hogweed (Heracleum mantegazzianum). Both plants impact biodiversity negatively and giant hogweed presents a particular risk to people because of its blistering effects on skin. Across the region we continue to manage invasive species and record any occurrences.

5   Priorities for biodiversity management on this region

The Eastern Region Sustainability Strategy and Eastern Region Biodiversity Plan support the national, network-wide delivery of the Network Rail Environmental Sustainability Strategy 2020-2050. In support of the ongoing commitment to be fitting and responsible custodians of the land we own, we are focussed on achieving the target of no net loss in

biodiversity on our linside and delivering biodiversity net gain across the route (by 2035), which included progressing the following priorities:

5.1 Habitat Management Plans

The Wildlife Trust were onboarded in 2023. They are working closely with Eastern Region's Environment Team to determine the best approach to producing meaningful plans for our habitats, across the Region. Habitat Management Plans define the management required for a given habitat type, and where necessary, outlines changes required to existing habitats. They also establish accountability for the habitat within the Route or Region and support asset management requirements.

5.2 Compliance with standard NR/L2/ENV/122 Biodiversity

Improving biodiversity must start with safeguarding what we already have, including when we carry out routine maintenance and improvements works. One of the most difficult challenges we face, is helping our teams understand when this might be needed. This year, we have been working with maintenance teams and asset management to develop processes that will help detect when impacts might occur, so we can upskill teams and provide ecological expertise when needed.

5.3 No Net Loss by 2024 and Biodiversity Net Gain by 2035

Last year, the Region explored the most effective way to identify unused land parcels and assess their potential for delivering biodiversity gains. Using GIS technology, we undertook a feasibility assessment to pinpoint areas best suited for biodiversity enhancement and to exclude those that were not appropriate.

Building on this work, we have developed the outputs of the assessment into a comprehensive Biodiversity Strategy, which now provides a clear framework for planning and prioritisation. This strategy has also supported capital projects by guiding site selection for biodiversity net gain delivery, ensuring alignment with regulatory requirements and organisational targets.

The initiative formed part of a pilot programme (see Section 6.1), which has informed the development of additional tools and processes to be rolled out next year. These tools will enable the business to plan effectively for achieving No Net Loss and Biodiversity Net Gain commitments, embedding best practice and consistency across all Routes.

Looking ahead, these actions will directly support the Region in meeting its CP7 biodiversity targets and fulfilling obligations under ORR reporting, ensuring that biodiversity delivery is measurable, transparent, and aligned with national policy..

6 Case Studies

6.1 TRU Biodiversity Asset Pilot – Designing for successful Handover and Long-term Management

The Regional team worked with the Transpennine Route Upgrade (TRU) to identify plots within the eastern estate where habitat improvements could deliver measurable biodiversity benefits. As the first project to focus on this area, the pilot helped both the project and the Region understand who the key internal stakeholders were (project ecologists, route ecologists, asset engineers, Off-Track Section Managers, Property, and other enabling functions) and what processes needed to be in place for the successful handover of biodiversity assets. This informed teams about the practical requirements for handover: clear ownership, maintenance responsibilities, monitoring plans, funding routes, and a simple, auditable record of what has been created and why.

Three sites were identified and explored as a pilot through joint site visits. Proposed enhancements included treatment of non-native invasive species, removal of diseased trees, thinning fast-growing canopy species, and planting slower-growing species to create a forest-edge structure and improve woodland diversity. Building on these proposals, the work also helped with the design of templates for Biodiversity Asset Plans (aligning asset registers, inspection regimes, and vegetation management schedules) so engineers could plan for the future management of sites in a way that brings projects into compliance with standards governing the handover of assets.

Figure 3: Selby Triangle, one of three plots identified for improvement to deliver biodiversity units.

Figure 4: Selby triangle understory showing evidence of previously managed coppice stools.

The pilot identified how best to link with Property (tenure, access, and consents) and which other parts of the business need early visibility when biodiversity plans occupy parts of the

estate, including Route Asset Management, Safety & Operations, Community & Stakeholder teams, and Supply Chain. Crucially, we also showed how Biodiversity Asset Plans can support local maintenance teams in delivering their vegetation management requirements—providing clear workbanks, species-specific prescriptions, and risk-managed methods that reduce reactive works.

Finally, the project identified opportunities to upskill local teams in habitat restoration techniques. There was a clear appetite to be involved in positive lineside management, helping to shift the narrative away from negative press and towards proactive stewardship of the railway estate. The pilot demonstrates how cross-functional working produces repeatable templates and processes for effective transfer of biodiversity assets from projects to routes.

6.2   Examples of partnership working – Clareborough Tunnel
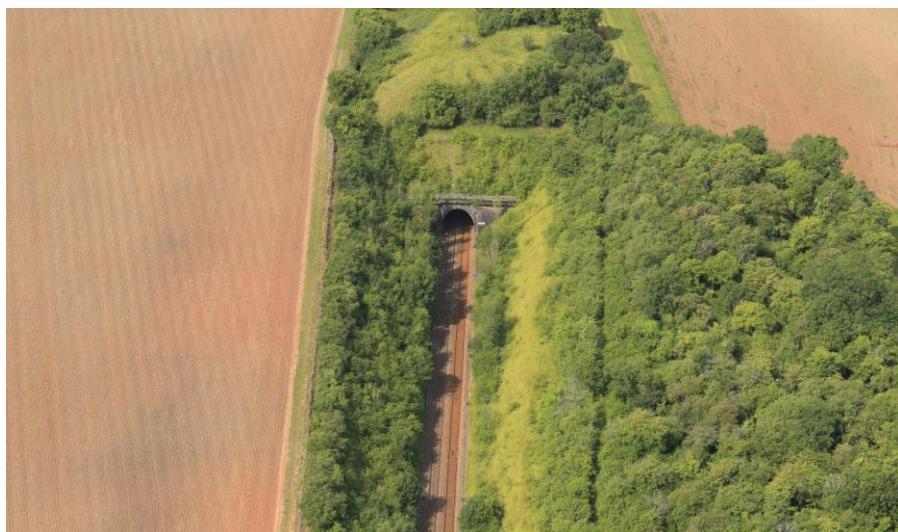
Figure 3: Clarborough Tunnel SSSI (east entrance) a biodiverse 'hotspot' surrounded by arable farmland.

Network Rail partnered with Nottinghamshire Wildlife Trust (NWT) as the most suitable organisation to deliver specialist conservation work at Clarborough Tunnel Nature Reserve. This collaboration was established to secure a five-year management plan for the Site of Special Scientific Interest (SSSI), ensuring its continued improvement and long-term ecological resilience. SSSIs represent some of the most important habitats in the UK, and within the rail estate they act as biodiversity hotspots. These sites provide critical stepping stones that connect the railway corridor to wider landscapes, improving habitat connectivity and supporting species movement across fragmented ecosystems. By

enhancing these areas, Network Rail contributes to a more joined-up ecological network, which is essential for nature recovery.

The project also aligns with Government targets to improve the condition of SSSIs across public and corporate estates. Meeting these targets is a key part of national biodiversity strategies, and this work demonstrates how infrastructure organisations can play an active role in delivering those ambitions. Through proactive management and collaboration with expert partners, Network Rail is helping to secure the future of these designated sites while fulfilling its responsibilities under environmental legislation and policy.

The management plan included traditional management techniques such as sheep grazing, which play a vital role in maintaining the ecological character of the site. Beyond their ecological benefits, these techniques deliver additional social value by keeping traditional land management practices alive and viable, while also helping to preserve rare breed livestock. This approach not only supports biodiversity but also strengthens cultural heritage and rural economies, ensuring that conservation and community values go hand in hand.

Figure 4: Nottinghamshire Wildlife Trust Grazing Officer with a team of herbivores ready to manage the designated site. Photo credit: Agnes Kiemel, Nottinghamshire Wildlife Trust.

Engaging directly with a conservation charity brought significant social value. Nottinghamshire Wildlife Trust provided local environmental expertise, strengthened community involvement, and ensured that management decisions were informed by best

practice. This approach also benefited the local Delivery Unit by working with a trusted local supplier, improving responsiveness to site needs and fostering strong relationships. Additionally, the process offered valuable insights into procurement, showing how appointing the most appropriate contractor—such as a specialist charity—can achieve compliance, cost-effectiveness, and environmental outcomes simultaneously.

The partnership at Clarborough Tunnel sets a strong precedent for future projects. It demonstrates how ecological stewardship can be integrated with operational priorities, delivering benefits for biodiversity, communities, and the rail network. By focusing on SSSIs as key nodes within the estate, Network Rail is not only protecting high-value habitats but also contributing to wider landscape connectivity and national conservation goals. This case study highlights the importance of collaboration, innovation, and strategic thinking in managing the rail estate for nature recovery..

6.3 Examples of Partnership Workiing – Network Rail and the Thames Chase Community Forest

Network Rail was approached by Thames Chase Community Forest seeking land for tree planting. To support this, Network Rail carried out a GIS-based feasibility assessment to identify areas within the charity's remit suitable for planting. This process highlighted several potential sites, which Thames Chase screened against grant criteria, resulting in three key sites being shortlisted. Joint site visits confirmed suitability and allowed Network Rail to allocate these areas for planting, with delivery planned for the 2025/26 season.

Figure 5: One of the sites identified by the feasibility assessment as an eligible candidate for the government grant.

This initiative directly supports Government incentives to increase tree cover, including targets under the Nature for Climate Fund and Trees for Climate programme, which aim to create thousands of hectares of new woodland by 2025. By working with community forests, Network Rail helps deliver these national ambitions while contributing to climate resilience and biodiversity enhancement.

Tree planting also provides a strategic benefit for railway operations. Maintaining a safe and reliable network requires ongoing vegetation management, which can involve removing trees and scrub from sensitive areas near the track. By proactively creating new woodland in appropriate locations, Network Rail offsets some of this necessary clearance work, ensuring that overall tree numbers increase while safety standards are maintained. This approach balances environmental responsibility with operational performance.

Building on the success of this partnership, Network Rail has now applied the same process with community forests nationwide, creating a consistent model for identifying suitable land, accessing grants, and delivering biodiversity benefits. The collaboration demonstrates how strategic partnerships can achieve multiple objectives: supporting national tree-planting targets, enhancing habitat connectivity, and strengthening relationships with local environmental organisations. It sets a strong precedent for future projects, showing how infrastructure and nature recovery can work hand in hand.

6.4 Examples of Partnership Working: Restoring Nature at Colney Heath: Network Rail's Commitment to Great Crested Newts

At Network Rail, we're committed to ensuring that our work supports nature recovery alongside delivering a safe and reliable railway. One way we achieve this is through our partnership with NatureSpace, which provides an equitable and transparent approach to organisational licensing for impacts on great crested newts. This innovative scheme means that when our projects affect newt habitats, we invest in high-quality compensation measures that deliver real, lasting benefits for wildlife.

In 2024, funds paid by our Eastern Region helped to restore a remarkable site at Colney Heath in Hertfordshire, part of the wider Colney Heath Common Local Wildlife Site. This area is one of the county's best remaining examples of acid heathland—a rare habitat that supports a rich variety of plants and animals. Over time, two historic ponds that once formed part of this landscape were lost, filled in during the 1940s to increase agricultural productivity during wartime. Their disappearance reduced biodiversity and disrupted the natural water balance of the heath.

Figure 6: One of the ponds created at the Furzefield compensation site at Colney Heath.

In 2024, funds paid by our Eastern Region helped to restore a remarkable site at Colney Heath in Hertfordshire, part of the wider Colney Heath Common Local Wildlife Site. This area is one of the county's best remaining examples of acid heathland—a rare habitat that supports a rich variety of plants and animals. Over time, two historic ponds that once formed part of this landscape were lost, filled in during the 1940s to increase agricultural productivity during wartime. Their disappearance reduced biodiversity and disrupted the natural water balance of the heath.

Working with Colney Heath Parish Council and Hertfordshire Wildlife Trust, NatureSpace led a sensitive restoration project to re-excavate the ponds without damaging the surrounding heathland. Using historic maps and subtle vegetation clues, the team carefully identified the original pond outlines and restored them to their former glory. This work required careful planning to manage machinery access and spoil removal while protecting fragile habitats.

The results have been outstanding. Within a year of excavation, great crested newt eggs were recorded, confirming successful breeding. The ponds now host rare wetland plants, including bladder sedge and the nationally scarce smooth stonewort, earning them Priority Pond status just three years after restoration. They also provide habitat for other species such as common lizard, grass snake, and water vole, creating a thriving ecosystem that benefits the wider landscape.

By supporting projects like Colney Heath, Network Rail is helping to create and connect habitats beyond the railway boundary. This approach demonstrates how infrastructure organisations can play a vital role in national conservation goals, ensuring that our operational priorities go hand in hand with protecting biodiversity. It's a clear example of

how partnership, innovation, and investment can deliver positive outcomes for both nature and society.

7 Future plans

Over the next year, the Eastern Region will take significant steps to strengthen biodiversity management and deliver on its commitments to No Net Loss and Biodiversity Net Gain (BNG). Building on the foundations laid in previous years, we will implement a suite of strategic actions designed to embed best practice, improve compliance, and support long-term ecological resilience across the rail estate.

A key priority will be the development of Route Biodiversity Action Plans (RBAPs), setting out clear objectives and measurable targets for each Route. These plans will provide a shared vision for all disciplines, ensuring biodiversity considerations are integrated into decision-making and investment planning. Complementing this, we will complete Habitat Management Plans (HMPs) covering 100 % of the Region's estate, bringing the Region into full compliance with Network Rail standards and providing practical guidance for site-level interventions.

To support consistent delivery, we will produce Biodiversity Asset Plan and Sectional Asset Plan templates, alongside Intervention Guides that outline best-practice techniques for habitat creation and restoration. These resources will enable teams to design and hand over biodiversity plans in a compliant and efficient manner.

The Region will also peer review and publish a Biodiversity Strategy, setting out how we will meet biodiversity targets in alignment with national policy and Network Rail's sustainability goals. Further work will include screening land parcels to identify priority sites for biodiversity gains, advancing data management systems to capture and share biodiversity information, and strengthening partnerships with conservation organisations and stakeholders.

Finally, we will continue to support capital projects and programmes, providing guidance and resources to help them plan and deliver biodiversity net gain effectively. Together, these actions will ensure the Region is well-positioned to meet CP7 targets and deliver measurable, transparent outcomes for biodiversity.

Spreading bellflower near Dudley, Central Route.

North West & Central State of Nature Report 2024

Contents

1   Personnel & Document Control

All ecologists should state their membership level of a recognised professional body (e.g. CIEEM, IEMA) alongside their name.

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1.1   Document Control

Version number	Approved by Date	Description	Prepared by	Reviewed by	Authorised by

2 Foreword

This report, for North West and Central (NW&C) region (Figure 1), covers activities that took place in 2024.

It outlines the state of nature on the region's estate and the ambitions and plans we have to protect and maintain its habitats and associated biodiversity. It also highlights key examples of the actions we have undertaken to improve these habitats, and where necessary control undesirable species. The report details how we track this performance and how we are currently performing. Also contained within the report are several case studies and workstreams which demonstrate alignment to our national objectives of achieving no net loss in biodiversity by 2024, and achieve biodiversity net gain of 10 % in each Region by 2035, along with a number of projects planned for the coming years. 2024 was a deadline set by the DfT, for the business to achieve no net biodiversity loss, making this report a key milestone for biodiversity reporting.

Figure 1: Map of NW&C Region

3 Executive Summary

3.1 Overview

NW&C is the Backbone of Britain, the low-carbon spine linking London, Birmingham, Manchester, Liverpool and Glasgow. Through our three devolved routes (North West, Central, West Coast South) supported by Capital Delivery we aim to increase our biodiversity alongside delivering a great service to our passengers, customers and neighbours.

