Habitat pile and raptor pole, Connington, East Coast

Network Rail State of Nature Summary Report 2021/22

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

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Foreword

It is now 5 years since John Varley OBE TD undertook a review in vegetation management practices on the railway.

Following the publication of the Varley review, we have made significant changes to our vegetation management practices. Our knowledge and capability is much improved. We are particularly pleased with our award-winning satellite technology which enables us to track and measure the biodiversity of habitats across the vast railway land estate. It enables us to measure and apply science in a way which never existed previously. It is still early days for this technology and we now have two data points. The 2 % difference between these two measurements is at the limit of the accuracy of the technology and it is too early to draw any firm conclusions about trends. We will be reducing the measurement grid size in order to improve the accuracy of the tool.

We have changed the way we work with our regulators and have secured network-wide licenses for the management of protected species. This has been achieved because our regulators have confidence in our management systems.

There remains much to do but we now have stronger controls and better data. We have a confidence which didn't exist 5 years ago.

Martin Frobisher OBE
Group Safety and Engineering Director
August 2023

2 Introduction

This report, for Network Rail, covers the period April 2021 to March 2022.

It is the second state of nature report produced by Network Rail and updates on the work that has taken place across our estate and the benefits this has had for nature across Britain.

This summary report refers to individual reports for each of the five regions of Network Rail as shown in Figure 1.

Figure 1: *Network Rail regions and routes*

It is five years since the Department for transport sponsored review into our vegetation management practices undertaken by John Varley. This second report is not attempting to compare progress over the last 12 months from the first report. The progress that we

have made as an organisation is exemplified by the amount of work that has been done by colleagues across the network. The appendices of this report contain the regional reports, which in turn contain only a fraction of the output from tireless work by colleagues across all disciplines.

Despite the good work that is taking place across the network, there are challenges. We do still receive complaints and concerns about our work and its apparent impact on habitats and biodiversity. The difference, however, is that more often than not we can provide explanation to those members of the public or their elected representatives. We can demonstrate that the work we are doing is part of a wider plan to, not only provide a safe performing railway, but maintain and protect biodiversity. We do still make mistakes, and the fact that these enquiries exist shows that our communications are not necessarily reaching everybody yet.

John Varley gave us and the Department for Transport six recommendations:

1. the Government must set out a clear policy position for Network Rail in terms of delivering for the environment

   Our response: the Department for Transport published their response to this recommendation, and this is where Network Rail's target of biodiversity net gain by 2035 is derived

2. appropriate governance must be put in place at organisation, route and project level

   Our response: the governance and understanding about the importance of biodiversity exists across the business

3. Network Rail should publish an ambitious vision for the lineside estate

   Our response: we published our vision in 2020 alongside our biodiversity action plan and were able to quantify the biodiversity on the railway estate for the first time ever in our first state of nature report

4. Network Rail must value and manage its lineside estate as an asset

   Our response: we have published our first standard for biodiversity management and have increased the number of staff specifically dealing with ecology in the business and developed a training course for our front-line colleagues

5. Network Rail must improve its communication with affected communities

   Our response: We continue to work with The Tree Council when working with local communities and have adapted the notification letters used to inform our neighbours of upcoming work. New methods of communicating the work, and reasons for it, are becoming common place, such as live on-line and drop-in events for local residents.

6. Network Rail should lead a cultural change for valuing nature and the environment

   Our response: At all levels of the organisation, environmental matters are discussed at the same time as safety matters. There are specific board- and non-executive director-level meetings focussed on sustainability. Periodic reporting of sustainability is no longer within the health and safety documentation but has its own stand-alone communication.

The work that has taken place at all levels of the organisation and across all of the business units of Network Rail has been recognised. Our projects have been highly commended in national and won international award ceremonies (Figure 2).

Figure 2: *Network Rail – winner of the international sustainable railway awards best green corridor award 2022*

In this state of nature report, we are again able to use the award-winning technology to identify habitats across the railway network and the landscape through which it passes. The accessibility and efficiency of the satellite data, together with the massive safety benefits of not sending colleagues out on to the railway far outweigh constraints from the data. The technology is the best available to us currently and we continue to investigate the potential to improve accuracy for future years.

We have re-baselined the data from the first state of nature report. A change in the interpretation of the satellite data now means we have a technique that can be repeated year on year allowing more accurate measurement and reporting of the data.

The novel nature of this method of reporting for the railway means we are still understanding how our routine management activities interact with the habitats we are monitoring. In addition, we do need more years' data to enable to start creating trends. It is also difficult to identify small annual fluctuations in the data. We discuss this in more detail in the report and appendices.

3 Executive Summary

3.1 Overview

Network Rail's biodiversity units for the network for this report are 250,982.82. The distribution of those units by the five regions are given in Table 1.

Table 1: *Network Rail baseline biodiversity units 2021/22*

	Units	Area (ha)
Network Rail	**250,982.82**	**51,792.52**
Eastern	62,585.64	15,842.14
North West & Central	50,068.56	11,377.89
Scotland's Railway	40,669.04	7,538.97
Southern	50,125.64	7,859.47
Wales & Western	47,533.94	9,174.08

The proportion of the significant habitat types found across the estate can be seen in Figure 3.

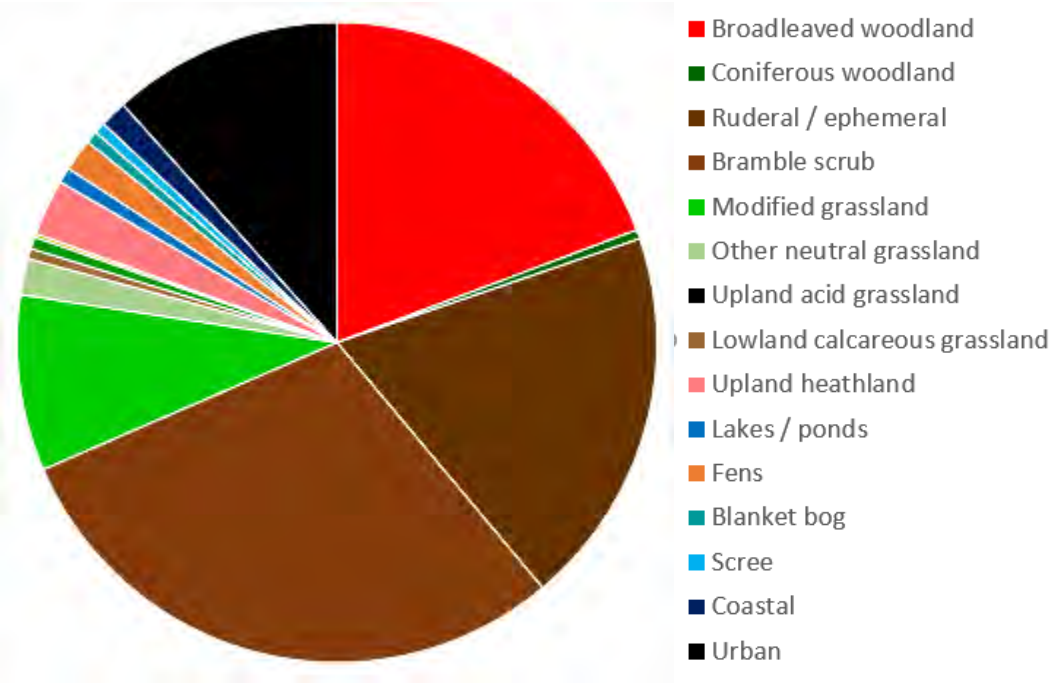

Figure 3: *Proportion of habitat across the rail estate in Britain 2021/22*

The relative importance of these habitats, in terms of biodiversity units, is seen in Figure 4. This chart highlights those habitat types where improvements in condition or increases

in area will support work towards biodiversity targets. Fundamentally, whether looking at the actual habitat, or using the biodiversity metric to derive an approximation for the amount of biodiversity, the Network Rail estate has an important role to play in nature recovery.