In the previous year, 2023 the total area of habitat recorded in NW&C was 11336.17 hectares which equated to 53381 habitat units. In 2024 the habitat area remains the same but the biodiversity units increase to 53908, representing a 0.9 % increase thus demonstrating achievement of our 2024 no net loss milestone. Case studies included in this report show work completed to meet this commitment and plans for the region to meet its 2035 10 % net gain targets.

NW&C contain a number of habitat types, ranging from very high to low distinctiveness. 11 of these habitat types are reported here with the most common being low distinctiveness sparsely vegetated land which accounted for 59 % of the estate. The second most common habitat type was grassland which accounts for 22 % of the estate. Woodland

3.2 Summary of ambitions for biodiversity management

The NW&C Region covers 4,500 miles of track, linking our main cities of London, Birmingham, Manchester and Liverpool. This region carries over 246.5m passengers a year and is one of the busiest on the rail network. It passes through some of the most picturesque and biodiverse landscapes in Britain.

In 2021 we published our Regional Sustainability Delivery Plan which outlines our ambitions for a lineside managed sustainably for safety, performance, the environment, our customers and our neighbours.

To support the achievement of these ambitions, NW&C is committed to the Key Performance Indicators (KPIs) of:

- Achieving no net loss in biodiversity on our lineside estate by 2024, which we have achieved this year, and achieve biodiversity net gain of 10 % in each Region by 2035. We will monitor our progress with these targets using remote sensing data, and report findings to the Department for Transport (DfT) in an Annual State of Nature (ASoN) reports, such as this.
- Our natural green infrastructure is viewed as an asset not a hindrance managing our land equally considering operation needs, safety and biodiversity net gain-which we will influence by placing sections of lineside estate under habitat management plans (HMPs), when they are scheduled to undergo vegetation management, to keep them compliant with operational standards and requirements. HMPs will ensure lineside habitat and vegetation management is sympathetic to ecological features and addresses ecological risks, while ensuring operational performance can be maintained or improved using processes such as nature-based solutions to adverse weather and climate change risk.

3.3   Summary of achievements for biodiversity management

There are a number of case studies and demonstration sites that have been undertaken showcasing positive biodiverse improvements that have been made within the Region. This has involved actions to conserve desirable species, habitat creation and restoration for biodiversity net gain and field trials of new management approaches.

3.4   What further action will we take?

Future plans will focus on developing a Habitat Management Plan Template with pre-defined logic which directs vegetation management colleagues through a series of questions, data sources before prescribing cyclical habitat management tasks. In addition, we will continue to monitor the successes or failures of our demonstration and pilot sites and share and implement learning across the region. We will continue to quantify the benefits that biodiversity enhancements, or habitat creation can have on operational performance and resilience, as well as any wider societal benefits, such as flood risk alleviation, or the provision of recreational sites. We will also continue to engage with local stakeholders and organisations, such as the Environment Agency, Natural England, Rivers Trusts and other relevant non-governmental organisations and charities, to deliver biodiversity enhancements that deliver benefits at a landscape scale.

4   State of nature on NW&C region

4.1   Biodiversity metric calculation for the region

Table 1 below shows the NW&C Regions habitat data and corresponding biodiversity unit calculations this provides. Within NW&C Region the habitat along the estate is 11,336 hectares in area and equates to 53,908 biodiversity units.

4.2   Region habitat types

Table 1 presents the composition of habitats on the NW&C estate and shows how the habitat types have changed from 2020to 2024. It is also supplemented with data from the preceding years to the 2020 baseline as a further point of reference. The built up areas, gardens and urban types are not a priority for NW&C as they are not habitats that we can improve on and provide low biodiversity units.

This year's habitat data shows that the most dominant habitats on the NW&C estate comprised broadleaved woodland, sparsely vegetated land and grassland. These are broader habitat types with much smaller areas of a further seventeen habitat types making up the overall habitat composition. Our priorities focus on effectively managing broadleaved woodland, which comprises 16 % of the regional habitat, while ruderal (59 %) and grassland (22 %) make up the more widespread but less distinctive habitat types. We aim to manage the operational risk presented by woodland habitat and create a lineside vegetation structure, containing a more diverse structure of habitats to increase the resiliency of the infrastructure while increasing biodiversity. Figure 3 shows the biodiversity units within NW&C from 2024 to baseline the baseline year (2020) have remained consistent, suggesting no net loss of biodiversity between 2024-2020.

Table 1: Regional habitat and biodiversity unit data for 2020 to 2024

Habitat type	Distinctiveness	2020		2021		2022		2023		2024	
		Area (hectares)	Total habitat units	Area (hectares)	Total habitat units	Area (hectares)	Total habitat units	Area (hectares)	Total habitat units	Area (hectares)	Total habitat units
Other woodland; broadleaved	Medium	1528.575	12228.596	1625.439	13003.5096	1831.263	14650.104	1644.2664	13154.1	1755.6224	14044.97
Wet woodland	High	15.7585	189.102	16.7571	201.0852	18.879	226.548	16.9512	203.4144	18.0992	217.19
Upland oakwood	High	15.7585	189.102	16.7571	201.0852	18.879	226.548	16.9512	203.4144	18.0992	217.19
Upland mixed ashwoods	High	15.7585	189.102	16.7571	201.0852	18.879	226.548	16.9512	203.4144	18.0992	217.19
Other coniferous woodland	Low	99.34	397.36	99.74	398.96	88.86	355.44	115.37	461.48	99.3	397.2
Heathland and shrub	High	106.1	1273.2	119.19	1430.28	149.94	1799.28	78.39	940.68	98.15	1177.8
Blanket bog	V.High	5.97	95.52	6.76	108.16	72.2	1155.2	19.34	309.44	4.87	77.92
Fens (upland and lowland)	V.High	6.86	109.76	3.13	50.08	5.62	89.92	3.51	56.16	9.34	149.44
Ponds (Non- Priority Habitat)	Medium	40.6	324.8	27.21	217.68	48.55	388.4	37.76	302.08	37.57	300.56
Modified grassland	Low	2206.03	8824.12	1763.42	7053.68	1698.21	6792.84	2501.41	10005.64	2533.62	10134.48
Ruderal/ephemeral	Low	7295.42	29181.68	7641.01	30564.04	7384.89	29539.56	6885.27	27541.08	6743.4	26973.6
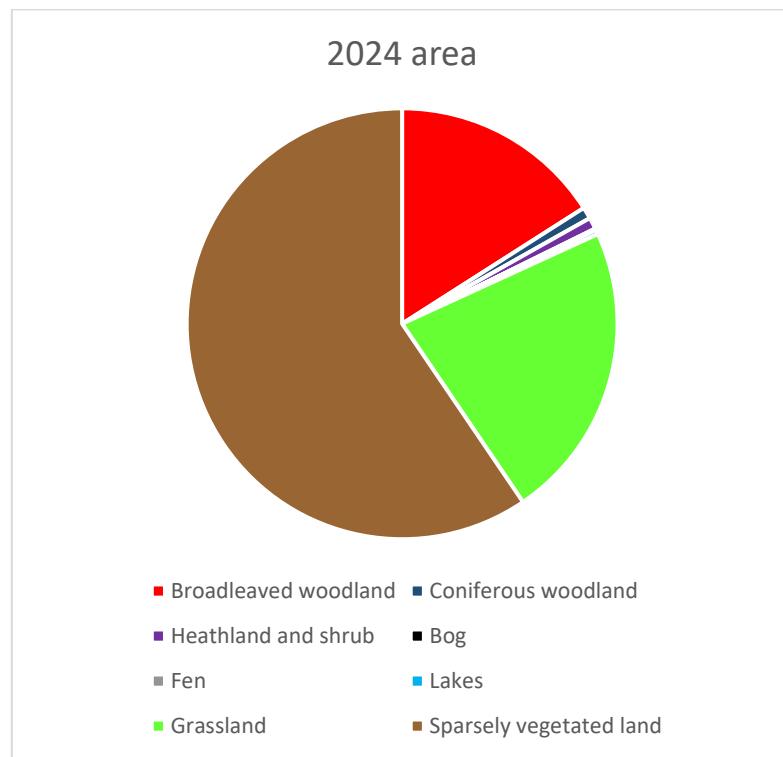
Figure 2: piechart showing 2024 habitat proportions by hectares.
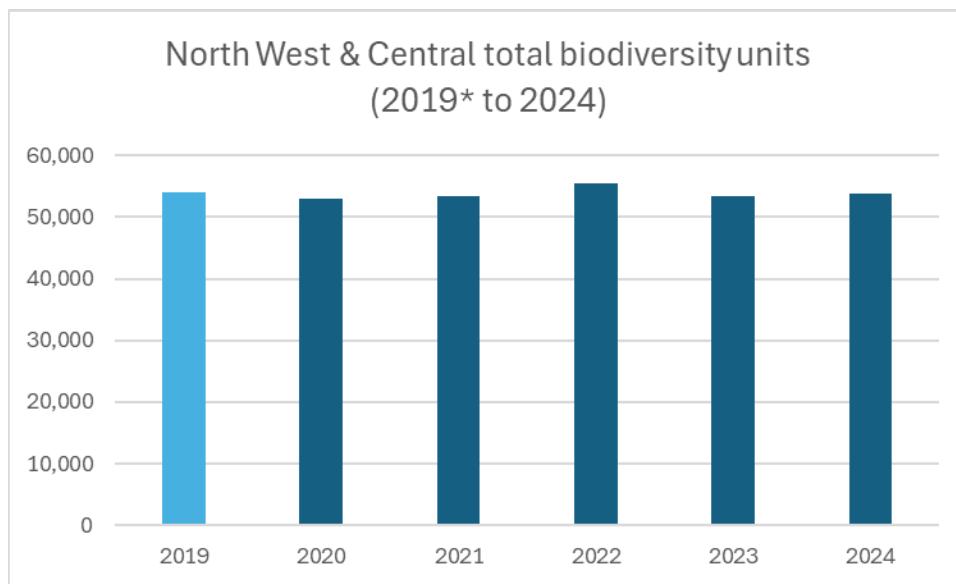
Figure 3: Barchart of habitat units from the 2020 baseline- 2024. 2019 included for statistical analysis.

Broadleaved woodland is one of the most dominant, biodiverse, but also operationally problematic habitats on the estate, often striking trains or infrastructure in severe weather or contacting overhead line equipment where it has grown unmanaged. Broadleaved tree species such as sycamore also cause adhesion issues when leaves fall upon the rails, which can result in further adverse operational impacts. For these reasons, broadleaved woodland often requires the most frequent and labour-intensive maintenance. Despite these problems, where broadleaved woodland is allowed to grow in suitable locations, and is suitably managed, it can connect habitats and allow biodiversity to thrive while mitigating other environmental risks such as flooding and landslips. Where woodland is growing in unsuitable locations, often in locations immediately adjacent to the track or infrastructure, we will often look to replace it, creating larger, improved, and better-connected species rich grasslands or scrub vegetation.

Ruderal has become less dominant since 2020. This likely reflects successional processes as grasses, scrub and woodland establish in the absence of management. More work is required to understand the biodiversity value of this habitat. Opportunities for post work interventions should be explored with the goal to improve this habitats condition or allow it to transition into a more distinctive habitat quicker.

In line with the regional approach of conserving and enhancing biodiversity, whilst maintaining or improving operational resilience, through adoption of nature-based solutions, we will adopt a successional approach to the lineside estate, allowing or creating species rich grassland and scrub close to the railway with hedgerows and trees further away. The implementation of this approach, however, will always remain considerate of other sensitive receptors priority habitats and species, designated nature conservation sites such as SSSIs and invasive non-native species (INNS), discussed in sections 4.3 and 4.4, respectively this will help the region work towards the biodiversity net gain agenda increasing the biodiversity of our estate and improving this in the future.

4.3   Priority species/habitats on the region

NW&C Region contains a wealth of priority habitat types which reflect the wealth of habitats through which the regions rail network intersects. The regional estate therefore contains or runs immediately adjacent to a patchwork of marine, coastal, woodland, grassland, and heathland priority habitats. Figure 4, below, displays a representative example of this.
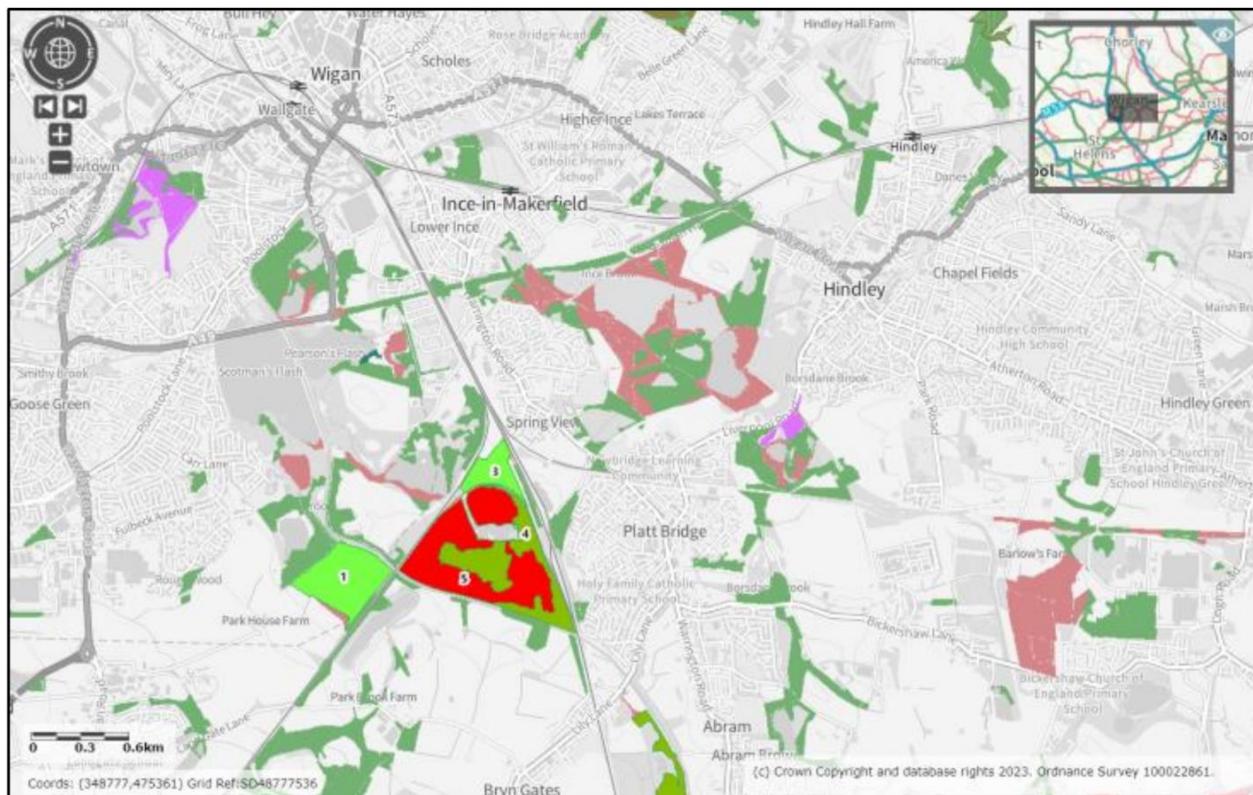
Figure 4: Representative distribution of designated nature conservation sites and priority habitats within NW&C Region

Historically, NW&C Region has had 40 SSSIs, across 7 Delivery Units (DU), which intersect or are located adjacent to the railway estate (Figure 4, above). SSSIs on or adjacent to the NW&C estate are designated for a variety of terrestrial, aquatic, and marine habitats and species, of which the condition varies. We hold site management statements (SMSs) for these SSSIs, which detail arrangements between ourselves and the regulator, Natural England, regarding routine works which can be undertaken without prior assent.

4.4   Invasive species on the region

The region has numerous locations where the lineside is affected by INNS, such as Japanese knotweed, Himalayan balsam, and giant hogweed – see Figure 5 for a representative example of INNS distribution. The presence of INNS present difficulties to internal delivery teams and our supply chain during the undertaking of maintenance and capital works within the region.
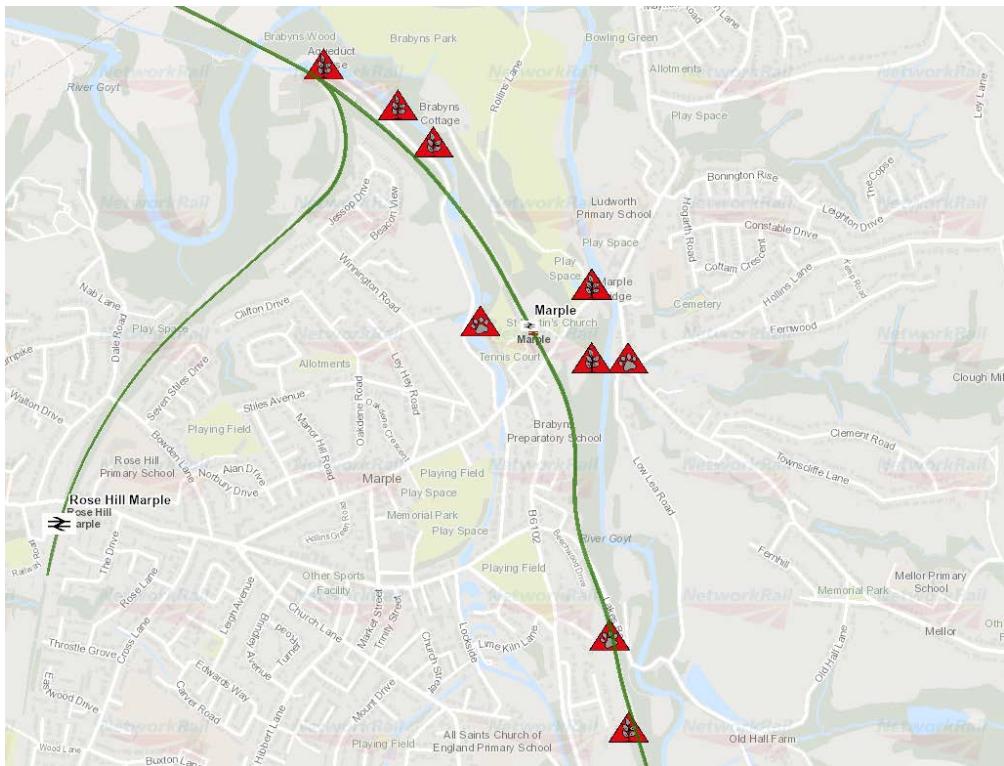
Figure 5: Representative distribution of INNS within NW&C Region

Our regional approach to habitat and vegetation management places emphasis on INNS management. Wherever vegetation management work is planned, an assessment as to the presence of INNS is made. Where INNS are present, and the proposed method of management or habitat structure does not consider them, it is changed accordingly to eradicate or contain the INNS, enabling native vegetation, of the desired type and structure, to establish and thrive.

5 Future work for biodiversity management in NW&C

The priorities for managing biodiversity by the end of CP7 is to focus on delivering 4 % net gain in biodiversity. Work will include:

- Managing future work banks to deliver improved operational performance and the amount and quality of biodiversity, simultaneously.
- Work banks are assessed on the following criteria:
  - o Designated sites such as Special Areas of Conservation (SAC), Special. Protection Areas (SPA), SSSI, or other local nature conservation designations, and their condition,
  - o Protected or priority species and habitats,
  - o INNS

- o Weather attributed Schedule 8 delay minutes and payments,
  - o Any recorded public trespass incursions.
- Where the proposed vegetation management or habitat structure does not consider the above attributes, it shall be altered to consider and be more sympathetic towards biodiversity while delivering and maintaining improved operational performance, such as the implementation of nature-based solutions to address Schedule 8 delays.
- Producing the Habitat Management Plans (HMP) template to be rolled out through the region and adopted by asset engineers and maintenance teams.
- Deliver practical examples of nature based solutions on the railway that deliver operational or cost efficiencies.
- Work with partners to improve habitat both within and outside our boundary.
- Explore the different options for BNG offsetting both on our own land and outside.
- Habitat data monitoring - we shall continue to monitor annual habitat data, to better understand how on-the-ground habitats, and other habitat management, is reflected in actual annual biodiversity figures.
- Where we believe this to be incorrect, we shall work to correct and/or supplement them with site specific biodiversity calculations, to demonstrate that our habitat interventions are, in fact, delivering a biodiversity improvement, that through current data collection methodologies, may currently be classified as a biodiversity loss.

6   Case studies

6.1   Examples of best practice habitat management approaches

We have consolidated much of the biodiversity and habitat management work being undertaken, across both the regional business and Capital Delivery, to define the principles of delivering no net loss and net gain of biodiversity and working towards compliance with the biodiversity standard: The below case studies provide some examples of these workstreams.

Willow scour protection

The Structures Team in the North West Route have been trialling greener options of scour protection. Traditional approaches have involved rock armour, placed stone or gabion baskets which has a greater carbon footprint as well as removing important riverine habitat. Rather than solving the problem these measures often just move the problem

downstream or to the adjacent bank leading to a process of increased canalisation of a natural river.

By using willow spiling the structures team were able to provide scour protection at low cost which provides an environmental benefit. An additional benefit of this measure is that Environment Agency Flood Risk Activity Permits are more likely to be granted quicker and at a lower cost to grey engineering solutions. As much of the regions work bank involve scour issues, applying this technique to other areas of the region will create efficiencies in approval process as well as a lower cost of transporting light willow whips.

There has been concern around using a new technique and it's efficacy compared to more traditional grey techniques. This is being addressed through briefings and reviewing case studies where splining has successfully established and provided scour protection.
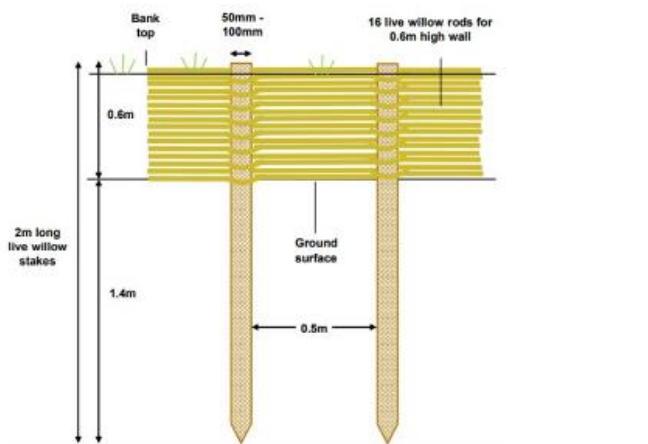
Habitat monoliths and veteranisation

Often arising management involves large scale chipping which smothers ground flora and releases CO2 quicker than when left as whole timber. Works delivery working on LEC 1 on the central route have been trialling different tree management techniques such as veteranisation and monolithing. A number of trees deemed hazardous to operational railway were reduced to compliance before being ring barked to prevent regrowth which may later impact rail. The standing trees were then further damaged to create additional habitat niches. Bird and bat boxes were also fitted to the trees with signs to advise future staff of their purpose.

This technique has multiple benefits:

- Reduces the amount of chipping spread.
- Leaves standing deadwood as habitat for a number of species of birds, mammals and invertebrates.
- Reduces the need for transporting chipping equipment and chippings.
- Locks carbon in the environment for longer

6.2   Examples of partnership working

<u>Roscoe roundabout tree planting</u>

Works delivery at Stockport planted 472 trees with local volunteers. The planting has since undergone follow up maintenance including spot spraying problem species. These trees have been planted to benefit the local community living adjacent to the railway.

<u>M62 Motorway bridge no net loss</u>

The M62 project is a key £22 million initiative by Network Rail to replace the railway bridge at Castleton. Delivered under permitted the project required 19.88 habitat units to deliver no net loss. The reinstatement featured planting of native woodland, wet woodland, scrub, hedgerow and species rich grassland).

The project formed part of an international collaboration between the Japanese Government and the UK Department for Business and Trade, which was jointly funded by

several partners including Network Rail, the Environment Agency and Rochdale Council. The initiative focused on advancing biodiversity enhancements, promoting nature-based solutions in both the UK and Japan, and strengthening supply chain capability.

As part of the program, several sites in Rochdale and Liverpool were visited to share knowledge and practical experience on biodiversity enhancement projects, flood risk management, and the challenges of delivering Biodiversity Net Gain (BNG) within UK policy frameworks. Discussions highlighted opportunities for improvement and explored innovative approaches to nature-based solutions.
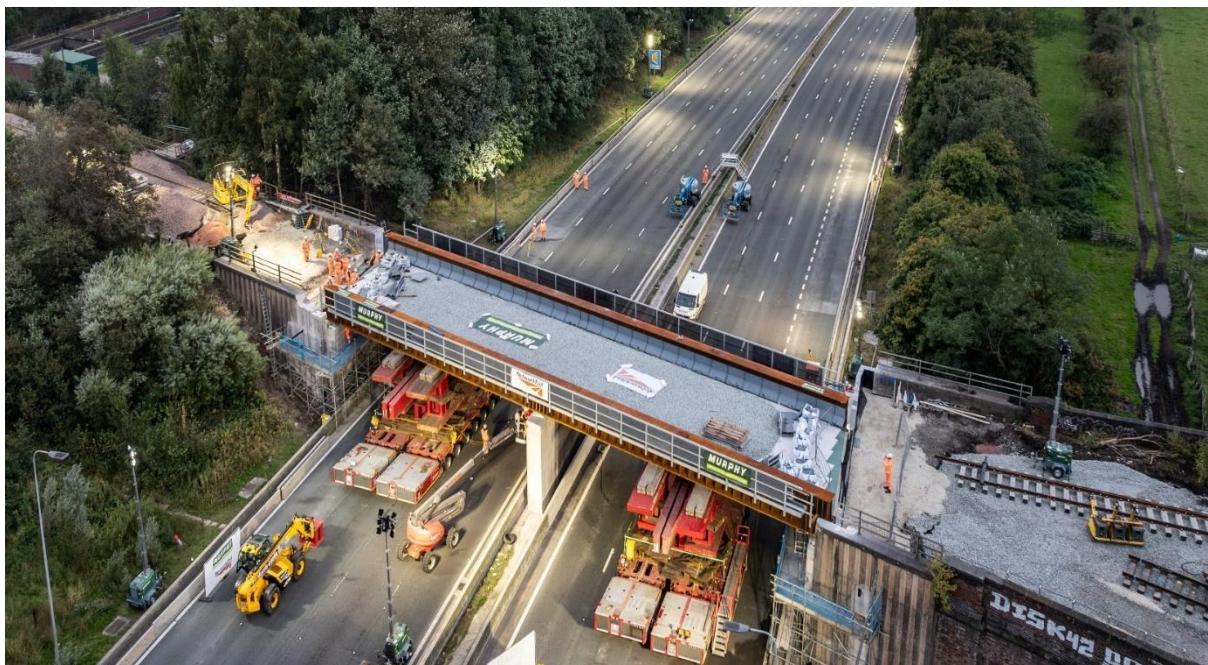
Protected species training frontline staff

The regional sustainability team have been visiting frontline staff in the North West route to brief how they can identify, avoid and mitigate protected species constraints. Over 200 staff members were briefed over multiple days and nights. Engagement was further improved by bringing a local licenced bat carer from the bat conservation trust who was able to display live captive bats who have been injured previously. Following this other DU's across the region have asked for similar briefing exercises. Identification of ecological risks and reporting has also improved.

7 Future plans

7.1 Habitat management plans

To comply with NR/L2/OTK/5201/03, NR/L2/ENV/122/02 and support the delivery of the Biodiversity Action Plan, NW&C Regional Sustainability team is working with DOT regional engineers to produce an automatically populating HMP to be used by maintenance. The spreadsheet has required thought out logic development so it is best able to advice lineside colleagues with little ecological knowledge how to manage lineside habitat to maximise biodiversity and operational compliance. As this template is developed it will be integrated into the regions existing VMS' to provide prescriptions on how created habitat will continue to be managed for biodiversity. Route vegetation work banks will be reviewed and added to the HMP spreadsheet which will provide a list of prescriptions and standard job numbers that can be monitored and recorded for future biodiversity accounting.

7.2   Stakeholder engagement plans for the next reporting period.

<u>Nature Space newt organisational licencing</u>

Following a positive example set by other regions, Nature Space have been commissioned to manage a newt organisational licence for the region. This will streamline the process of completing work where great crested newts are a constraint, allowing us to identify high risk areas and activities before compensating for new habitat creation.

The first year of the licence being used in the region saw uptake by capital delivery and works delivery however there has been no use of the licence within the maintenance disciplines. Future work will involve identifying risk zones and work for DU so they are better able to identify the risk and apply the licence as appropriate.
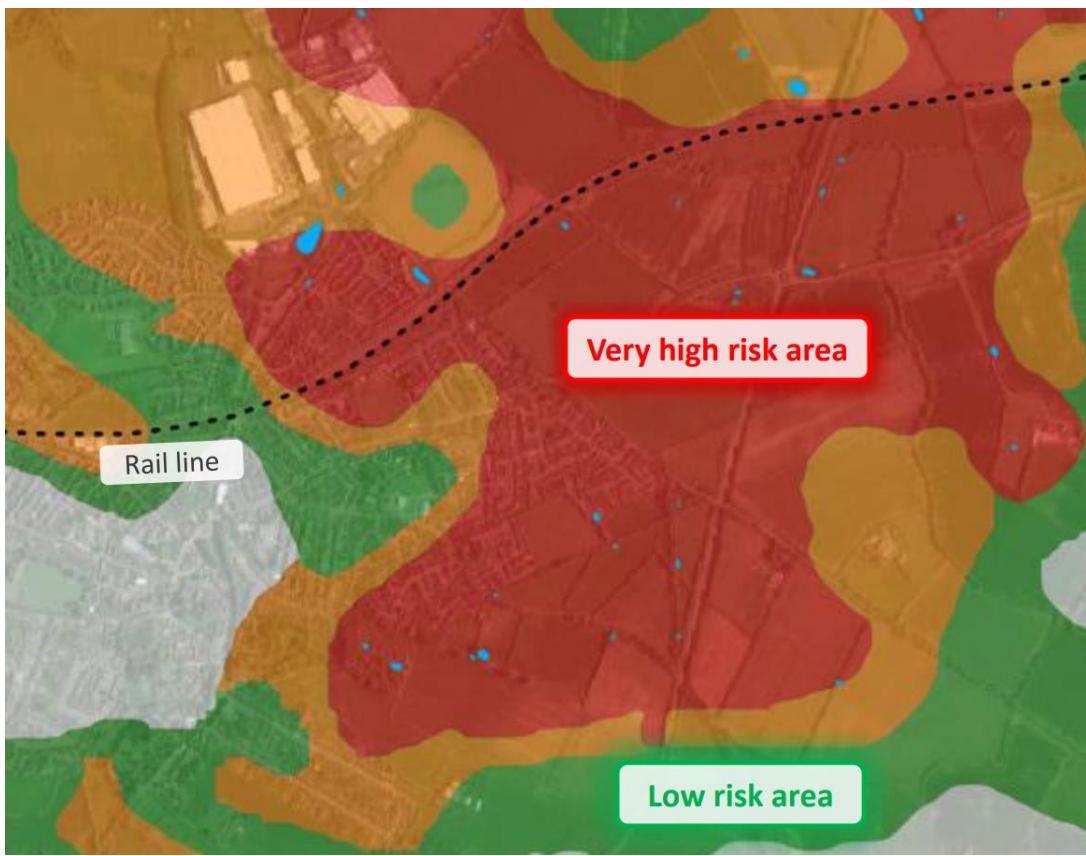
Figure 8: Nature Space risk map showing areas of risk for encountering great crested newts during works.