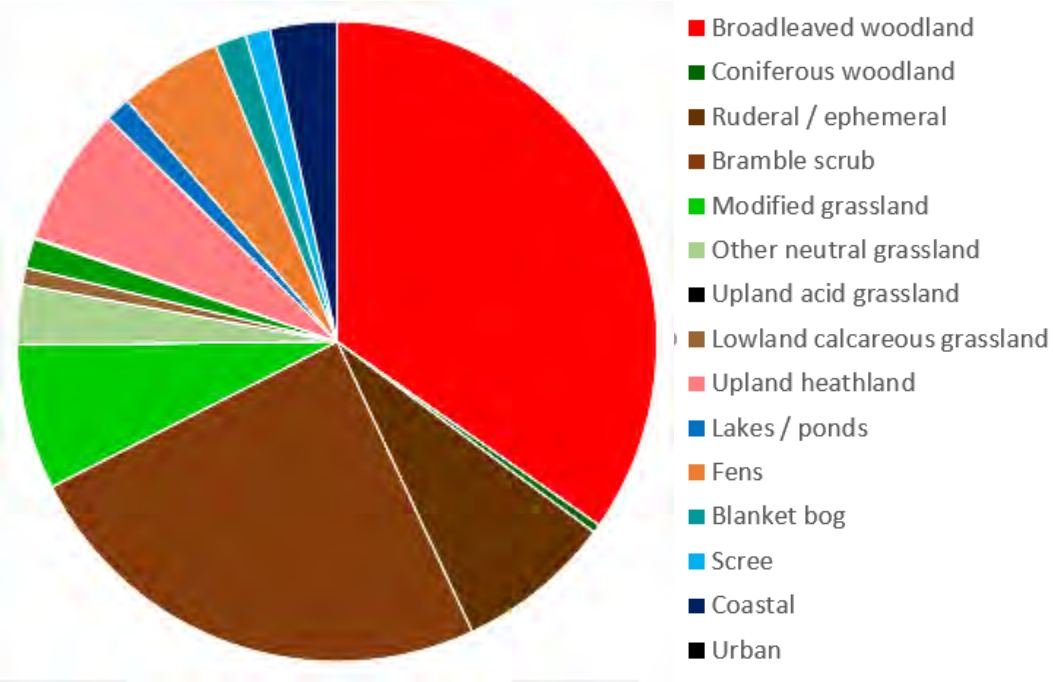

Figure 4: *Habitat biodiversity units found on the rail estate in Britain 2021/22*

3.2 2020 and 2021 data

The use of satellite data, with its repeatable collection, analysis and interpretation techniques, will ultimately enable trends in biodiversity to be identified. As described in subsequent sections and Appendix 5.1, it is difficult to be certain of any trending with only two years-worth of data, i.e. two data points. Nevertheless, some possible reasons for changes in area of habitat, and subsequently unit score, can be proposed. These hypotheses can be tested in future state of nature reports as the volume of data increases.

Overall, the total number of biodiversity units calculated for the Network Rail estate is still in the region of a quarter of a million. The average unit per hectare has decreased slightly from 4.95 to 4.85. This represents a 2.1 % drop between 2020 (256,348.14 units) and 2021 (250,982.82 units).

The apparent changes in habitat areas (and associated biodiversity units) can be seen in Figures 5 and 6.

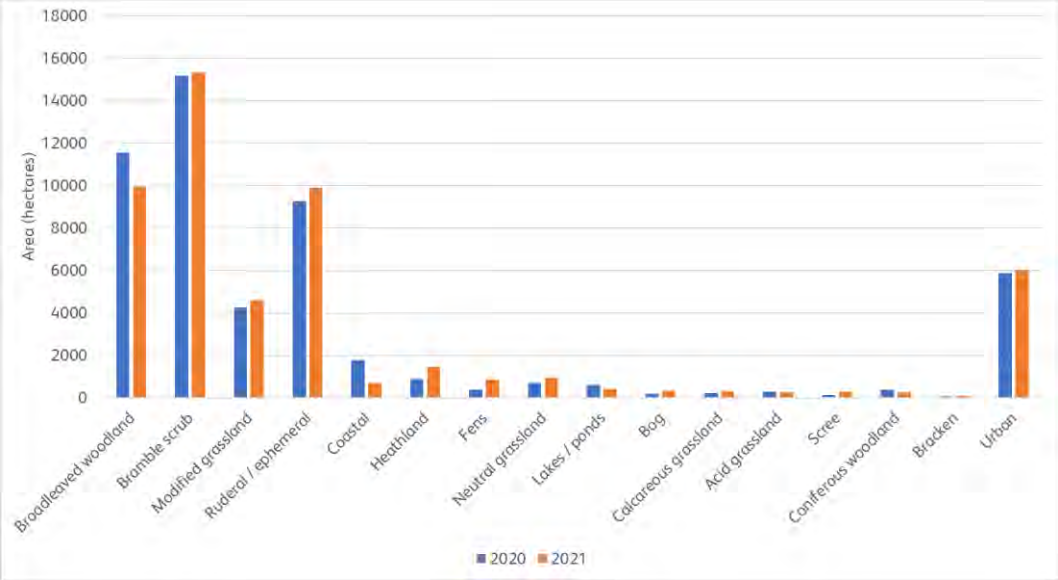

Figure 5: *Apparent change in habitat area 2020 vs 2021*

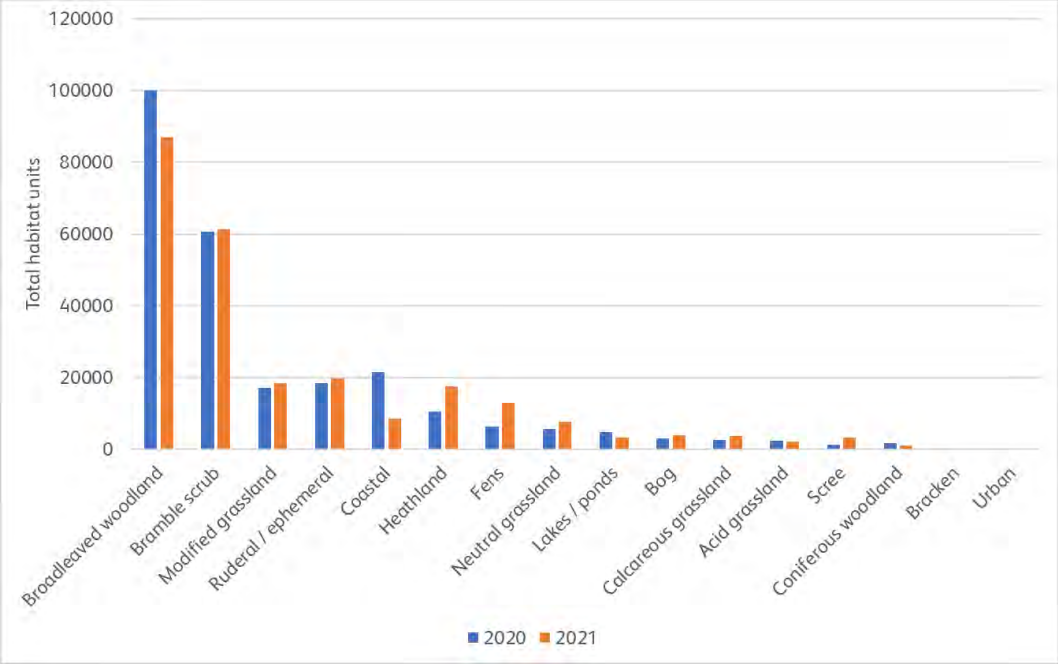

Figure 6: *Change in biodiversity unit calculation by habitat type 2020 vs 2021*

The data show a change in the area of broadleaved woodland over the two study years. This is seen alongside an increase in the areas of bramble scrub, heathland and ruderal habitats. It is possible that this simply represents the volume of vegetation management activity across the railway estate as risks posed by woodland adjacent to the operational railway are managed. The challenge of a remotely sensed dataset is that whilst a newly managed woodland area may appear to be heathland from the satellite, on the ground it may simply be a routine thinning operation with coppicing – the woodland habitat is still

intact. As our dataset becomes more mature, we will be able to compare outputs from the satellite interpretation with our works management tools, like Ellipse. This should give us the ability to understand the volumes of work carried out. The narrative within regional case studies, such as those in the regional appendices to this report (Appendices 5.1. to 5.6) will also describe the biodiversity benefit afforded by that work.

The other large change in area and units between 2020 and 2021 is for coastal habitats. As could reasonably be expected, this is a much smaller dataset, but the 60 % change is obvious. In contrast to the reduction in woodland habitat, itis unlikely that such a large area of coastal habitat will have been changed by the activities of the railway. The data analysis techniques are described in Appendix 5.1 and discuss the challenge presented by the width of the rail infrastructure. The railway's land take in coastal areas may be much less than those areas further inland and as such, the data are more influenced by the adjacent habitat. Moreover, the fluctuations seen in the 'aquatic' habitats (coastal, fen, bog and lakes/ponds) may also be linked to the climate and the conditions experienced during the two data years.