Network Rail Scotland State of Nature Report 2024

1   Personnel & Document Control

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2   Foreword

This retrospective report, for Scotland region, outlines the state of nature across our estate, covering activities that took place between January and December in 2024.   It highlights key examples of the work we undertook to create and enhance existing habitat on our land, and where necessary invasive non-native species. The report also details our ambition to further improve biodiversity on Network Rail land and beyond.

Figure 1: *Network Rail Scotland region*

3   Executive Summary

3.1   Overview

Scotland's Railway covers a large geographical area from the Borders to Thurso at the far tip of the Northeast of Scotland.

The Scotland route operates through many nationally and internationally designated sites. This includes two National Parks (Loch Lomond and the Trossachs National Park and the Cairngorms National Park), 91 Sites of Special Scientific Interest (SSSI), 32 Special Areas of Conservation (SAC), 25 Special Protected Areas (SPA), 21 Ramsar sites.

Using the UK-Habitats Classification System (UKHab), a survey of the rail network by the UK Centre for Ecology and Hydrology (UKCEH) shows the Scotland region intersects a range of habitats including deciduous woodland, arable and improved grasslands, as well as urban areas. These habitat types and designated sites support a range of species from mammals and invertebrates to plants and fungi, including notable and protected species

such as beavers, badgers, bats, otters, red squirrel, pine martens, amphibians, reptiles, numerous species of bird, and wildflower species.

Like other regions across the network, Scotland's Railway has the potential to act as a vital wildlife corridor by offering connectivity between habitats. We are therefore taking action to protect and enhance biodiversity within our lineside estate that could contribute to reversing an alarming trend of global biodiversity loss.

Scotland records the highest proportion of deciduous woodland land cover of all the Network Rail regions. This type of habitat supports several species of bats and birds, but notably in Scotland this type of habitat supports protected species like the red squirrel and pine marten.

Outside of London, Scotland's Railway operates the largest suburban rail network and provides access along busy commuter routes to our seven cities. Often habitats can be fragmented within these built-up areas, however along the railway corridor we find smaller networks of other types of habitats, like woodland and grassland, which form green corridors. These so-called green corridors facilitate the movement of species within these urban environments providing them with access to resources like food and shelter, meaning the railway has an important role in improving habitat connectivity.

3.2   Summary of ambitions for biodiversity management

2024 was the first full year of Control Period (CP)7 where Biodiversity remains a key priority for Scotland's Railway, and is one of the five key themes within the Scotland's Railway Climate Action Plan 2024-2029. Within this plan, we have an overarching objective to increase biodiversity across Scotland's Railway which is underpinned by a series of milestones and actions. Further detail can be found in our CP7 Biodiversity Delivery Plan.

Some highlights from the CP7 Biodiversity Delivery Plan include a commitment to the delivery of 500 hectares of habitat restoration inside or outside of the boundary. In addition, we are committed to a 4% improvement of our Biodiversity Net Gain (BNG) score and roll out of habitat management plans as per Module 2 of NR/L2/ENV/122. To support these aims we are spending c. £500k each year of CP7 to develop a portfolio of nature-based solutions and habitat restoration projects to deliver throughout the control period. We will also identify at least 10 nature sites within our ownership boundary to manage for the good of biodiversity.

3.3   Summary of achievements for biodiversity management

In 2024, we made significant strides in strengthening our relationships with external parties to deliver positive outcomes for biodiversity both on and off the network. This has resulted in a portfolio of nature-based solutions and development of habitat restoration projects that can support in the delivery of our regulatory targets of the CP. These will be discussed in greater detail in the Case Study and Future Plans sections of this report.

By integrating conservation practices into infrastructure management and fostering partnerships with external stakeholders, these efforts have not only safeguarded habitats but also created new opportunities for wildlife to thrive. From innovative habitat creation and species protection to community-driven planting initiatives, our achievements reflect a holistic approach to environmental stewardship, demonstrating the positive impact of strategic, sustainable actions across the region.

Some of our 2024 achievements include:

- Enhanced relationships with and supported National Trust for Scotland, RSPB Scotland and Forth River's Trust with the replanting over 9760 trees and thorny shrubs. This created around 7 hectares of woodland and 400m of natural boundary.
- Approximately 2 hectares of Rhododendron removal on the MLG2 at Glenfinnan Viaduct and the approach to Beasdale Station where the line sits within Beasdale Special Area of Conservation (SAC).
- Completed Synthetic Aperture Radar (SAR) survey of 3220m of earthworks with beaver presence in the area to identify burrowing risk and gauge the size of the voids.
- Developed a strong portfolio of potential projects and opportunities with a growing list of charities and public bodies to support the CP7 programme. This includes the development work on the Dalmuir wetland with Scottish Canals.

3.4   What further action will we take?

Throughout CP7, there is a rolling programme of land management that will fund habitat creation and nature-based solutions. This work bank will be instrumental in fulfilling commitments outlined within the biodiversity delivery plan; part of Scotland's Railway Climate Action Plan 2024-2029, as well as other commitments to Transport Scotland and the ORR.

This includes enhancing or creating at least 500 hectares habitat, improving our BNG score by at least 4 % and producing Scotland's habitat management plans and ensuring data availability to support biodiversity decision making.

4 State of nature on Scotland region

4.1 Biodiversity metric calculation for the Scotland region

In 2020, the UKCEH, in partnership with Network Rail, undertook a remote sensing survey of the entire rail network across England, Wales and Scotland. This survey produced a land cover map displaying 21 different habitat types found 1km either side of the rail network. The outputs from this survey were then used to calculate a baseline for Scotland region using the Defra 3.0 biodiversity metric, which utilises data on habitat type to calculate the biodiversity value of a particular area.

The UKCEH seeks to continuously improve how it collects and interprets data and each year there have been improvements in the method applied to calculate biodiversity. However, these improvements in the method have resulted in inconsistencies when comparing figures across different years.

To provide the most consistent and accurate assessment of biodiversity units, the same updated approach has been applied to all data from 2020 to 2023. This method uses advanced satellite sensors and AI technology to monitor the extent and condition of habitats across the railway. This process has an overall accuracy of approximately 84 %, based on 31,000 validation points.

One challenge in habitat classification is that some railway habitats are easily confused with similar-looking landscapes in the wider countryside. For example, sparsely vegetated ballast can be mistaken for arable land or inland rock, and different types of tall grassland on railway land can be difficult to distinguish.

To reduce these misclassifications, the UKCEH have refined the approach to habitat classification by grouping certain habitat types into two broader categories:

- Sparsely vegetated (combining classes such as arable land, inland rock, developed land, and coastal habitats)
- Grassland (combining different grassland types, including modified, neutral, calcareous, and acid grassland)

This updated analysis presented the Scotland region with revised baseline figures of a total of 7506.22 hectares of habitat with a value of 38651.73 biodiversity units compared with an original baseline of 7506.23 hectares of habitat with a value of 43,348.18 biodiversity units. The proportion of habitat types found across Scotland are shown in Figure 2.

Since this initial baselining exercise, regional biodiversity units have been provided to the region, from our Technical Authority on an annual basis to identify changes in habitat type, condition and changes in biodiversity units.

The most recent dataset provided for the year 2024 indicates a total of 7506.22 hectares of habitat (a break down is shown in Figure 3) with a value of 38358 biodiversity units. This latest data set indicates a small but not statistically significant decrease in biodiversity units compared with the dataset for 2020 baseline (-0.7 %), as shown in Table 1. This is likely explained by the increased vegetation management activity across the region that will be consistent throughout each year of CP7. There was a significant uplift in biodiversity units in 2022 against the 2020 baseline and a near 5 % uplift from 2021. The reasoning for this uplift couldn't be determined and was almost entirely lost against the baseline the following year in 2023. The most logical explanation is the tool misidentified a portion of habitat as a higher value habitat in 2022 and corrected itself in the next pass in 2023.

Year	2020 (baseline)	2021	2022	2023	2024
Biodiversity Units	38651.73	38140.14	40017.99	38725.11	38358
Total area (Ha)	7506.22	7506.22	7506.22	7506.22	7506.22
% change (from 2020 baseline)	-	-1.3 %	+3.5 %	+0.2 %	-0.7 %

Table 1: *Scotland region biodiversity units 2020-2024*
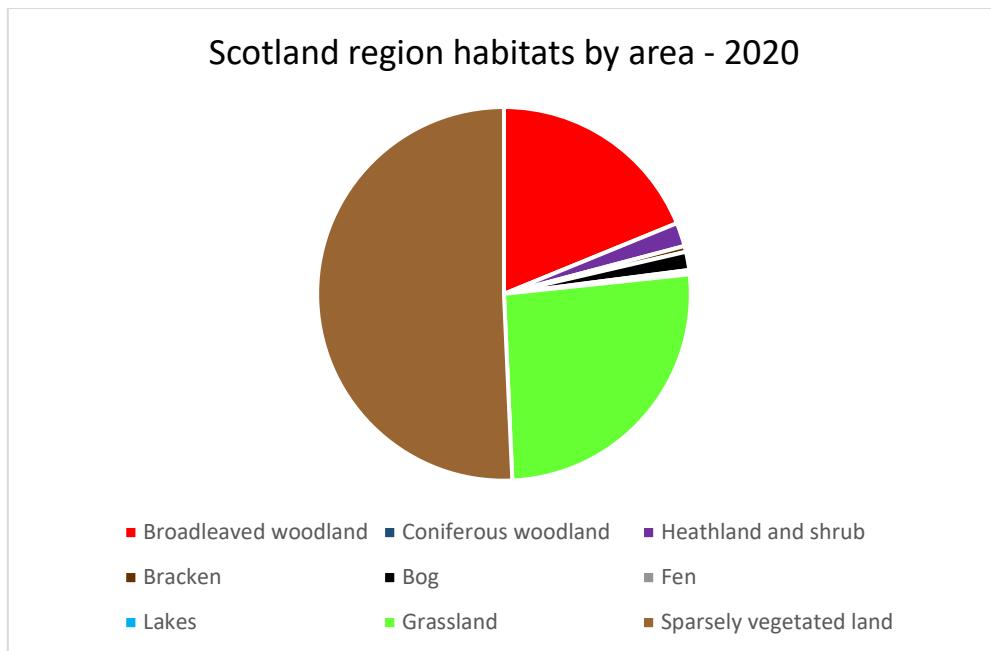
Figure 2: *Proportion of habitat types in the Scotland region in 2020*
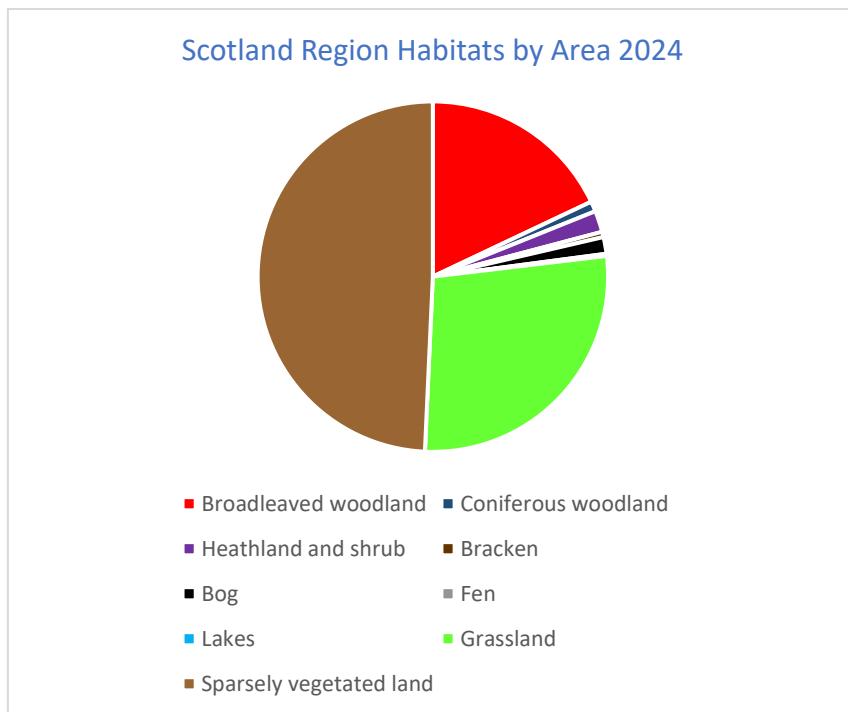
Figure 3: *Proportion of habitat types in the Scotland region in 2024*

4.1.1   Data interpretation and limitations

The updated methodology for 2020-2024 corrects errors from comparing land cover maps across years, which previously caused inconsistencies in habitat classification. It also

improves accuracy by consolidating multiple habitat types into two broader categories, aiding the classification of smaller or mixed habitats.

However, limitations remain. The use of 10m resolution imagery—where each pixel represents a 10m x 10m area on the ground— can miss smaller or mixed habitats, making it harder to distinguish vegetation types and key habitat features. Some details can only be reliably identified through field surveys.

Additionally, the inclusion of a 1km buffer of habitats on either side of the railway makes it challenging to determine which habitats fall within the railway boundary and, ultimately, what is within our control to manage and maintain.

We recognise that the data is still in its early stages, meaning we can currently provide only a high-level snapshot and basic analysis. However, as data accuracy improves over time, we expect to conduct more detailed assessments of habitat changes and further evaluate the biodiversity value across our estate in Scotland.

4.2   Region habitat types

In Scotland, the railway network traverses a diverse range of habitats, each with unique ecological significance. In the West Highlands, the railways pass through extensive montane and moorland habitats, characterised by heather, peat bogs, and rocky outcrops. A section of the railway along the West Highland Line can be seen in Figure 4 located in Rannoch, an area which has international importance due to its significant bog habitat. Similar habitat is found around the Forsinard Flows on the Far North Line. These areas support species such as red deer, golden eagles, and rare plants like the Scottish primrose or Rannoch-rush (*Scheuchzeria palustris*). The peatlands found here are crucial for carbon storage, playing a significant role in climate regulation.

Figure 4: *A section of the West Highland Line located in Rannoch*

Moving eastward, the Central Belt features woodland and grassland habitats. Deciduous forests, dominated by oak, birch, and Scots pine, provide vital habitats for rare and protected species like red squirrels and pine martens.

The grasslands are home to pollinators like bees and butterflies, which are essential for maintaining biodiversity.

In the East and North-East, including Aberdeenshire and the Moray coast, our network expands through agricultural and wetland areas. These habitats are important for bird species such as ospreys, waders, and waterfowl. Wetlands are crucial for water filtration and flood control.

The Southern Uplands are characterised by upland heath and grassland habitats, supporting ground-nesting birds like grouse and curlew.

The railway also connects Scotland's major cities and traverse more urban environments where the habitat is more fragmented, limiting the movement of species. An example of this can be seen in Figure 5, where the railway passes through a predominantly built-up, urban area with grassland scattered around with poor connectivity.

Figure 5: *Section of the railway through the town of Linlithgow*

While these areas are fragmented, they do provide essential green spaces for urban wildlife, and like other regions across the network, Scotland's Railway has the potential to act as a vital wildlife corridor by offering connectivity between these habitats through its lineside.

4.3   Priority species/habitats in the Scotland region

Our railway estate provides habitat which supports an array of priority species considered to be of principal importance for biodiversity conservation in Scotland. Examples of these species include beaver, in which previous efforts to protect this species seen the installation of beaver pass under the railway (the first of its kind in the country).

Our woodland habitat in the region supports priority and protected species like the pine marten, which can be found primarily in the Scottish Highlands in the north and Galloway Forest Park in the south, with numbers increasing across the central belt of Scotland. Pine

marten co-exist well another priority species the red squirrel, which are found across the region in coniferous, broadleaved and mixed woodland areas.

Our lineside also provide favourable habitat and food sources for invertebrate species like the small blue butterfly, which is known to feed of Kidney vetch found on our lineside in both the southwest and northeast of the region.

4.4 Invasive species on the region

There are many invasive plants and injurious weeds found across the Scotland region and we have a legal obligation to prevent them from spreading or causing a nuisance. Invasive non-native (INNS) flora species are a growing problem for the region and our strategy is to manage them, rather than try to eradicate them. We collaborate with neighbouring landowners and other stakeholders, like NatureScot, to ensure efforts to manage INNS are effective as possible.

Each of the four maintenance Delivery Units (DU) in the region: Glasgow, Motherwell, Edinburgh and Perth are responsible for controlling INNS within their area. Information collected on the occurrence of INNS indicates Japanese knotweed, giant hogweed and Himalayan balsam are the most prolific across the region, with all three species recorded in every DU.

Japanese knotweed:

Spreads underground by direct growth of rhizomes (roots) and above ground through the transfer of plant fragments to new locations. Above ground stems can grow rapidly, up to 2m in 30 days, and the plant is able to grow through substrates including tarmac and concrete, meaning it can pose safety and operational issues for the railway. It can also impact our lineside neighbours due to issues when selling property within a certain distance of knotweed on Network Rail land.

Figure 6: Japanese knotweed

Himalayan balsam:

Often found growing along rivers, disused railway lines or in similar linear corridors where it dominates habitats, grows densely and shades out native plants. Plants can produce more than 500 seeds before it dies in the autumn. When the seed pods are ripe, the

Figure 7: *Himalayan balsam*

110

slightest touch causes them to burst open catapulting and dispersing the seeds up to 7m away.

Giant hogweed:

Thrives in any habit, but particularly where soil has been disturbed like riverbanks, derelict land, or railway embankments. Its spread endangers the survival of native plants, and it can harm grazing animals. This plant also poses a health risk to humans, causing severe irritation, swelling and painful water blisters when skin comes into contact with the sap in sunlight.

Figure 8: *Giant hogweed*

During 2022 work was completed to map the spread of INNS across the region and improve visibility of what had been treated. Throughout 2023 we have worked with each DUto improve data accuracy in the reporting tool to identify hotspot areas and assist with more targeted approaches to spraying. This work is ongoing and has been identified as a priority workstream as part of the Scotland's Railway Climate Action Plan 2024-2029 (see Section 5).

4.5 Demonstration sites or projects

4.5.1 Cohabiting with the Eurasian beaver *Castor fiber*

Resident beavers in a wetland area adjacent to the SCM4 near Gleneagles continue to offer us learning opportunities about how this founder population may interact with our network. Beavers are keystone species that create habitat that encourages more species richness in that area and in turn increases biodiversity, natural capital and potential for ecosystem services. For these reasons and many others, NatureScot encourage landowners to learn to live alongside beavers and to use their support to manage any impacts that present. As good custodians of our habitat, this is what we are seeking to do. Previously we have removed dams from a culvert under licence and installed a beaver pass and trash screen to prevent further damage (see photo below). We are derisking the assets but avoiding displacement of the resident beavers. Following a report of a ballast deformity here in in 2024, we commissioned a project to survey the embankments with Synthetic Aperture Radar and LiDAR to identify beaver burrows and potentially the sizer of the voids associated with the burrows.

Figure 9: *Beaver Tunnel near Gleneagles*

The survey was partially successful. There have been issues with the LiDAR data that have prevented a final run of the model and report. The initial findings indicate that the technology will find beaver burrows, but it is unclear at this stage if it can estimate the size of the void, which is a crucial success criterion for Network Rail. It is hoped that the model will be re-run in 2025 and the results can be discussed further in the next State of Nature Report.
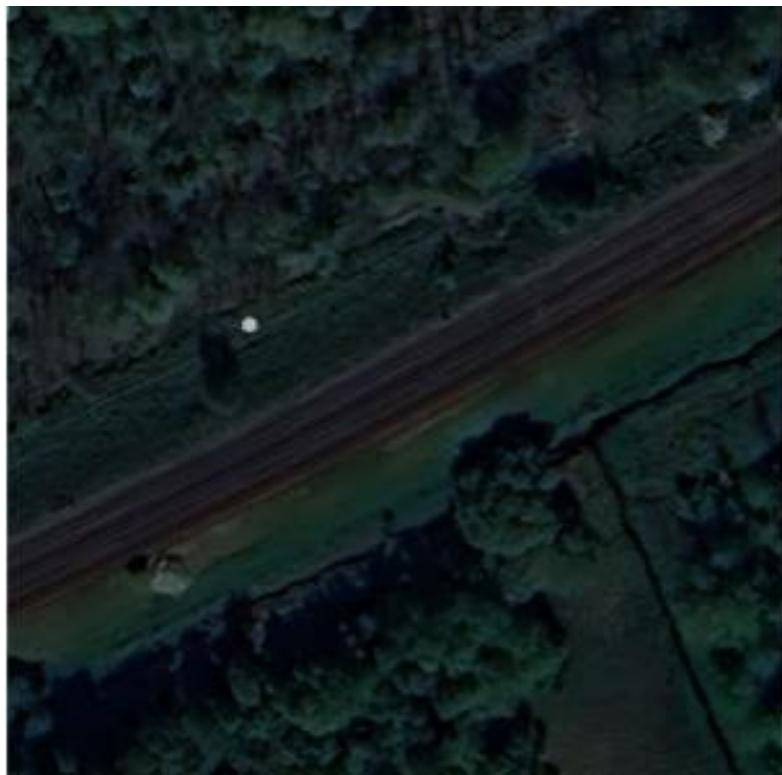
Flight 2

Probable positions of beaver burrow locations

5 Priorities for biodiversity management on this region

Regional priorities for Biodiversity in Scotland are laid out in our Climate Action Plan. The Scotland's Railway Climate Action Plan 2024-2029 was developed through a review of the Scotland Sustainability Strategy, feedback from stakeholders, and benchmarking against public sector best practice. Lessons learned informed significant changes, including reducing the number of themes from 10 to five, of which Biodiversity is one.

Detailed delivery plans for each theme were created by subject leads and refined in workshops with over 100 contributors, culminating in final endorsement from the Scotland's Railway's Sustainability Steering Group and Programme Board. The plan aligns with international, national, and internal policies. Key legislative drivers include the Scottish Government's net-zero target by 2045, the UN's Sustainable Development Goals, and strategies such as the National Transport Strategy. This ensures that the plan not only meets regulatory requirements but also contributes to broader climate and sustainability objectives.

To progress towards this target, our CP7 Biodiversity delivery plan is underpinned by a series of milestones and actions focussed on data availability, habitat creation and

Figure 10: *Burrow identified by SAR Survey (white dot)*

enhancement, the training of our workforce and making biodiversity protection and enhancement a "business as usual" activity" across Scotland's railway.

CP7 Climate Action Plan for Biodiversity

1. Create a system for collecting, storing, analysing and reporting biodiversity data
2. A risk based system for prioritisation of INNS plant sites is made available
3. 500 hectares of habitat is created or enhanced on or off railway land
4. Third parties are actively engaged to promote biodiversity, while creating social value, through activities like tree planting, INNS clearance and vegetation management
5. Routes to Biodiversity capability are established
6. Our supply chain are actively engaged to promote biodiversity improvements through project work
7. The ecological capacity in the region is increased
8. A programme for producing and implementing habitat management plans is established
9. Delivery teams are being assured against Biodiversity requirements

6   Case studies

6.1   Examples of best practice habitat management approaches

6.1.1   Rhododendron control at Glenfinnan Viaduct and Beasdale Station

Rhododendron is a widespread and problematic invasive plant, especially in the western highlands where it was initially used to provide cover for deer in forested sporting estates but is now out of control.   Like any problematic INNS, it is very difficult to treat, especially where it grows on steep rocky hillsides or railway cuttings and embankments. Pre-pandemic, Network Rail had been working with adjacent landowners in these areas and with NatureScot to control Rhododendron. However, INNS control was halted for a period due to the pandemic and as a result the Rhododendron became too large for herbicide spraying and was no longer controllable by the local maintainers due to IRATA requirements to cut and treat the stumps on these significant earthworks.

In 2024, Rhododendron was cut and treated at Glenfinnan Viaduct and on the approach to Beasdale Station. This resulted in two hectares of INNS removal and habitat

improvement at locations where native rainforests are present including Native Pinewoods at Glenfinnan and Atlantic Oak Woodland at Beasdale SAC. Removal of the Rhododendron and subsequent control will prevent impacts to these protected areas and hopefully leave room for the qualifying interests at these sites to infiltrate onto Network Rail land.

This work has improved landowner relations in this area and helped manage the risk of prosecution had there been impacts to the nearby protected areas. It also returns the sites to a state that can be managed by the local maintainers.

Figure 111: *Before (top) and After (bottom) shots of Rhododendron control at Glenfinnan Viaduct (left) and Beasdale Station (right)*

6.2   Examples of partnership working

6.2.1   Forth River's Trust

The Forth River's Trust (FRT) and Scotland's Railway have been working closely as part of FRT's Reviving the Allan Water Project which began in 2020. The project focused on re-naturalising the Allan Water, a watercourse that was canalised over 150 years ago to make room for more farming and the installation of the Scottish Central Mainline between Stirling and Perth. FRT approached Scotland's Railway as a key stakeholder due to the proximity of the work. The work largely benefits the railway as it pushes water away from the network and slows down the movement of water through the Allan

catchment, which has pinch points like Mill of Keir Viaduct that requires frequent inspections during adverse weather and is subject to scour risk.

In 2022 we funded a riparian woodland creation scheme on the Danny Burn, a tributary of the allan water where we planted 2000 trees. In 2024 we did a second phase of habitat creation on the catchment and planted a further 4000 trees using 40 days of Scotland's Railway staff volunteer days as well as creating volunteer opportunities for the wider community, who also get involved.

In addition to the replanting scheme, this partnership lined up two pieces of work for 2025 during which we will be delivering a 200 hectare peatland restoration project above the Allan Water in collaboration with FRT and NatureScot. Further development work is planned in 2025 to ease a weir on the Scoruring Burn, another Allan Water tributary. This could potentially open in 3km of spawning habitat for salmonids.

Our work with FRT is important to us and it not only supports biodiversity but simultaneously delivers social value benefits to by connecting us with the wider community and supporting FRT in its charitable aims.

Figure 12: *Scotland's Railway volunteer tree planters*

7   Future plans

7.1   Habitat management plans

The production of Habitat Management Plans forms a key milestone within the Scotland's Railway Climate Action Plan Biodiversity Delivery Plan, and we will monitor and

report on progress throughout CP7. We will produce an overarching Vegetation and Habitat Management Plan (VHMP) that will serve as an operating manual that determines the broad approach per habitat type on the network. The vegetation management programme will be utilised to gather specific habitat data across that portfolio of work. This data will be used to deliver bespoke site-specific habitat management plans to improve the biodiversity of our lineside. These documents will be created using a bespoke piece of software called ESMapp, which uses ESRI mapping to capture the extent and type of habitat on the network as well as specific records of INNS and protected species and other relevant information such as third party management priorities at a given location.

Habitat data for all sites in the vegetation management portfolio were captured in 2024. These will be developed into detailed plans as ecological resource grows and the ESMapp tool is piloted and suitability confirmed.

7.2   Nature Sites

It is Scotland Region's ambition that 10 Nature Sites are created on the network in CP7. Several sites have been identified for potential use as a Nature Site, including those at Stranraer, Inverkeithing, Carstairs, Irvine and Perth. The proposed sites are located adjacent to the railway boundary and have huge potential for enhancement and for their benefits to biodiversity. We intend to explore these opportunities further with key stakeholders including Bug Life, Forth River's Trust, Fife Coast and Countryside Trust, Scottish Wildlife Trust, RSPB Scotland and Glasgow and Clyde Valley Green Network.

Southern Region State of Nature Report 2024

Contents

1 Personnel & Document Control

All ecologists should state their membership level of a recognised professional body (e.g. CIEEM, IEMA) alongside their name.

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Date	November 2025
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Date	November 2025

1.1 Document Control

Version number	Approved by Date	Description	Prepared by	Reviewed by	Authorised by
1	24/11/2025	First Draft	Hazel Holt	Karin Skelton	Sarah Borien

2   Foreword

This report, for Southern region, covers activities that took place in 2024 (January to December).

It outlines the state of nature on the region's estate and the ambitions and plans we have to protect and maintain its habitats and associated biodiversity. It also highlights key examples of the actions we have undertaken to improve these habitats, and where necessary control undesirable species.

Figure 1: *Southern Region*

3   Executive Summary

3.1   Overview

Southern Region owns a total of 7,832 hectares of habitat with a baseline value of 38,902 biodiversity units. Three habitat classes dominate our region: sparsely vegetated land (a new consolidated category including widespread bramble scrub); grassland; and broadleaved woodland. Of these, woodland has particularly high value and potential for habitat connectivity opportunities in the landscape. Southern also has smaller areas of nationally important heathland and wetland habitats.

Southern has direct management responsibility for 102 Sites of Special Scientific Interest (SSSI) / European protected sites. In addition to this, there are 700 non-statutory protected Local Wildlife Sites wholly or partially in Southern's estate. Biological records have been obtained showing that hundreds of protected or priority species use Southern's lineside habitats. Proactive conservation action is taken in the Region for a number of these species, including the hazel dormouse, smooth snake, rare sand lizard and great crested newts.

3.2   Summary of ambitions for biodiversity management

Southern has a comprehensive biodiversity programme, with a range of innovative projects and priority initiatives in place to deliver improvements against biodiversity objectives and targets. We play our part in tackling global habitat loss by protecting and enhancing wildlife and providing nature-based solutions to managing our land and for climate resilience. We are committed to delivering a net gain in biodiversity and working with local stakeholders to create greater wildlife connectivity, leaving our land in a better state for tomorrow than we found it today.

There are two nature-related workstreams in the Southern Region CP7 Sustainability Plan. These are:

	CP7 Targets
Protecting wildlife and nature and sensitively managing species and habitats	• 100 % of Network Rail Southern Land is covered by a Habitat Management Plan by end of CP7 • 1 State of Nature report published annually

Enhancing biodiversity and delivering nature-based solutions	• 4% increase in biodiversity on Network Rail Southern Land • 1 Nature Recovery Network partnership established per route • Increase in nature-based solutions implemented to address asset performance challenges

3.3   Summary of achievements for biodiversity management

Key management and infrastructure activities that have had impacts on biodiversity include a focus on collaborative working to integrate biodiversity management across different functions within Southern Region. A cross-functional steering group has been set up to progress the development of habitat management plans and biodiversity net gain, and a separate sustainability meeting has been set up with the Property team to explore ongoing opportunities for delivering biodiversity enhancements. Outside of Southern Region, we have collaborated with Eastern Region to develop a template for lineside habitat management plans which once finalised, will be an automated template for managing specific sections of the lineside environment.

Seven additional locations with biodiversity opportunities in the region were identified and have been incorporated into the Railway Nature Site portfolio increasing the number of Railway Nature Sites in Southern to 57. Railway Nature Sites have been allocated across Southern region to demonstrate not only our commitment to biodiversity enhancements and habitat management, but also to explore opportunities of linking the the biodiversity and social value programmes to achieve beneficial outcomes for both. As part of a habitat enhancement programme for the Railway Nature Sites, invasive species were removed across 8 sites.

In terms of protecting existing lineside environments, the Southern Ecology team has produced a region-wide approach to the Habitat Regulations Assessment for all planned maintenance activities as well as a mandatory regional process for SSSI compliance (See Section 5).