3.3 Data challenges

The method we are using to calculate the biodiversity on our estate is with the biodiversity metric published by Defra. It relies on using habitats as a proxy for biodiversity. The units we have derived are calculated from the area of habitat, its condition and location.

As we described in the first state of nature report, we have used satellite remote sensing to identify the broad habitat types found across the network. We have then worked with our experts within the regions to assign habitat classification and condition.

The use of the metric and its reliance on habitat identification along with the resolution of the satellite imagery does have some unintended consequences. Primary amongst these is the inability to readily identify small-scale works to improve habitat condition. Similarly, features that have been installed to provide particular benefit to certain species are unlikely to be recognised by the satellite data interpretation.

3.3.1 Biodiversity narrative

The regional state of nature reports provide that opportunity to describe activities that do benefit species, habitats and therefore biodiversity. The front cover image of this report shows a disused railway location with materials from the site to create habitat piles and a

raptor pole. These features will not be seen on a satellite image, but will contribute, over time to improved habitat for wildlife and ultimately habitat condition. As such, this reporting process allows us to demonstrate the range of activity that is taking place on the ground. This ability to demonstrate how much work we are doing, where it is taking place and why is an essential part of the evidence to demonstrate our determination to support nature recovery.

3.3.2 Data trend analysis

The data we have now been collecting for two years is beginning to provide a resource to monitor the changes in our habitats. We will be able to identify the positive, and negative, impacts of our essential management activities. That knowledge will help us to identify new techniques and processes to increase the positive impacts and decrease the negative ones.

It is important to note that the ability to definitively compare between the annual datasets is some way off. The annual variation between the datasets is such that data from more years are required in order to distinguish changes due to our activity. More explanation is provided in Appendix 5.1.

The scale of our datasets does however mean we can see how our thin slice of the British countryside is interacting with the landscape through which it passes. This information can be used to support the activities of some of our seven million neighbours. We can provide the connectivity between isolated populations of both people and wildlife.

3.4 Summary of ambitions for biodiversity management

Network Rail's sustainable land use strategic framework draws together the work completed since the 2018 Varley Review. It describes our vision and strategic aims to achieve a more sustainable way of managing our lineside estate. It also serves as an invitation to our stakeholders, adjacent landowners, environmental organisations and our neighbouring communities to work with us to meet these goals. The regional reports in the appendix identify the ambitions around the network, including:

- Eastern
    - understand the biodiversity on our estate.
    - enlist the help of The Wildlife Trusts and bring in resource and
    - develop systems and processes to allow us to make informed decisions and plans
    - be responsible custodians of an important asset
- North West & Central
    - achieve no net loss in biodiversity on our lineside estate by 2024 and achieve biodiversity net gain of 10 % in each Region by 2035
    - view our natural green infrastructure as an asset not a hindrance managing our land equally considering operation needs, safety and biodiversity net gain
- Scotland's Railway
    - achieve no net loss in biodiversity on our lineside estate by 2024
    - work towards compliance with the Network Rail Biodiversity standard NR/L2/ENV/122 across all business units
    - ensure the Network Rail standard NR/L2/ENV/015 is embedded within all project design and construction activities across the region
    - complete Biodiversity Net Gain calculations for all Capital Delivery projects
- Southern
    - achieve no net loss in biodiversity on our lineside estate by 2024, and achieve biodiversity net gain of 10 % in each Region by 2035
    - recruit in-house ecologists to improve the management and assurance of our ecological risks and mitigation plans
    - create Habitat Management Plans covering the Region, with a focus on high value biodiversity sites including Sites of Special Scientific Interest (SSSIs) and Local Wildlife Sites (LWSs)
    - implement actions to enable the delivery of biodiversity net gain on major Capital Delivery projects
    - deliver initiatives with partners and stakeholders as part of our wider sustainability strategy which aims to protect biodiversity and gives back to local communities by creating and supporting green spaces and volunteering opportunities

    - establish processes to measure the value, condition and benefits generated by wildlife and nature on our network, and improved reporting and communication of these benefits and value delivered
- Wales and Western
    - actively engage with key external and internal stakeholders in relation to biodiversity
    - aim to have sufficient Ecology resource in order to be compliant with the ENV122 standard
    - 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
    - retain a corridor of vegetation along the boundary of our land holdings wherever it is practicable to do so
    - 'maintain and enhance' as 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

3.5 Summary of achievements for biodiversity management

3.5.1 Regional achievements

Additional detail for the biodiversity achievements in the regions can be found in the specific regional appendices.

- Eastern
    - The region has attained an organisational licence in an industry first collaboration with NatureSpace for working around great crested newts. This has streamlined the regulatory process for Network Rail and is a step-change in the conservation of the newts in England. Modelling calculates a proportionate compensatory payment made by Network Rail. This funding then helps the Newt Conservation Partnership to create and restore high quality habitat. Importantly long-term monitoring and management is also funded.

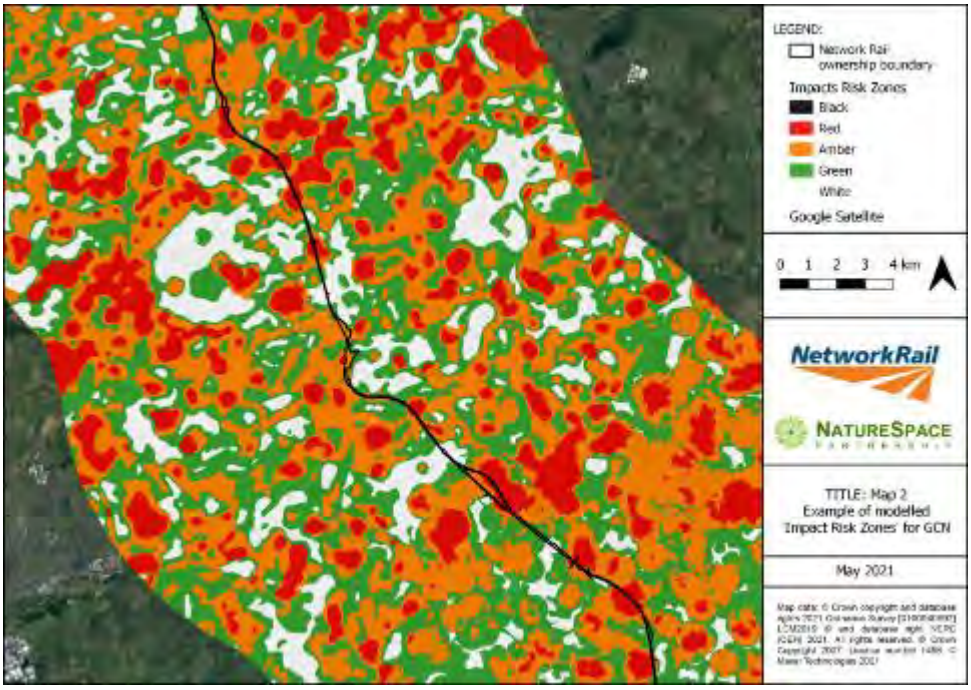

Figure 7: *Species distribution modelling and habitat suitability mapping*

- North West & Central
    - To actively address instances of asset failures due to flooding events, inter-disciplinary teams from within the region have begun working with the Eden Rivers Trust (ERT), and other stakeholders such as National Highways and the Environment Agency, to identify nature-based solutions to the impact of flooding events on infrastructure within the Eden catchment.