Southern has also continued to engage with external stakeholders through discussions with developing Local Nature Recovery Strategy Partnerships as well as our ongoing partnership with the Tree Council and Naturespace.

3.4   What further action will we take?

Southern will continue to develop the workstreams already in progress. Biodiversity Net Gain will remain a key priority with implementation of our BNG strategy. There will be a focus on monitoring the impacts to habitats from our cyclical vegetation management through our maintenance activities, as well as ongoing reporting from our Capital Works (renewals and enhancements).

Habitat Management Plans (HMPs) will be developed on two levels:

- regional level HMPs focusing on the main habitat types across Southern
- site specific plans for priority habitats which includes our Railway Nature Sites and legally protected sites such as SSSIs.

For our Railway Nature Sites, we will be undertaking baseline surveys including biodiversity accounting to inform the development of HMPs. This will help us to develop a habitat enhancements programme for Year 3 onwards to support the BNG target.

A new focus will be to explore opportunities to implement nature-based solutions on Capital Works schemes with a particular focus on supplementing engineering solutions by using nature to alleviate flood risk on our infrastructure.

Finally, we will continue to build on existing partnerships with external stakeholders such as the Tree Council and Zoological Society London as well as exploring new opportunities through the Local Nature Recovery Strategies (LNRS) and how these can be integrated into our developing Habitat Management Plans.

4   State of nature on Southern region

4.1   Biodiversity metric calculation for the region

A baseline register of the habitat classes in Southern Region's network and their spatial extent was created through the processing of satellite images in 2020 (by Network Rail nationally). This identified 16 habitat classes in the Southern estate. The 'statutory metric' – a government-developed tool for measuring Biodiversity Net Gain – was used to calculate the value of the habitats present in the Region at baseline (2020), measured in 'biodiversity units'.

It should be noted that the national data analysis is not sufficiently accurate to inform detailed understanding of Southern's habitats; for example, scrub habitats, which are extremely widespread in Southern, are not differentiated or visible in the national data. However, by applying consistent analysis each year, the data is expected to show a useful indication of likely change.

In 2024, the re-assessment of habitat satellite imagery measured the value of Southern's habitats as **39,757** biodiversity units. This demonstrates there has been no statistically significant change in the data and therefore Southern has met its target of no net loss of biodiversity by 2024.
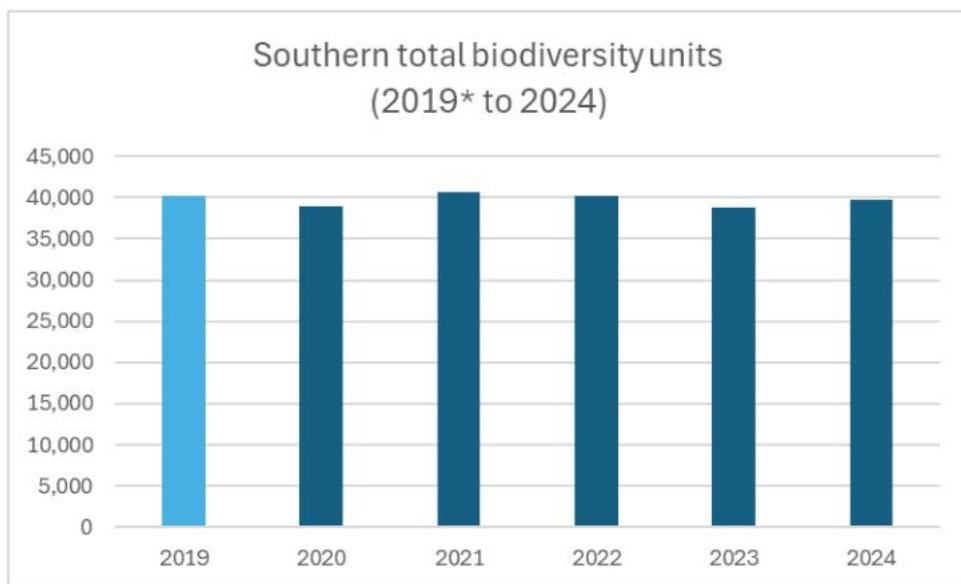
Figure 2: *Bar chart showing the total biodiversity units over the period 2019-24. NB: There is an asterisk on the title to remind that the 2019 data is included as it was used for the statistical analysis. The baseline year is 2020.*

4.2   Region habitat types

According to the national satellite data analysis, three habitat classes continue to dominate across Southern's estate: sparsely vegetated land, which is likely including the widespread bramble scrub habitats, grassland and broadleaved woodland.

Biodiversity Units, per year					
Habitat type					2024
Sparsely vegetated land	16,448.96	17,297.44	17,954.84	15,719.76	15590.12
Grassland	8,426.92	6,254.32	5,637.56	8,688.56	8268.36
Broadleaved woodland	7,291.92	9,390.32	9,326.24	8,772.72	9095.28
Fen	3,388.00	3,066.40	1,655.04	2,179.68	2790.08
Heathland and shrub	1,775.52	3,383.88	4,041.36	1,948.44	2400.48
Coniferous woodland	1,163.80	1,050.68	993.36	1,140.40	1235.12
Lakes	406.48	271.12	635.92	396.48	377.6
Total	38901.60	40,714.16	40,244.32	38846.04	39757.04

Table 1 Breakdown of habitat types/biodiversity units in Southern region

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Records from Local Biological Record Centre data, shows that 186 Sites of special Scientific Interest (SSSI) are present within the search area (500m from the running rail). Of these 102 directly interface with the Southern railway boundary. 56 % of these sites are in Wessex Route, with 25 % and 18 % in Kent and Sussex Routes respectively. 101ha of these sites are also designated as European Special Areas of Conservation and Special Protection Areas. In addition to this, there are 700 non-statutory protected Local Wildlife Sites wholly or partially in Southern's estate.

Scrub, an extremely prevalent habitat in Southern's lineside, is a transition state between grassland and woodland and provides vital food and shelter to a diverse range of animals and pollen and nectar sources for insects.

Lowland deciduous woodland is widespread in the Southern estate and is a UK priority habitat providing many crucial ecosystem functions, supporting a large range of species including priority species such as bats and hazel dormouse. Deadwood and veteran trees support many species. According to habitat connectivity analysis

undertaken by Network Rail, woodlands along Southern's railways offer significant value for improving habitat connectivity in the landscape.

Railside grasslands are home to a wide variety of plants and animals and provide important connectivity and habitat 'mosaic' functionality for wildlife. Almost half of all the protected sites in Southern's estate are (partly) designated for their grassland habitats.

Lowland heathland is another UK priority habitat in Southern, primarily in the Wessex Route in nationally protected areas such as the New Forest National Park and Dorset Heaths. Southern also has small areas of important priority wetlands, particularly fen and marsh habitats in the Kent Route, in the Dungeness, Romney Marsh & Rye Bay and Stodmarsh protected site areas.

Figure 3 below show the extent of habitat area in Southern in 2024:
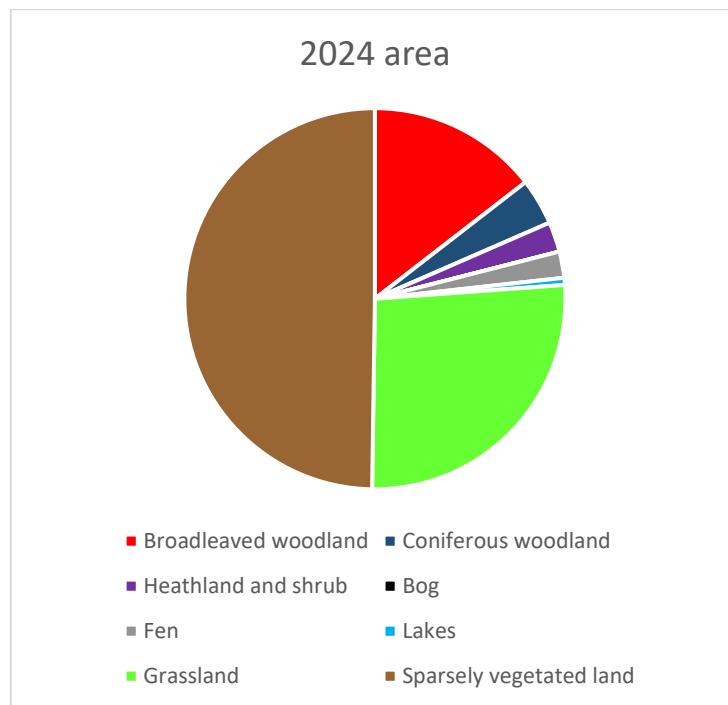
Priority species/habitats on the region Southern's rail corridor is a vital asset for conservation, as confirmed by the last 10 years of Local Biological Record Centre data covering the 500m from the running rail. Records show the presence of all 6 Protected Terrestrial Mammals (otter, beaver, badger hazel dormouse, pine marten and red squirrel), 16 bat species (including the rare Lesser Horseshoe and Bechstein's bats), and a total of eight reptile and amphibian species (including six reptile species like the smooth snake and sand lizard). Additionally, the area's ecological importance is highlighted by the

presence of 36 Schedule 1 protected bird species, such as the Red Kite and Peregrine Falcon.

In Southern Region, using the Great Crested Newt Organisational licence managed by Naturespace, 32 renewals/enhancements projects were authorised to work under the licence. These projects impacted a total of 28.9ha of GCN habitat across the region, 5.3ha of which were good quality GCN habitats (grassland/scrub/woodland). As a result of our partnership with Naturespace and to address these impacts, 0.6ha of high quality GCN habitat has been created by the Newt Conservation Partnership as part of a landscape-level conservation strategy. These habitats will be managed and monitored for at least 20 years.

4.3   Invasive species on the region

Invasive non-native species of plants and animals are found throughout the Region and pose a significant challenge to biodiversity and operational management. There is a legal requirement to not facilitate the spread of such species, but the majority found on the railway are widespread and complete eradication from the Southern estate is not feasible.

In Southern the principal plant species of concern and control effort for biodiversity protection continues to be Japanese knotweed, Himalayan balsam, rhododendron and buddleia, which are all invasive non-native species which out-compete other plants and pose threats to wildlife and the safe management of the railway. Additionally, giant hogweed and ragwort are managed as harmful or 'injurious' species respectively (ragwort is native but is deemed to require control as a threat to farming productivity).

(See section 6.1 for a case study on invasive species removal)

4.4   Demonstration sites or projects

4.4.1   Kent Habitat Management Pilot

The Kent Habitat Management Pilot has continued with the ongoing trial of a series of Habitat Management Techniques across 69 lineside sites. In 2024, all sites have had further monitoring to continue analysis of any trends/findings. The findings to date have also been peer reviewed by ZSL to help us ensure the ongoing success of the pilot. The outcome of the 2024 review will be finalised in 2025 to determine next steps for this programme and that the learning is embedded into future management of lineside habitats.

5 Priorities for biodiversity management on this region

Southern's strategic priority is to deliver against our CP7 objectives of:

- Protecting wildlife and nature and sensitively managing species and habitats
- Enhancing biodiversity and delivering nature-based solution

Aligned to these outcomes, and to managing and improving habitats and biodiversity across Southern region, our delivery priorities included:

- Delivering no net loss by 2024 and achieving biodiversity net gain by 2035. Our regional strategy (updated in 2024) sets out the steps for how we will achieve this through detailed habitat mapping and development/implementation of habitat management plans.
- Creation of 7 additional Railway Nature sites across the region. These continue to be areas of lineside or underutilised land with existing or potential value for biodiversity. The additional sites have been secured through Business Strategy Clearance. A number of sites have been subject to works to remove invasive species (see section 6.1)
- To reinforce environmental stewardship and manage statutory obligations, particularly those listed under the Wildlife and Countryside Act 1981, Southern undertook a major Site Management Statement (SMS) review in 2024. This initiative conducted a comprehensive gap analysis that reviewed both SSSI interfacing the railway infrastructure (within or within 10m of the boundary) and the existing SMS template to make regional improvements. The analysis was essential to identify sites requiring a new or updated SMS. An SMS is critical because it represents a pragmatic, regional approach adopted and improved by Southern, providing robust guidance to enable maintenance teams to carry out necessary works sensitively. The document lists generic and site-specific control measures to comply with statutory obligations. This ensures that critical maintenance, that meets the requirements set, can be undertaken while proactively accounting for ecological receptors and seasonality, which enables routine work to proceed without the need for a formal assent from Natural England. Although the SMS is no longer legally mandatory, Southern region has proactively embedded it as an internal process to ensure continuous, best practice management of its operational interface with over 100 nationally important

ecological sites. The programme, which is subject to ongoing updates, is now focused on completing all outstanding SMS reports.

- To ensure full compliance with the Habitats Regulations, Southern region commissioned a comprehensive, region-wide program of Habitats Regulations Assessments (HRA) for all planned maintenance activities impacting European Designated Sites. This extensive piece of work was strategically segregated by route, resulting in dedicated Appropriate Assessment (AA) reports for the Kent, Sussex, and Wessex routes. This proactive, regional undertaking is a significant step, progressing all required sites to the AA stage to demonstrate due diligence and secure legal compliance. Each route-specific report provides a complete HRA framework, detailing both the necessary assessment and the specific mitigation measures required to avoid or minimise potential negative impacts on protected sites, ensuring responsible environmental stewardship alongside operational needs.

6 Case studies
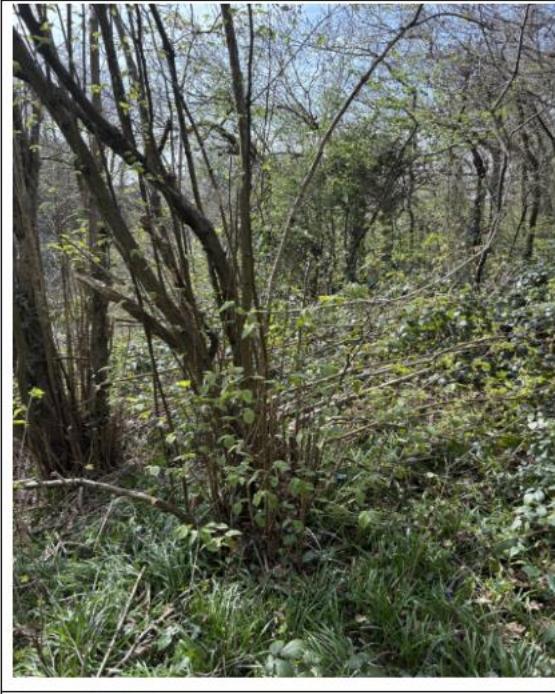
6.1 Examples of best practice habitat management approaches

As part of our Railway Nature Sites programme, habitat enhancement was undertaken at 6 sites, focussing primarily on control/removal of undesirable species such as rhododendron and buddleia as well additional enhancements to improve sites for biodiversity.

At Western Junction, buddleia was removed and Virgnia Creeper (*Parthenocissus quinquefolia*) a Schedule 9 species was treated. Woody vegetation was untouched wherever possible and habitat piles were created from arisings.

	Picture 1	Starting to clear the buddleia in the area
	Picture 2	Many new habitat piles created throughout the triangle.

At Wivelsfield Railway Nature Site, 12 groups of buddleia was removed and stacked to create habitat piles and a total of 11 bags of litter were removed from site. In addition, 30 % of Hazel (*Corylus avellana*) was laid, increasing connectivity and promoting new growth with a natural hedge laying technique.

	Picture 4	Implementing a rotational woodland management practice will ensure more growth and more food for the woodland's inhabitants.
	Picture 3	Two examples of live hedge laying as shown in pictures By using special techniques and working with great care, COOMBES has significantly increased woodland connectivity through features such as live hedge laying.

6.2   Examples of partnership working

Southern regions ongoing partnership with Naturespace who manage our Great Crested Newt Organisational Level Licence is part of our ongoing commitment to work with key stakeholders to create habitat across the landscape. As part of our partnership, Southern Region has committed to supporting the creation of high-quality clean water ponds connected by suitable terrestrial habitat, creating a network of favourable habitats where

newt populations can thrive. For every pond occupied by great crested newts that is lost through development, Naturespace create or restore at least four high-quality ponds, ensuring suitable surrounding terrestrial habitat is in place and will monitor the sites for at least 20 years.

Across the areas in which Naturespace operates the District and Organisational Licensing Schemes (including outside of Southern region), hundreds of clean water ponds have been created or restored for great crested newts, and great crested newts have already been recorded in 84 % of compensation sites created through the scheme. All of this is delivered by Naturespace's partners at the Newt Conservation Partnership in collaboration with numerous landowners and managers across the regions, informed by expert advice and guidance from the Million Ponds Project Toolkit and Amphibian Habitat Management Handbook.

7 Future plans

7.1 Habitat management plans

In order to meet our regional target "100 % of Network Rail Southern Land is covered by a Habitat Management Plan (HMP) by end of CP7", the development of these plans will continue to be a priority into 2025. Habitat Management Plans (HMPs) will be developed on two levels:

- regional level HMPs focusing on the main habitat types across Southern
- site specific plans for priority habitats which includes our Railway Nature Sites and legally protected sites such as SSSIs.

Detailed habitat mapping will be undertaken across Southern Region using satellite technology and AI. This should provide Southern Region with more detailed habitat assessments and therefore a more accurate biodiversity accounting baseline. This data will be used to complement the mapping provided by CEH and to help us prepare the HMPs.

To accompany our HMPs, we will also create a suite of habitat management tasks / prescriptions to ensure the practical implementation of our plans at the site level. These will be trialled with Route teams to ensure we are maximising operational efficiency and also to understand how we embed these effectively into existing processes.

For our priority habitats, we will be undertaking baseline surveys including biodiversity accounting to inform the development of site specific HMPs. This will form the development of our habitat enhancements programme for the Railway Nature Sites for Year 3 onwards to support the BNG target.

7.2 Biodiversity Net Gain

Biodiversity Net Gain will remain a key priority with implementation of our BNG strategy. There will be a focus on monitoring the impacts to habitats from our cyclical vegetation management through our maintenance activities, as well as ongoing reporting from our Capital Works (renewals and enhancements).

7.3 Nature Based Solutions

A new focus will be to explore opportunities to implement nature-based solutions on Capital Works schemes with a particular focus on supplementing engineering solutions by using nature to alleviate flood risk on our infrastructure for example. This will require a

collaborative approach to delivering projects with our Capital Works, Drainage & Offtrack and Weather Resilience & Climate Change Adaptation teams.

7.4 Stakeholder engagement plans

Finally, we will continue to build on existing partnerships with external stakeholders such as the Tree Council and Zoological Society London as well as exploring new opportunities through the Local Nature Recovery Strategies (LNRS) and how these can be integrated into our developing Habitat Management Plans. Many of the LNRS are due to be published in 2025 onwards.

Photo 1 Cynghordy Viaduct. (Image credit: Angus Andrew).

Wales & Western Region
State of Nature
Report 2024

Contents

1. Personnel & Document Control

All ecologists should state their membership level of a recognised professional body (e.g. CIEEM, IEMA) alongside their name.

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Document Control

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DRAFT		DRAFT	Angharad Owen		
FINAL		FINAL	Angharad Owen		

2. Foreword

As a response to the Varley Review in 2018, Network Rail responded with a commitment to meeting the recommendation for each Route to produce annual state of nature reports. This commitment was captured in the Network Rail Environment and Sustainability Strategy. This report, for Wales & Western Region, covers activities that took place in 2024.

This State of Nature report outlines the Region's ambitions and plans we have to protect and maintain and enhance the habitats and associated biodiversity on our estate. It also highlights key examples of the actions we have undertaken to improve these habitats, and where necessary control undesirable species.

The Wales & Western Region serves Wales, the Thames Valley, West of England, and the Southwest Peninsula. The Region is made up of two Routes:

➢ Our Wales & Borders route, which links Cardiff, Newport, Swansea, Wrexham, and Shrewsbury, and provides rail connections in more rural areas.

➢ Our Western route, which stretches from London Paddington station to Penzance, through Bristol and up to the boundaries of Wales, Worcester, and Basingstoke.

Figure 1 Extent of the Wales & Western Region (Image: Network Rail)

In addition to the commitment for each Region to produce a State of Nature report, the Wales & Borders Route are also required to produce a summary report[1] every 3 years on how we have worked to fulfil our Section 6 Duty under the Environment (Wales) Act 2016. Network Rail are committed to enhancing and maintaining the biodiversity value of its land where possible and reasonably practicable.

3. Executive Summary

3.1 Overview

Across the Wales & Western Region, the delivery teams have progressed with commissioning targeted baseline ecology surveys of our lineside estate to inform planning of vegetation management works. Due to the prioritisation of targeting vegetation management in areas where Ash Dieback is causing a threat to the line, the baseline surveys have prioritised those areas. These baseline surveys will inform the Habitat Management Plans that will in turn inform the Vegetation Management Plans.

The habitat mapping data produced by the Centre for Ecology & Hydrology (CEH) on behalf of Network Rail, assessed thirteen habitat types, with 'sparsely vegetated land' being the most abundant habitat reported covering approximately 17 % of our lineside. Since the baseline was created in 2019, there has been a 17 % reduction in area of broadleaved woodland reported, however there is an increase in area of 40 hectares from the 2024 reporting period.

Rare and priority species recorded across the Region within or directly adjacent to our land include greater and lesser horseshoe bats (*Rhinolophus ferrumequinum, Rhinolophus hipposideros*), slow worms (*Anguis fragilis*), otters (*Lutra lutra)*, hazel dormice (*Muscardinus avellanarius*) (see Figure 2), common toad (*Bufo bufo*) and brown hare (*Lepus europaeus*). Due to pressures from external land management and hunting and control of some species, our lineside likely acts as a refuge for some species such as hare, foxes (*Vulpes vulpes*) and badgers (*Meles meles*).

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[1] Network Rail's summary report - environment act wales

Figure 2 Adult dormouse found on the BJR in Wales (Image credit: Network Rail).

3.2 Summary of ambitions for biodiversity management

The Wales & Western Region are committed to 'maintain and enhance' so far as is consistent with the proper exercise of our functions to be compliant with our 'Biodiversity Duty' in Wales; and achieving 'no net loss' in biodiversity on our lineside estate in England by 2024.

Our commitments include those set out below. The Region will:

➢ Actively engage with key external and internal stakeholders in relation to Biodiversity.
➢ Aim to have sufficient Ecology resource to advise the delivery teams to be compliant with the ENV122 standards.
➢ Continue to look at finding innovative solutions to lower the impact of our engineering works on the environment.
➢ Improve the knowledge base internally at Network Rail to allow staff to recognise opportunities to enhance biodiversity when programming or project management,
➢ Improve basic knowledge of staff to identify biodiversity and ecological constraints.
➢ Wherever it is practicable to do so retain a corridor of vegetation along the boundary of our land holdings.

3.3 Summary of achievements for biodiversity management

- The Delivery teams (i.e. Capital Delivery and Maintenance) are continuing to both procure ecology surveys, and complete surveys using internal resource, to inform planning of works. These include Phase 2 surveys for protected species, including Bats, Dormice and Great Crested Newts.

- Across the Region we have several European Protected Species mitigation licences in place to enable works to proceed to maintain our lineside vegetation and for enhancements.

- Great Crested Newt District Level Licence procured via NatureSpace in September 2024 for the Region's landholdings in England.

- In Wales, the Ecologists working in Maintenance have created template Precautionary Method Statements that link with their internal database.

- Delivery teams continue to seek novel ways of working to have least amount of impact on wildlife, and use of technology to access inaccessible locations. This has included using drones to assist with ground level tree assessments for bat roost potential; trialling the use of thermal cameras to assist with nesting bird surveys at night; and use of footprint tunnels for surveying dormice.

- The North Wales Maintenance team have trialled using Aspen fuel which has the benefit of reduced toxic emissions, improved performance and service life of machinery.

- The Region is phasing out using eco-plugs allowing natural coppicing from regrowth and avoiding introducing plastics to the lineside.

3.4 What further action will we take?

The focus for the coming year is for the Region to complete habitat management plans (HMPs) for areas where there are statutory designated sites (e.g. SSSI's, SACs, SPAs) within or adjacent to Network Rail land.

The Region will continue to progress with delivering the ELR ecology surveys on the Wales & Borders route which is being managed directly via the Ecologists in the Delivery Units. On the Western route, Construction Services have been progressing with coordinating the ELR surveys ahead of the vegetation management works and Maintenance are planning to recruit internal Ecology resource. These surveys will inform future works and, where there are ecological constraints identified, allow mitigation to be planned and permissions to be acquired ahead of works commencing,

We will continue to embed requirements to positively manage our assets to 'maintain and enhance' biodiversity and be complaint with external legislation regarding ecology. We are also focusing on embedding Ecologists within the Delivery teams who act as the first point of call for provision of advice to e.g. frontline staff.

The Region is working on procurement of a new Wales & Western Ecology Framework of Suppliers to be live by April 2025. This new Framework will aim to provide better coverage of support to teams across the Route, including the more remote areas such as coastal locations in Wales including Pembrokeshire, Llŷn Peninsula, and the Cornish coastline for instance.

Through consultation with Natural Resources Wales (NRW) and Welsh Government (WG), we will work towards resolving the question around using the Biodiversity Metric 3.0 for calculating Biodiversity in Wales and meeting the requirements under Net Benefit for Biodiversity[2] (NBB) on the Railway.

4. State of nature on Wales & Western region (period between January 2024 and December 2024

There is a distinct difference between environmental legislation and policy and therefore the way in which Ecology and Biodiversity are managed in the devolved nations. Legislation and policy are written by two different governments, with different requirements. The devolved nations have separate statutory and governing bodies, with permissions (including licensing and consenting) being processed differently. There are distinct differences between the ways in which licensing for both survey and mitigation are managed, and the guidance provided by the Statutory Nature Conservation Organisations (SNCO's) in England and Wales.

In Western, the Biodiversity Metric tool was developed to be used to calculate Biodiversity using a qualitative measure. Whereas in Wales this tool has not been recognised to calculate a value for biodiversity by either Welsh Government or NRW and they are looking to use a quantitative measure through the application of NBB. Network Rail require for the Biodiversity Metric tool to be used (both internally and externally) for projects across the Region to provide a standard reporting approach.

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[2] Net-Benefits-briefing.pdf (cieem.net)

4.1 Wales & Borders Route and the Section 6 Duty under Environment (Wales) Act 2016

With reference to the Section 6 Environment (Wales) Act 2016 Summary report produced in December 2019, the Wales & Borders Route has progressed with commitments which would enable the Wales & Borders route to fulfil their Section 6 duty. A summary report was also produced and published by Network Rail for the period December 2019 – December 2022[3].

4.2 Biodiversity metric calculation for the region

The DEFRA Biodiversity metric, which uses habitat as a proxy for biodiversity, has been used in the Wales & Western region to provide a biodiversity score measured in habitat units. Table 1 provides an overview of scores derived from habitats which occur within the Network Rail property boundary.
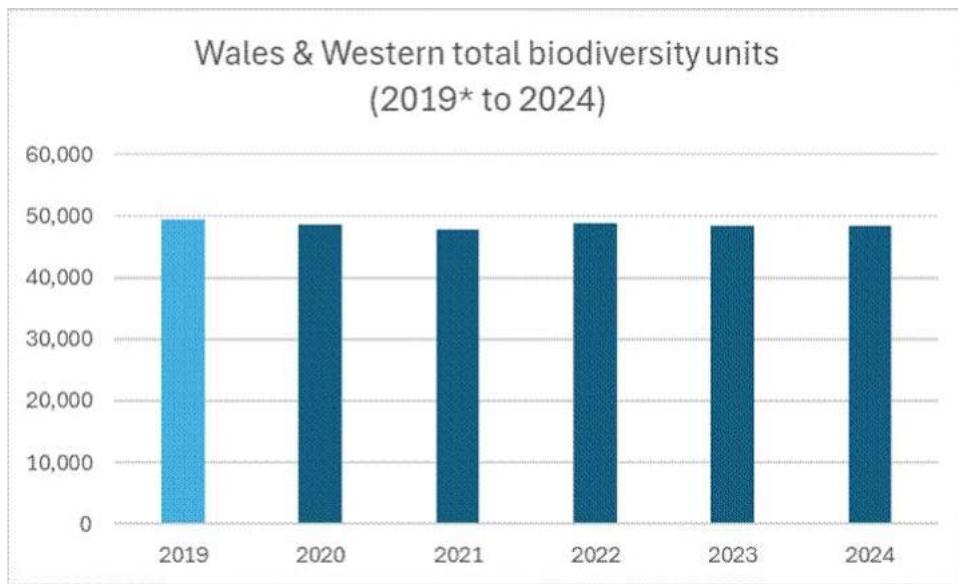

Table 1: Chart showing the total biodiversity units calculated for Wales & Western region from 2019* to 2024.

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[3] Network Rail's summary report - environment act wales

Different habitat types are assigned a 'distinctiveness' and 'condition' rating, where highly distinctive habitats in good condition score more than habitats with low distinctiveness in poor condition. Figure 3 illustrates the types of habitats which occur in the region and their relative proportion.
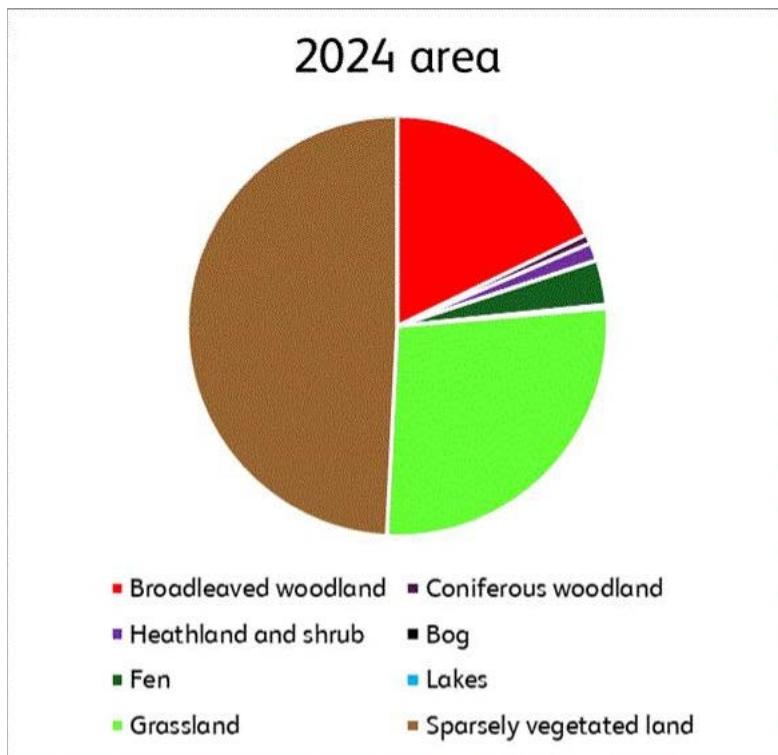

Figure 3: Pie chart illustrating the area of habitat types on the Wales & Western regional estate.

Since 2023 habitat types have been condensed together due to the difficulty in distinguishing similar categories, such as grassland variants, which limits direct year-on-year comparisons. In comparison with 2023 sparsely vegetated land is the dominant habitat on the Wales and Western Estate (see Figure 4). Analysis of wet habitats across the region indicates an increase in Fen habitat units since 2023, accompanied by a decline in Bog units and lake coverage. Both Fen and Bog are designated as broad priority habitats[4]. However, due to the limited numbers in the underlying dataset, a holistic assessment of the entire estate rather than focusing on individual habitat categories will provide a better picture.