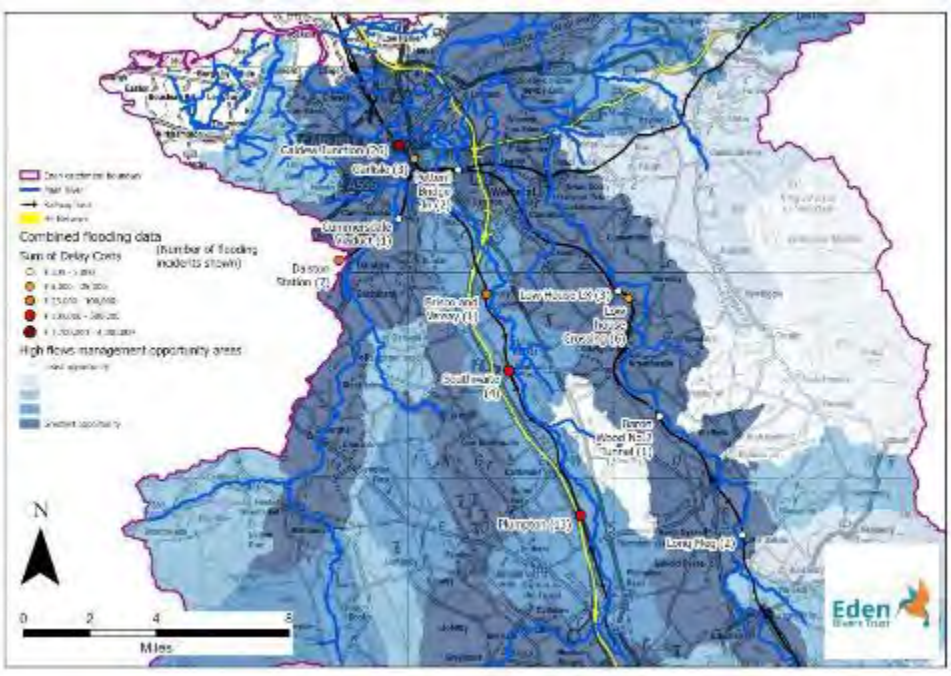

Figure 8: *High level scoping activity undertaken by the Eden Rivers Trust*

- Scotland's Railway
    - The remediation of the landslip site at Fairlie in which raised beds have been installed on the slope which have been planted with native, railway compatible species. Installing the planted raised beds will increase the stability of the slope, improve visual amenity, and promote local biodiversity.

- Southern
    - A leading-edge partnership with The Tree Council continued during 2022 and the initial seed we planted in 2020, watered with a £1million pledge to set up local planting schemes across the Region, has grown and started to bloom into something that will leave a legacy for future generations.

Figure 9: *Partnership planting with The Tree Council*

- Wales & Western
    - In order to inform the vegetation management works, the Region are procuring and undertaking ecology surveys of lines ahead of works which are to boundary in order to provide mitigation for ecological constraints identified on site. These surveys will also provide data to inform other projects delivered in those areas and whether permissions are required in order for works to proceed. Ultimately identifying ecological constraints as early as possible when planning of works will avoid delays to programme.

3.5.2 Post Implementation Review

Network Rail standards should undergo a review within 12 months or so of publication. These reviews take account of stakeholder feedback so that adjustments to requirements can be made or correcting text where errors have been identified.

A standard working group with representatives from across the regions has been put together. Feedback is being collated from the users of the standard and the aim is to be able to submit the second issue of the standard for publication by the end of 2022.

3.5.3 Lineside 2035

This feasibility study in partnership with the Forestry Commission has demonstrated that there are almost 1 million hectares of land within a kilometre of the railway that have some suitability for tree planting. The modelling took account of high-quality agricultural land and environmentally designated sites and removed them from consideration. Conversely, areas close to ancient woodland and those that could provide benefit to local communities were highlighted. An infrastructure woodland edge design (Figure 10) was developed by The Tree Council so that new habitat could be created adjacent to linear infrastructure with reduced future risk. The project has received high level support from Government departments, environmental organisations and the forest and transport industries. A conference is planned for 2023 that will set out the work that has been done and seek to identify opportunity or expansion across the network, whilst removing any blockers that may be found.

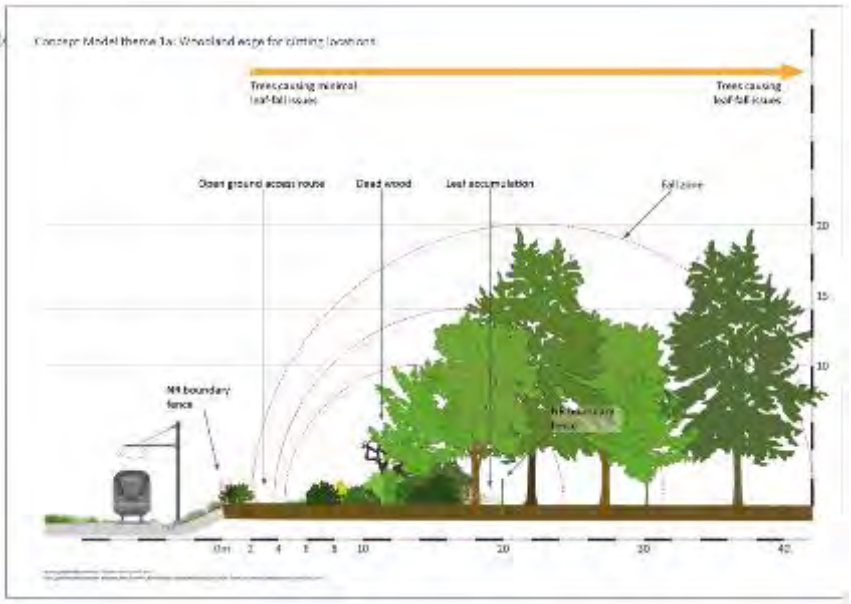

Figure 10: *Infrastructure woodland edge*

4 Future plans

4.1 Regional plans

Additional detail for the regions' plans for the future can be found in the specific regional appendices.

- Eastern
    - We will develop an integrated approach for vegetation and habitat management that meets the needs of all Network Rail functions and other industry stakeholders through the development of Sectional Plans.
- North West & Central
    - 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.
- Scotland's Railway
    - We aim to establish a methodology for producing Habitat and Vegetation Management Plans within the region, and test this with a pilot. This work will help us understand the most efficient and effective way to produce meaningful habitat and vegetation management plans for the full region.
- Southern
    - We will complete our work on establishing a series of Railway Nature Sites around the Region, high value sites for nature which will be ring-fenced and safeguarded for the benefit of the railway and the communities we serve.
- Wales & Western
    - We will continue to embed requirements to positively manage our assets to 'maintain and enhance' biodiversity and be compliant with external legislation with regard to ecology.

4.2 Audit and assurance

An audit and assurance regime will be developed to enable the monitoring of the regions' work to the biodiversity standard and support any variations that may be necessary. The functional audit programme will be used to enable a comprehensive assurance regime to be drawn up.

4.3 Future opportunity

This information that we have now expanded continues to demonstrate the opportunity for using our land for the benefit of people and nature. The challenges we face that were originally identified in the first state of nature report are still valid and are repeated here:

- initiatives for renewable energy, property development, rail expansion, electrification and biodiversity all competing for the same land
- improving the accuracy and detail of the satellite data (in terms of habitat identification) and biodiversity calculations
- resource of competent and capable people to manage the work in the rail environment
- business cases to obtain the necessary funding to complete the work

5 Appendices

Big Bang Fair (STEM event), NEC

Network Rail

Biodiversity data capture and calculations

Contents

6 Personnel & Document Control

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

Report author	Neil Strong
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Date	31 July 2023
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Date	6 August 2023

6.1 Document Control

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7 Introduction

This report on biodiversity data capture and calculations accompanies the second annual state of nature report produced by Network Rail for the period April 2021 to March 2022.

Network Rail has again worked with the UK Centre for Ecology and Hydrology (UKCEH) to produce data from a remote sensing survey of the rail network in order to produce a 10m pixel land cover map showing 21 habitat types across the rail network. The map was produced using similar methods to the most recent UKCEH land cover maps with a conversion to align the land cover classes with the UK-Habitats Classification System (UKHab). The UKHab system aligns with the Department for Environment, Food and Rural Affairs (DEFRA) and Natural England's Biodiversity Metric

Network Rail used the outputs of this piece of work to calculate a baseline using the Biodiversity Metric tool.

The methodology used to calculate the national biodiversity units has not changed since the first annual report. As such it is not described in this document, but reference can be made to Appendix 5.1 of the first report[1].

The technique for interpretation of the satellite data has improved since the first report. In order to be able to have a consistent approach for this and subsequent years, it has been necessary to recalculate the data used in the first report.

This paper details the biodiversity units present in each region, and an aggregated table of the national data. The paper also discusses the challenges associated with data comparison between reports of different years.