[4] UK BAP Priority Habitats | JNCC - Adviser to Government on Nature Conservation
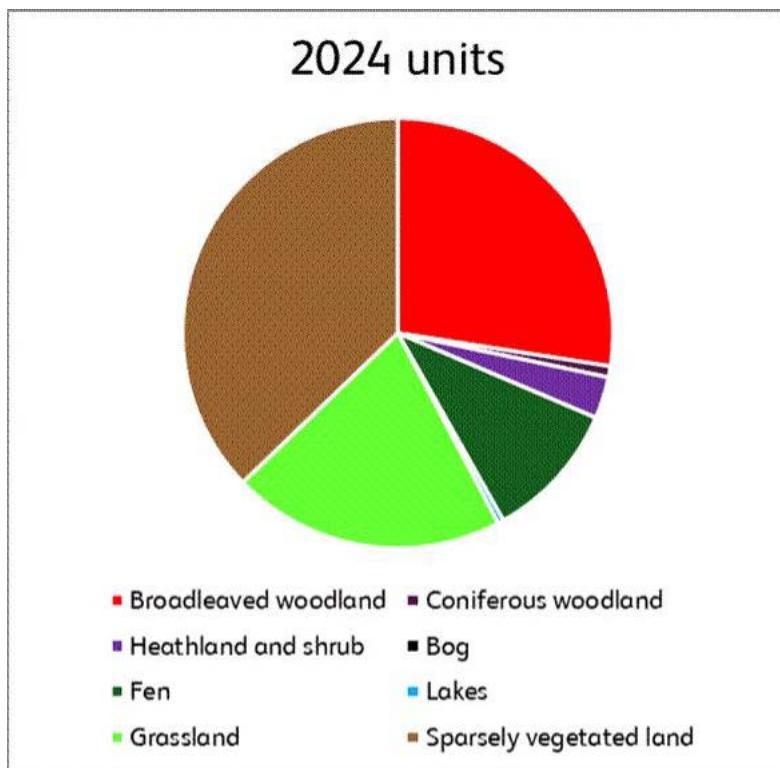
Figure 4: Pie chart showing units of habitat proportions for 2024 on the Wales & Western regional estate

The region encompasses a total of habitat area of 9,140 hectares with a habitat unit value of 48,356.84. There has been no reduction in total area since the previous reporting period or since 2021. This shows that in general habitat proportions across the Wales and Western estate is generally stable as shown in Table 2.

Habitat units have very slightly decreased the last two reporting periods. This suggests that future habitat management efforts should focus on improving the habitat condition of the existing habitats that are already present on the site.

Table 2: DEFRA Biodiversity metric scores for habitats identified in the Wales & Western region in 2024

Habitat type	Area (hectares)	Distinctiveness	Condition	Habitat units
Other woodland; broadleaved	1562.1792	Medium	Moderate	12497.43
Wet woodland	16.2727	High	Moderate	195.27
Lowland mixed deciduous woodland	16.2727	High	Moderate	195.27
Upland oakwood	16.2727	High	Moderate	195.27
Lowland beech and yew woodland	16.2727	High	Moderate	195.27
Other coniferous woodland	33.42	Low	Moderate	133.68
Other Scot's Pine woodland	33.42	Medium	Moderate	267.36
Upland Heathland	126.8	High	Moderate	1521.60
Blanket bog	0.18	V.High	Moderate	2.88
Fens (upland and lowland)	314.29	V.High	Moderate	5028.64
Ponds (Non- Priority Habitat)	26.05	Medium	Moderate	208.40
Modified grassland	2481.53	Low	Moderate	9926.12
Ruderal/Ephemeral	4497.41	Low	Moderate	17989.64
TOTAL	9,140			48,356.84

> ➢ **Connectivity**

Remotely sensed habitat data, together with habitat specific connectivity mapping, available on the GeoRINM Viewer as Environmental Opportunity maps produced on

behalf of Network Rail by UKCEH[5], can be used to identify locations to prioritise opportunities for habitat restoration and creation. One of the GIS layers identifies areas suitable for Sown Winter Bird Food, which could support collaboration with local landowners and wildlife organizations. Figure 5 highlights a location in Wiltshire with significant potential for implementing this enhancement. The layer can also be used to prioritize areas where farmland bird populations require targeted support, such as regions in Devon and Cornwall where efforts to increase Cirl Bunting numbers have been ongoing, or areas where Turtle Doves remain present and would benefit from additional food resources to help boost the population.
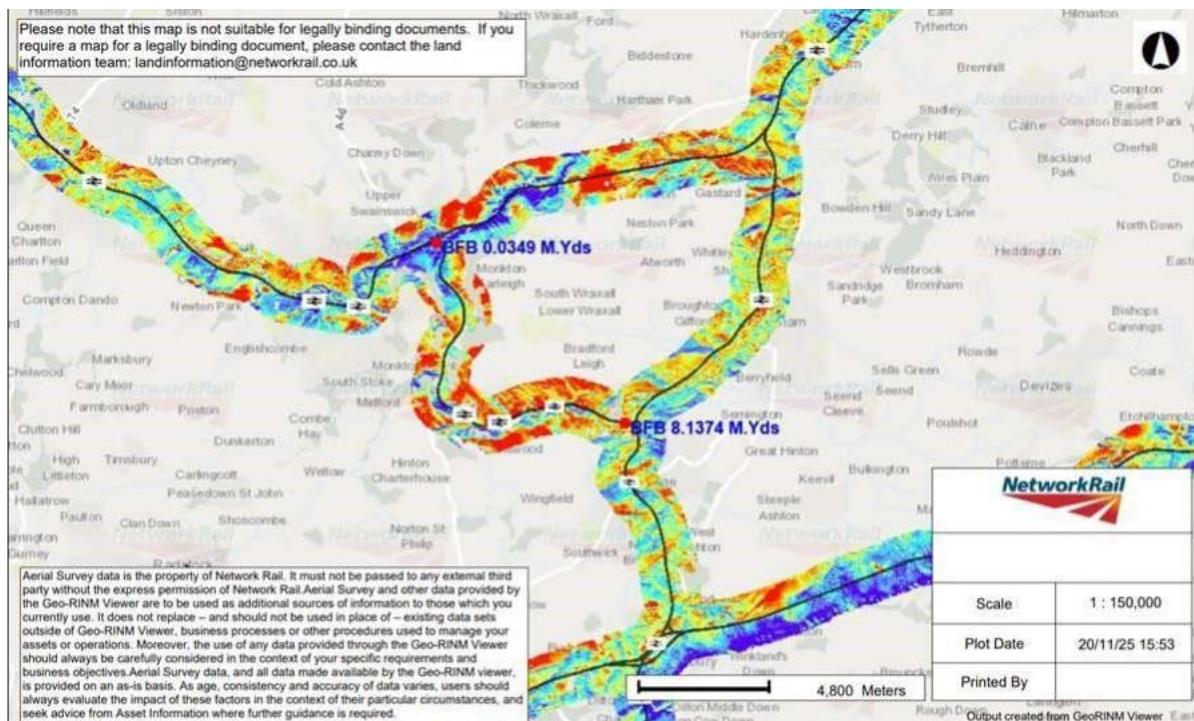

Figure 5: Map illustrating Sown winter bird food opportunities in Wiltshire near Bradford-on-Avon on the BFB ELRs.

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5 UKCEH_Report_Network Rail_Potential_for_Biodiversity_Net_Gain (1).pdf

4.3 Region Designated sites.

According to the National Database of Sites of Special Scientific Interest (SSSIs) on Network Rail Land (2013) the Wales & Western Region's lines run through or adjacent to 129 geological and biological SSSIs, 11 Special Protection Areas (SPAs) 11 Ramsar sites and 29 Special Areas of Conservation) SACs. Condition assessment is assessed by the Statutory Authority (i.e. NRW and Natural England) broken down by management unit and does not provide an overall condition assessment for the entire site.

4.4 Priority species and habitats on the region

In Western, during baseline surveys where a walkover was undertaken to inform preliminary ecological appraisals, reedbeds, ponds and hedgerows which are all Priority Habitats were recorded on the MLN1 in October 2024.

A bat roost characterisation and hibernation survey was undertaken on the OWW (Oxford to Worcester line) in July and August 2024, where the presence of lesser horseshoe and common pipistrelle (*Pipistrellus pipistrellus*) roosts were confirmed. In addition, daubenton's (*Myotis daubentonii*) and noctule (*Nyctalus noctula*) were also recorded using the area. This record is of importance, as there are no designated sites for bats within 15km of the area, nor any previously documented lesser horseshoe roosts.

In June and July 2024, a hazel dormouse tube check survey was conducted on the NDN near Crediton in Devon. Dormice were confirmed on the site, which was the first record within 1 Km of the original desk survey. Dormice were also confirmed in the summer of 2024 on the SWM2 line. The two new records underscore the ecological significance of the railway corridor, both in terms of its habitat suitability and its role in facilitating connectivity between habitats for this species.

Otters were recorded in summer of 2024 on the SWM2 around 4km from Stroud in Gloucestershire using Trail Cameras. Footage showed three otters swimming together in the feeder stream and along the railway embankment, indicating a possible family group and the presence of a holt nearby. This demonstrates the value of trail cameras as the embankment could not be accessed fully at the time of the survey, but by using the technology the site could be assessed for this species. In addition to picking up the otters it also recorded the presence of muntjac (*Muntiacus reevesi*) and badgers on the site.

4.5 Invasive species on the region

Since 2019 in Wales, we currently conduct a substantial work bank focussed on Japanese knotweed (*Fallopia japonica*) every year. The sites are in the 100's and the work is conducted by suitably qualified personnel from Construction Services and informed by BASIS trained personnel. The work bank is made up of individual locations that have been reported to NR via the helpline from members of the public, lineside neighbours, Local Authorities, and other agencies (e.g. NRW). The site's details are recorded, and a spray regime of 3 years is started with records kept after each individual spray to ensure no missed treatments.

5. Priorities for biodiversity management on this region

➢ Expanding our internal Ecological technical resource to provide support across the teams and functions, including backfilling vacant roles.

➢ Development of HMPs which will inform the Vegetation Management Plans (VMP) which are requirements under Standard 5201 and ENV_122. The ORR has set a target to have HMPs for our landholdings by the end of CP7.

➢ DEAM Ecology team to continue to seek opportunities to build external relationships with key stakeholders and seek opportunities to work together to find 'Net Benefits for Biodiversity' in Wales.

➢ Progress with the Cultural Change for 'Valuing Nature' in the Region.

➢ Ecologists to continue to work with the Contracts & Procurement (C&P) team on new supplier Frameworks to ensure that the minimum competency requirements set by the Wales Route Ecologist in 2019 for Ecological resource is delivered by the Contractors and ensure robust advice is provided.

➢ Weather Resilience and Climate Change Adaptation (WRACCA) team will continue to seek to identify opportunities for Nature-based Solutions as opposed to grey solutions.

6. Case studies

6.1 Examples of partnership working

<u>Connecting the Culm</u>

At the start of CP7, Network Rail engaged with the Connecting the Culm[6] project in a partnership to achieve resilience through a nature-based solution at Hele and Bradninch Level Crossing which is a known flood site (see Figure 6).

Figure 6 Hele and Bradninch Level Crossing when in flood

A 'grey' engineered solution was developed to re-build two bridge structures over the river adjacent to the railway to increase flow and prevent overflow onto railway. This solution has been unfunded by DfT. Therefore, Network Rail have sought other solutions including a 'green' nature-based solution.

In early 2024, Network Rail made a financial contribution to further develop the nature-based solution. Regular project team updates are held with participation from key stakeholders, including representatives from the Wales & Western Region. The nature-based solution is currently being developed with different examples including leaky dams high up in the catchment which will slow the flow of water to Hele crossing point. In addition, there is a solution to restore natural floodplains to temporarily store excess rainwater during heavy rainfall. At Hele crossing, implementation of the NBS measures is modelled to reduce peak flood flow by 16-21 % and flood durations by between 5-10hrs.

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[6] [Home - Connecting the Culm](#)

The aims of the project are to enhance resilience to flooding and drought, improve water quality, and support biodiversity through community co-creation and strategic catchment planning.

The project is expected to deliver significant environmental benefits. Water quality will be enhanced through wetland-based interventions designed to filter surface run-off from the M5, with anticipated reductions of approximately 20 % in nitrate and phosphate concentrations and a 35 % decrease in sediment load. It will also restore resilience to the area.

Biodiversity gains will be achieved through the reinstatement of trees and hedgerows, increasing habitat area by an estimated 10 % and supporting a projected 25 % rise in local species populations. These measures will also contribute to flood risk mitigation at key receptor sites, including the Hele railway crossing.

In addition, the project is forecast to sequester approximately 4,000 tonnes of CO_2 equivalent annually. Over its 25-year duration, these actions will provide long-term, positive benefits, serving as an evidence-based model for future initiatives. This project will be progressed and planned to be delivered in CP7.

6.2 Example of improved management of an Asset where protected species are present.

Vegetation management on the VOG

A positive example of how we have improved management of ecological constraints and managing our estate in Wales positively for biodiversity is that of vegetation management works following a public complaint on the VOG line on the Vale of Glamorgan.

Multiple DDD ash trees were unfortunately identified as hazardous adjacent to a member of the public's house, and these were assessed as requiring removal for health and safety reasons. A PEAR and further protected species surveys were undertaken on the ELR. These surveys included dormouse surveys. No dormice were identified during the surveys, and the report recommended an ECoW supervise the works to protect other species.

Following the works the area was replanted by staff from the local Maintenance Delivery Unit, with approximately 200 trees including a mix of species such as hazel, hawthorn,

blackthorn, spindle and hornbeam. As only ash trees were removed the compensatory planting has increased the species diversity at the site. By encouraging both operatives and office staff from the DU to assist with the tree planning this habitat management work was also used as an opportunity to positively engage staff with biodiversity as a topic area.

Photo 2 South Wales DU planting trees following removal of Ash trees on the VOG in 2024.

7. Future plans

7.1 Habitat management plans

The regional strategy for completing HMPs is to prioritise the areas where there are protected sites (i.e. Statutory Designated sites such as SSSI's) within and adjacent to Network Rail's boundary. The output of the HMPs will aim to inform the management per eighth of a mile to complement and overlap with management of other assets reported in Ellipse. Due to the extent of information that this will generate, actions and data will need to be held in an effective ecology database to filter the information so that requirements can be understood by individuals across the business functions. The Region completed a business case strategy (including IT requirements) in December 2023. Since then, the other Regions have now identified that they also require an Ecology Database, and we will continue to collaborate on this requirement as it is a fundamental requirement to effectively deliver the actions from the HMPs.

7.2 Stakeholder engagement plans for the next reporting period.

The Region will actively engage with key external and internal stakeholders in relation to Biodiversity, this will be mainly through the Nature Partnerships, and specifically in Wales via the working groups focused on Area Statements7. This stakeholder engagement will include continued engagement with Welsh Government, NRW and charities including the Royal Society for the Protection of Birds (RSPB) and Wildlife Trusts. This activity is constrained by resource so this engagement will continue to be based around business needs and available resource. Additional Ecologists in post at a strategic level in the Regional DEAM team focusing on whole life Asset Management would allow time for more meaningful discussions with external stakeholders working on long-term aims and more strategic thinking to identify opportunities which a non-technical expert might not recognise.

7.3 Nature-based Solutions

The WRCCA team, with support from the Biodiversity team in DEAM, will continue to identify opportunities for Nature-based Solutions with these being a core theme of our climate resilience strategy.

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[7] Natural Resources Wales / Area Statements