[1] https://www.networkrail.co.uk/wp-content/uploads/2022/10/Network-Rail-State-of-Nature-report-plus-six-appendices.pdf

8 Results

8.1 Eastern

Table derived from Network Rail Eastern Biodiversity Metric Baseline 2021.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Other woodland; broadleaved	2644.32	Medium	Moderate	21154.56
Wet woodland	27.83	High	Moderate	333.96
Lowland mixed deciduous woodland	27.83	High	Moderate	333.96
Upland oakwood	27.83	High	Moderate	333.96
Lowland beech and yew woodland	27.83	High	Moderate	333.96
Upland mixed ashwoods	27.83	High	Moderate	333.96
Other coniferous woodland	27.91	Low	Moderate	111.64
Ruderal/Ephemeral	4764.1	Low	Poor	9528.2
Bramble scrub	3835.84	Medium	Poor	15343.36
Modified grassland	1223.39	Low	Moderate	4893.56
Other neutral grassland	116.34	Medium	Moderate	930.72
Upland acid grassland	44.93	Medium	Moderate	359.44
Lowland calcareous grassland	23.11	High	Moderate	277.32
Bracken	0	0	0	0
Upland Heathland	125.6	High	Moderate	1507.2
Ponds (Non- Priority Habitat)	184.01	Medium	Moderate	1472.08
Fens (upland and lowland)	273.51	V.High	Moderate	4376.16
Blanket bog	33.12	V.High	Moderate	529.92
Inland rock outcrop and scree habitats	1.85	High	Moderate	22.2
Other inland rock and scree	0.02	Medium	Moderate	0.16
Coastal lagoons	8.02	High	Moderate	96.24
Features of littoral rock	0	High	Moderate	0
Features of littoral sediment	2.17	High	Moderate	26.04
Features of littoral rock	8.62	High	Moderate	103.44
Features of littoral sediment	0.44	High	Moderate	5.28
Saltmarshes and saline reedbeds	14.86	High	Moderate	178.32
Built linear features	2370.8	V.Low	N/A - Other	0

8.2 North, West & Central

Table derived from Network Rail North West & Central Biodiversity Metric Baseline 2021.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Other woodland; broadleaved	1802.65	Medium	Moderate	14421.2
Wet woodland	18.58	High	Moderate	222.96
Upland oakwood	18.58	High	Moderate	222.96
Upland mixed ashwoods	18.58	High	Moderate	222.96
Other coniferous woodland	43.78	Low	Moderate	175.12
Ruderal/Ephemeral	2407.04	Low	Poor	4814.08
Bramble scrub	3408.92	Medium	Poor	13635.68
Modified grassland	834.1	Low	Moderate	3336.4
Other neutral grassland	660.06	Medium	Moderate	5280.48
Upland acid grassland	64.74	Medium	Moderate	517.92
Upland calcareous grassland	41.26	High	Moderate	495.12
Bracken	0	0	0	0
Upland Heathland	235.98	High	Moderate	2831.76
Ponds (Non- Priority Habitat)	68.6	Medium	Moderate	548.8
Fens (upland and lowland)	52.83	V.High	Moderate	845.28
Blanket bog	40.35	V.High	Moderate	645.6
Inland rock outcrop and scree habitats	0.37	High	Moderate	4.44
Other inland rock and scree	36.53	Medium	Moderate	292.24
Coastal lagoons	0	High	Moderate	0
Features of littoral rock	0.01	High	Moderate	0.12
Features of littoral sediment	67.68	High	Moderate	812.16
Features of littoral rock	14.77	High	Moderate	177.24
Features of littoral sediment	3.55	High	Moderate	42.6
Saltmarshes and saline reedbeds	43.62	High	Moderate	523.44
Built linear features	1495.31	V.Low	N/A - Other	0

8.3 Scotland's Railway

Table derived from Network Rail Scotland Biodiversity Metric Baseline 2021.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Other woodland; broadleaved	1819.86	Medium	Moderate	14558.88
Upland oakwood	18.96	High	Moderate	227.52
Upland birchwoods	18.96	High	Moderate	227.52
Upland mixed ashwoods	18.96	High	Moderate	227.52
Wet woodland	18.96	High	Moderate	227.52
Other Scot's Pine woodland	14.49	Medium	Moderate	115.92
Other coniferous woodland	28.97	Low	Moderate	115.88
Ruderal/Ephemeral	1467.89	Low	Poor	2935.78
Bramble scrub	1610.84	Medium	Poor	6443.36
Modified grassland	586.17	Low	Moderate	2344.68
Other neutral grassland	6.57	Medium	Moderate	52.56
Upland acid grassland	136.88	Medium	Moderate	1095.04
Calcareous grassland	1.03	High	Moderate	12.36
Bracken	97.61	Low	Poor	195.22
Upland Heathland	390.43	High	Moderate	4685.16
Ponds (Non- Priority Habitat)	7.59	Medium	Moderate	60.72
Fens (upland and lowland)	40.63	V.High	Moderate	97.76
Blanket bog	242.2	V.High	Moderate	2756
Inland rock outcrop and scree habitats	1.95	Medium	Moderate	15.6
Other inland rock and scree	192.89	High	Moderate	2314.68
Coastal lagoons	0.67	High	Moderate	8.04
Features of littoral rock	7.86	High	Moderate	94.32
Littoral mixed sediments	50.95	High	Moderate	611.4
Features of littoral rock	11.84	High	Moderate	142.08
Features of littoral sediment	9.96	High	Moderate	119.52
Saltmarshes and saline reedbeds	82	High	Moderate	984
Built linear features	653.85	V.Low	N/A - Other	0

8.4 Southern

Table derived from Network Rail Southern Biodiversity Metric Baseline 2021.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Lowland mixed deciduous woodland	1467.6	High	Moderate	17611.2
Other coniferous woodland	100.26	Low	Moderate	401.04
Ruderal/Ephemeral	0		0	
Bramble scrub	4131.28	Medium	Poor	16525.12
Modified grassland	652.84	Low	Moderate	2611.36
Other neutral grassland	9.38	Medium	Moderate	75.04
Other lowland acid grassland	3.69	Medium	Moderate	29.52
Lowland calcareous grassland	226.96	High	Moderate	2723.52
Bracken	0	0	0	0
Lowland Heathland	444.02	High	Moderate	5328.24
Lowland Heathland	42.09	High	Moderate	505.08
Ponds (Non- Priority Habitat)	80.19	Medium	Moderate	641.52
Fens (upland and lowland)	193.54	V.High	Moderate	3096.64
Blanket bog	0	V.High	Moderate	0
Other inland rock and scree	1.43	Medium	Moderate	11.44
Coastal lagoons	1.26	High	Moderate	15.12
Features of littoral rock	0	High	Moderate	0
Features of littoral sediment	16.21	High	Moderate	194.52
Features of littoral rock	0	High	Moderate	0
Features of littoral sediment	1.02	High	Moderate	12.24
Saltmarshes and saline reedbeds	28.67	High	Moderate	344.04
Built linear features	459.03	V.Low	N/A - Other	0

8.5 Wales and Western

Table derived from Network Rail Wales and Western Biodiversity Metric Baseline 2021.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Other woodland; broadleaved	1901.08	Medium	Moderate	15208.64
Wet woodland	19.8	High	Moderate	237.6
Lowland mixed deciduous woodland	19.8	High	Moderate	237.6
Upland oakwood	19.8	High	Moderate	237.6
Lowland beech and yew woodland	19.8	High	Moderate	237.6
Other Scot's Pine woodland	13.19	Medium	Moderate	105.52
Other coniferous woodland	13.19	Low	Moderate	52.76
Ruderal/Ephemeral	1276.97	Low	Poor	2553.94
Bramble scrub	2351.92	Medium	Poor	9407.68
Modified grassland	1302.04	Low	Moderate	5208.16
Other neutral grassland	153.12	Medium	Moderate	1224.96
Upland acid grassland	19.28	Medium	Moderate	154.24
Lowland calcareous grassland	22.02	High	Moderate	264.24
Bracken	0	0	0	0
Upland Heathland	182.09	High	Moderate	2185.08
Lowland Heathland	46.57	High	Moderate	558.84
Ponds (Non- Priority Habitat)	65.31	Medium	Moderate	522.48
Fens (upland and lowland)	289.25	V.High	Moderate	4628
Lowland raised bog	2.98	V.High	Moderate	47.68
Inland rock outcrop and scree habitats	0.62	High	Moderate	7.44
Other inland rock and scree	61	Medium	Moderate	488
Coastal lagoons	2.73	High	Moderate	32.76
Features of littoral rock	60.69	High	Moderate	728.28
Features of littoral sediment	60.5	High	Moderate	726
Features of littoral rock	8.53	High	Moderate	102.36
Features of littoral sediment	29.71	High	Moderate	356.52
Saltmarshes and saline reedbeds	168.33	High	Moderate	2019.96
Built linear features	1063.76	V.Low	N/A - Other	0

9 Data interpretation

9.1 Data acquisition

Land cover/habitat maps produced by UKCEH for Network Rail are derived from 10m pixel satellite data from ESA's Copernicus Sentinel-2 mission. These Sentinel-2 images are free to access. These satellites have a revisit time of 6 days over Britain, so there are approximately 60 complete views captured each year.

Sentinel-2 is an optical sensor and detects sunlight reflected from the Earth's surface. Images are recorded as 13 discrete spectral bands including visible (red, green and blue) and invisible (infrared and ultraviolet) regions of the electromagnetic spectrum. UK CEH software tools process all Sentinel-2 images over the UK within a year. These tools are able to disregard regions with excess cloud and haze. The pixels that remain represent the Earth surface.

For the cloud-free pixels the median reflectance per month is calculated. This compresses the 60 full-UK coverages into 12 composite image collections and significantly reduces data volume for additional computation steps.

A Random Forest machine learning algorithm is trained to model the relationship of seasonal variations in land surface reflectance between habitats and land cover. The model predicts 21 UK-Habitats. This is truncated to 1km either side of network rail land holdings.

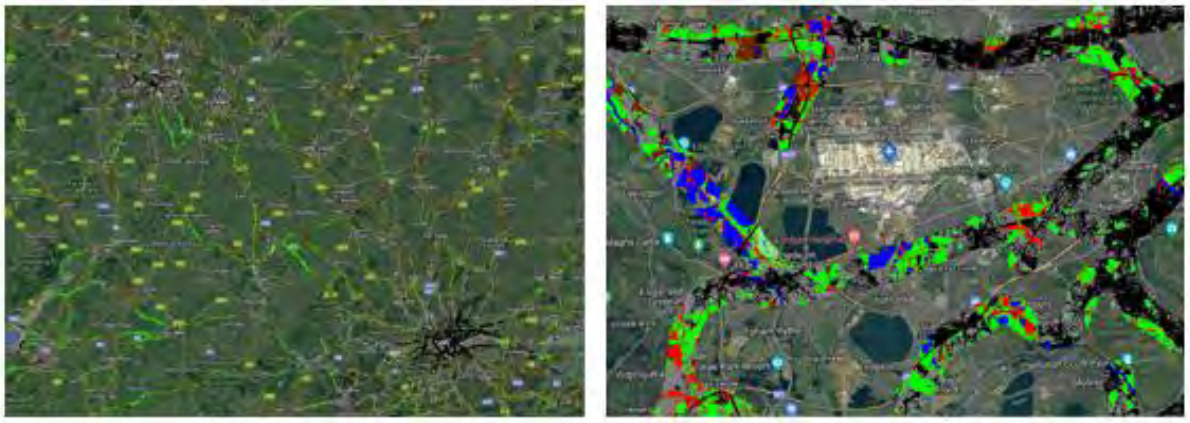

Figure 1 *Network Rails UK-Habitats map 1km either side of land holdings*

9.2 Data variation

Model predictions for UK-Habitat maps compiled for Network Rail have been validated. This involved a random sampling of regions within 250m of the track bed. Habitat values were assigned by experts, and these were compared to model predictions. There is a slight interannual variation, but accuracy has always been close to 80 %; therefore, we expect approximately ~20 % annual error.

Estimates have been completed for 2020 and 2021. Some interannual variation will be due to real changes in habitat distribution. However, the amount of habitat that changes from one class to another on an annual basis will be small and is estimated to be less than 5 %. This is much lower than the expected error, ~20 %. Because expected error is significantly higher than real change the majority of interannual fluctuation will be error, and the signal of real change will be 'lost in the noise'.

Errors are random in time and space, so the same errors are very unlikely to occur in the same location year-after-year (they are spatially and temporally transient). Real-world changes on the other hand will persist in space and time. Therefore, as the time series of NR UK-Habitat maps matures the overall volume of change will eventually overtake the expected error and reliable trends in habitat dynamics will begin to appear.

9.3 Mixed pixels

Mixed pixels are pixels that cross the boundaries between land cover types. A proportion of a mixed pixel will cover one habitat type, the remaining proportion at least one other. Mixed pixels are ambiguous and difficult to assign to a single habitat type for both surveyors and classification models.

A very high proportion of railway estate land holdings are narrow relative to pixel resolution. Track and lineside vegetation are often less than 20m wide. Features that are narrow relative to pixel resolution (10m) are likely to represent mixed pixels.

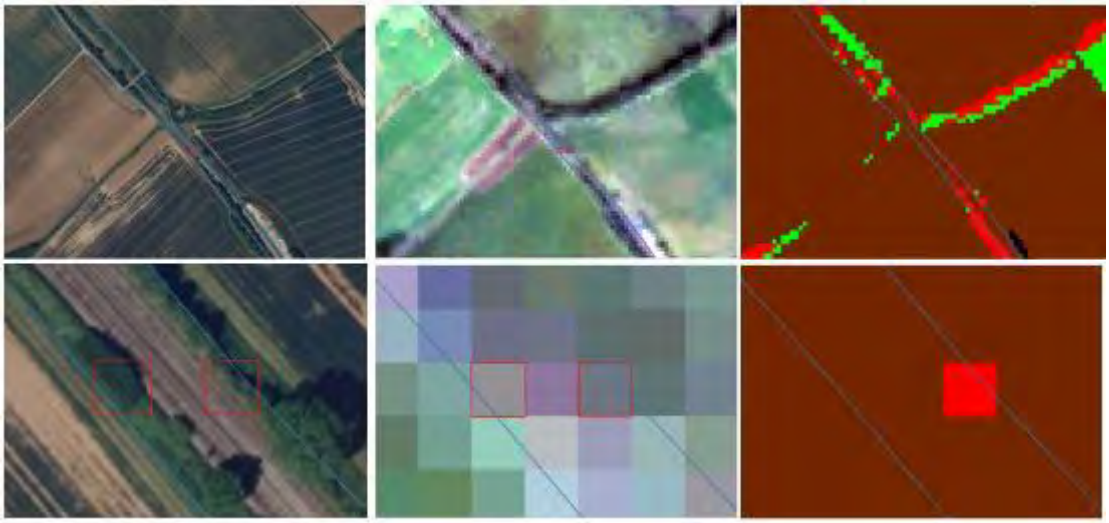

Figure 2. *Example of pixel mixing in vicinity of rail track. Left figures highlights two mixed pixels against very high-resolution aerial images. Centre the equivalent area and sentinel-2 images. Right the predicted land cover. Each pixel represents a mix of track, trackside vegetation and arable field margin.*

9.4 Future resolution

It is difficult to quantify model performance of the Random Forest classification algorithm for narrow track features. Partly this is due to access restrictions making observations required for validation difficult to collect, but also because surveyors too struggle to assign single habitat values to mixtures.

Because of this 10m resolution challenge, higher resolution sensors can enhance estimates of Network Rail's habitat assets. Planet's SuperDove missions collect annual images of the UK land surface at 3m resolution and have enhanced potential to describe Network Rails habitat assets. However, unlike Sentinel-2 images they are not free to access.

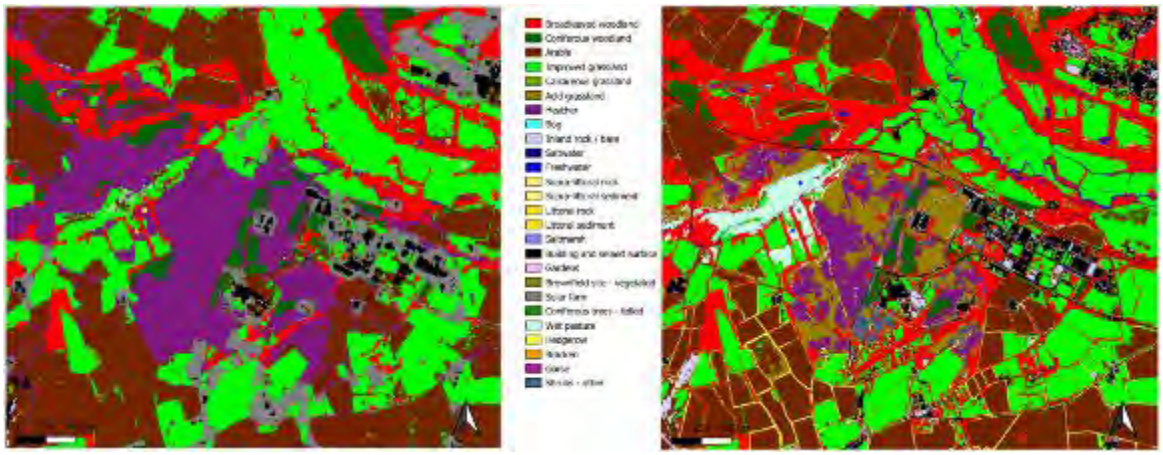

Figure 3 *An example of the much higher level of detail that can be achieved using 3m pixel (right) v 10m pixels (left).*

10 References

Network Rail (2021) *State of Nature Report.* Available online. State of Nature report [Accessed 30/07/2023]

UKCEH (2021) *Network Rail Estate Baseline data set*. (Unpublished)

11 Appendix

Copies of the revised 2020 biodiversity metric results are provided below.

11.1 Eastern

Table derived from Network Rail Eastern Biodiversity Metric Baseline 2020.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Other woodland; broadleaved	2992.43	Medium	Moderate	23939.44
Wet woodland	31.5	High	Moderate	378
Lowland mixed deciduous woodland	31.5	High	Moderate	378
Upland oakwood	31.5	High	Moderate	378
Lowland beech and yew woodland	31.5	High	Moderate	378
Upland mixed ashwoods	31.5	High	Moderate	378
Other coniferous woodland	45.43	Low	Moderate	181.72
Ruderal/Ephemeral	4753.81	Low	Poor	9507.62
Bramble scrub	3726.86	Medium	Poor	14907.44
Modified grassland	1001.63	Low	Moderate	4006.52
Other neutral grassland	120.9	Medium	Moderate	967.2
Upland acid grassland	9.56	Medium	Moderate	76.48
Lowland calcareous grassland	6.4	High	Moderate	76.8
Bracken	0	0	0	0
Upland Heathland	69.97	High	Moderate	839.64
Ponds (Non- Priority Habitat)	236.32	Medium	Moderate	1890.56
Fens (upland and lowland)	167.06	V.High	Moderate	2672.96
Blanket bog	13.46	V.High	Moderate	215.36
Inland rock outcrop and scree habitats	1.15	High	Moderate	13.8
Other inland rock and scree	0.01	Medium	Moderate	0.08
Coastal lagoons	4.69	High	Moderate	56.28
Features of littoral rock	0	High	Moderate	0
Features of littoral sediment	10.41	High	Moderate	124.92
Features of littoral rock	7.05	High	Moderate	84.6
Features of littoral sediment	7.93	High	Moderate	95.16
Saltmarshes and saline reedbeds	148.92	High	Moderate	1787.04
Built linear features	2360.64	V.Low	N/A - Other	0

11.2 North, West & Central

Table derived from Network Rail North West & Central Biodiversity Metric Baseline 2020.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Other woodland; broadleaved	2088.34	Medium	Moderate	16706.72
Wet woodland	21.53	High	Moderate	258.36
Upland oakwood	21.53	High	Moderate	258.36
Upland mixed ashwoods	21.53	High	Moderate	258.36
Other coniferous woodland	67.37	Low	Moderate	269.48
Ruderal/Ephemeral	2167.79	Low	Poor	4335.58
Bramble scrub	3512	Medium	Poor	14048
Modified grassland	744.84	Low	Moderate	2979.36
Other neutral grassland	468.31	Medium	Moderate	3746.48
Upland acid grassland	100.79	Medium	Moderate	806.32
Upland calcareous grassland	39.34	High	Moderate	472.08
Bracken	0	0	0	0
Upland Heathland	158.86	High	Moderate	1906.32
Ponds (Non- Priority Habitat)	87.33	Medium	Moderate	698.64
Fens (upland and lowland)	1.4	V.High	Moderate	22.4
Blanket bog	5.35	V.High	Moderate	85.6
Inland rock outcrop and scree habitats	0.37	High	Moderate	4.44
Other inland rock and scree	36.28	Medium	Moderate	290.24
Coastal lagoons	0	High	Moderate	0
Features of littoral rock	0.39	High	Moderate	4.68
Features of littoral sediment	182.84	High	Moderate	2194.08
Features of littoral rock	15.32	High	Moderate	183.84
Features of littoral sediment	4.71	High	Moderate	56.52
Saltmarshes and saline reedbeds	161.25	High	Moderate	1935
Built linear features	1470.43	V.Low	N/A - Other	0

11.3 Scotland's Railway

Table derived from Network Rail Scotland Biodiversity Metric Baseline 2020.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Other woodland; broadleaved	2429.75	Medium	Moderate	19438
Upland oakwood	25.31	High	Moderate	303.72
Upland birchwoods	25.31	High	Moderate	303.72
Upland mixed ashwoods	25.31	High	Moderate	303.72
Wet woodland	25.31	High	Moderate	303.72
Other Scot's Pine woodland	24.11	Medium	Moderate	192.88
Other coniferous woodland	48.21	Low	Moderate	192.84
Ruderal/Ephemeral	994.13	Low	Poor	1988.26
Bramble scrub	1538.84	Medium	Poor	6155.36
Modified grassland	788.13	Low	Moderate	3152.52
Other neutral grassland	0	Medium	Moderate	0
Upland acid grassland	163.11	Medium	Moderate	1304.88
Calcareous grassland	0	0	0	0
Bracken	79.26	Low	Poor	158.52
Upland Heathland	317.03	High	Moderate	3804.36
Ponds (Non- Priority Habitat)	5.71	Medium	Moderate	45.68
Fens (upland and lowland)	6.11	V.High	Moderate	97.76
Blanket bog	172.25	V.High	Moderate	2756
Inland rock outcrop and scree habitats	74.72	High	Moderate	896.64
Other inland rock and scree	0.75	Medium	Moderate	6
Coastal lagoons	0.48	High	Moderate	5.76
Features of littoral rock	2.15	High	Moderate	25.8
Littoral mixed sediments	72.35	High	Moderate	868.2
Features of littoral rock	17.27	High	Moderate	207.24
Features of littoral sediment	10.58	High	Moderate	126.96
Saltmarshes and saline reedbeds	73.58	High	Moderate	882.96
Built linear features	619.2	V.Low	N/A - Other	0

11.4 Southern

Table derived from Network Rail Southern Biodiversity Metric Baseline 2020.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Lowland mixed deciduous woodland	1475.2	High	Moderate	17702.4
Other coniferous woodland	178.47	Low	Moderate	713.88
Ruderal/Ephemeral	0		0	0
Bramble scrub	4089.49	Medium	Poor	16357.96

Modified grassland	877.11	Low	Moderate	3508.44
Other neutral grassland	0.07	Medium	Moderate	0.56
Other lowland acid grassland	0.85	Medium	Moderate	6.8
Lowland calcareous grassland	162.53	High	Moderate	1950.36
Bracken	0	0	0	0
Lowland Heathland	224.25	High	Moderate	2691
Lowland Heathland	37.71	High	Moderate	452.52
Ponds (Non- Priority Habitat)	140.42	Medium	Moderate	1123.36
Fens (upland and lowland)	35.81	V.High	Moderate	572.96
Blanket bog	0	V.High	Moderate	0
Other inland rock and scree	0.13	Medium	Moderate	1.04
Coastal lagoons	0.5	High	Moderate	6
Features of littoral rock	0	High	Moderate	0
Features of littoral sediment	22.21	High	Moderate	266.52
Features of littoral rock	0	High	Moderate	0
Features of littoral sediment	0.95	High	Moderate	11.4
Saltmarshes and saline reedbeds	159.38	High	Moderate	1912.56
Built linear features	454.39	V.Low	N/A - Other	0

11.5 Wales and Western

Table derived from Network Rail Wales and Western Biodiversity Metric Baseline 2020.

Habitat type	Area (hectares)	Distinctiveness	Condition	Total habitat units
Other woodland; broadleaved	2170.67	Medium	Moderate	17365.36
Wet woodland	22.61	High	Moderate	271.32
Lowland mixed deciduous woodland	22.61	High	Moderate	271.32
Upland oakwood	22.61	High	Moderate	271.32
Lowland beech and yew woodland	22.61	High	Moderate	271.32
Other Scot's Pine woodland	15.46	Medium	Moderate	123.68
Other coniferous woodland	15.46	Low	Moderate	61.84
Ruderal/Ephemeral	1351.02	Low	Poor	2702.04
Bramble scrub	2298.13	Medium	Poor	9192.52
Modified grassland	846.96	Low	Moderate	3387.84
Other neutral grassland	112.54	Medium	Moderate	900.32
Upland acid grassland	19.25	Medium	Moderate	154
Lowland calcareous grassland	7.02	High	Moderate	84.24
Bracken	0	0	0	0
Upland Heathland	50.2	High	Moderate	602.4
Lowland Heathland	17.81	High	Moderate	213.72
Ponds (Non- Priority Habitat)	129.91	Medium	Moderate	1039.28
Fens (upland and lowland)	188.14	V.High	Moderate	3010.24
Lowland raised bog	0.16	V.High	Moderate	2.56
Inland rock outcrop and scree habitats	0.16	High	Moderate	1.92
Other inland rock and scree	16.01	Medium	Moderate	128.08
Coastal lagoons	2.85	High	Moderate	34.2
Features of littoral rock	48.83	High	Moderate	585.96
Features of littoral sediment	157.6	High	Moderate	1891.2
Features of littoral rock	8.02	High	Moderate	96.24
Features of littoral sediment	26.62	High	Moderate	319.44
Saltmarshes and saline reedbeds	642.67	High	Moderate	7712.04
Built linear features	958.17	V.Low	N/A - Other	0

Eastern Region State of Nature Report 2021/22

Contents

12 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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Report authoriser	
Position	
Date	

12.1 Document Control

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

13 Foreword

This document is the second State of Nature report for the Eastern Region, covering the period April 2021 to March 2022.

Last year, Network Rail published its Biodiversity Action Plan (BAP) setting out its vision of '*a lineside managed sustainably for safety, performance, the environment, our customers and our neighbours*'. The Eastern Region responded with the Eastern Environmental Sustainability Strategy and by adopting the ambitious Eastern Region Biodiversity Plan. The plan committed the Region to a series of objectives that would realise benefits for biodiversity; this document outlines the first steps taken towards achieving those objectives. It also reviews the state of nature on the Region's estate following the baseline captured the previous year 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.

Figure 2.1: *Network Rail's Eastern Region*

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 its first 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.

14 Executive Summary

14.1 Overview

The Eastern Region is Network Rail's largest Region, passing through National Parks and Areas of Outstanding Beauty, amongst other environmentally protected sites, including over 60 SSSIs.

Biodiversity calculations predict the Region has approximately 62,585.64 biodiversity units within its estate.

A total of 27 habitat types were recorded, two of which were 'very high' value. The most common habitat types were bramble scrub and low-lying vegetation, accounting for 54 % of the estate and 39 % of its biodiversity units. These common, 'low-value' habitats present an opportunity to improve biodiversity and their even distribution across the Region provides each Route with an equal opportunity to do so.

'Broadleaved woodland' accounted for 18 % of the Region's estate and 37 % of its biodiversity units. A loss in this 'high-value' habitat and its associated biodiversity appears to have occurred since the biodiversity baseline was captured in 2019. However, data sets are too few and close together to allow for meaningful conclusions to be made with confidence at this resolution and scale. Woodland is most often managed because of the risks posed to railway infrastructure, but the Region has begun to change its vegetation management practices by improving its woodland management techniques. It will also seek to establish appropriate habitats that will improve biodiversity, informed by ecological data and stakeholder engagement.

Over the past year the Region has sought to protect and safeguard protected and notable species, some of which include, peregrine, willow tits, invertebrates (e.g., dingy skipper and Duke of Burgundy), hazel dormice and amphibians (such as great crested newts). The Region also worked with Natural England to designate part of a new SSSI at Dearne Valley.

The Eastern Region continues to progress the development of its Ecology Team in partnership with the Wildlife Trusts. A team structure has been agreed that will embed ecological expertise at Region and Route level. A programme has been agreed with the charity that will deliver stakeholder engagement events, a Biodiversity Inventory, Route Biodiversity Action Plans, Habitat Management Plans, Vegetation Management Plans and project-specific Sectional Plans. These tools will form the Region's plan for its lineside habitats and will help the Region meet its biodiversity net gain ambitions.

14.2 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 will start by enlisting the help of The Wildlife Trusts and 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 will develop systems and processes to allow us to make informed decisions and plans for our biodiversity that will lead to meaningful gains. Ultimately, this will allow us to be responsible custodians of an important asset, upon which so much depends, at a critical point in time.

14.3 Summary of achievements for biodiversity management

Key to achieving 10 % biodiversity net gain will be in understanding what biodiversity net gain should look like. Over the past year, we have engaged the Wildlife Trusts to understand how best they can help us understand the biodiversity we have within, and alongside, our estate. We have secured funding for the remainder of the control period to bring in a team of Wildlife Trust ecologists and Engagement Managers. A programme of works has been agreed and funded that will start with a comprehensive and strategic approach to stakeholder engagement and data collection that will lead to opportunity mapping that the Region can capitalise upon.

14.4 What further action will we take?

In addition to furthering the development of the projects, plans and initiatives identified in this report, the Region is now looking ahead to:

- work closer with capital projects and the supply chain, including large programmes such as the Transpennine Route Upgrade (TRU), to understand how best to work, and track progress towards, common biodiversity goals

- explore the creation of an Eastern Region Ecology Framework that will include suppliers from across the Region and better serve the Routes with local, ecological advice and support, in a way that supports local communities and delivers better social value
- establish how to better support local teams implement the Network Rail Biodiversity Standard (NR/L2/ENV/122), establish processes to do this and support where needed
- identify and explore new technologies that will help deliver plans for biodiversity at scale
- identify new partnerships and stakeholders to help deliver their initiatives and ambitions for biodiversity, wherever possible
- Further work is required to ensure infestations of NNIS are recorded in our systems and appropriate treatment plans are agreed and actioned
- an integrated approach for vegetation and habitat management that meets the needs of all Network Rail functions and other industry stakeholders through the development of Sectional Plans

15 State of nature for the Eastern Region

15.1 Biodiversity metric calculation

Network Rail's national biodiversity baseline was captured by the Centre for Ecology and Hydrology (CEH) in 2019 and 2020, the methods and results of which were published in the first State of Nature Report 2020/21[2]. This exercise was repeated in 2021 but with an improvement to the way satellite data were interpreted and habitat areas were calculated. There was also an improvement to the accuracy of Network Rail boundary data used in the assessment. These improvements have been retrospectively applied to the 2019 and 2020 datasets, since the publication of the first report (2022) and the baseline is thus recalibrated.

Datasets therefore exist for 2019, 2020 and 2021, a summary of which is presented in Table 4.1, below.

Table 4.1: *Total area and biodiversity units recorded each year for the Eastern Region.*

Year	Area (Ha)	Biodiversity Units (BU)	Average BU / Hectare
2019	15842.14	63697.66	4.02
2020	15842.13	63333.62	4.00
2021	15842.11	62585.64	3.95

The area recorded each year remained the same, although the associated biodiversity units appear to decrease by 1112.02, equating to a 1.75 % difference. The average biodiversity unit recorded per hectare also dropped from 4.02 to 3.95. However, datasets are too few and too close together to allow meaningful conclusions to be made with confidence, at scale, for Regional biodiversity trajectories, against the background noise of an operational network.

This new baseline suggests the Region needs an increase of 6,369.77 biodiversity units to meet its ten percent net gain biodiversity target by 2035.

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

[2] Strong, N. (2022). *Network Rail State of Nature Summary Report 2020/21*. Available at: [https://www.networkrail.co.uk/wp-content/uploads/2022/10/Network-Rail-State-of-Nature-report-plus-six-appendices.pdf]

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 4.2, below

Table 4.2: *UK Hab[3] types, their distinctiveness, total area and associated biodiversity units (BUs) across all three datasets (2019–2021).*

		2019		2020		2021	
Habitat type	**Distinctiveness**	**Area (ha)**	**BUs**	**Area (ha)**	**BUs**	**Area (ha)**	**BUs**
Other woodland; broadleaved	Medium	3123.39	24987.12	2992.43	23939.44	2644.32	21154.56
Wet woodland	High	32.88	394.56	31.5	378	27.83	333.96
Lowland mixed deciduous woodland	High	32.88	394.56	31.5	378	27.83	333.96
Upland oakwood	High	32.88	394.56	31.5	378	27.83	333.96
Lowland beech and yew woodland	High	32.88	394.56	31.5	378	27.83	333.96
Upland mixed ashwoods	High	32.88	394.56	31.5	378	27.83	333.96
Other coniferous woodland	Low	34.26	137.04	45.43	181.72	27.91	111.64
Ruderal/Ephemeral	Low	3861.13	7722.26	4753.81	9507.62	4764.1	9528.2
Bramble scrub	Medium	3351.16	13404.64	3726.86	14907.44	3835.84	15343.36
Modified grassland	Low	1129.17	4516.68	1001.63	4006.52	1223.39	4893.56
Other neutral grassland	Medium	160.59	1284.72	120.9	967.2	116.34	930.72
Upland acid grassland	Medium	8.09	64.72	9.56	76.48	44.93	359.44
Lowland calcareous grassland	High	1.69	20.28	6.4	76.8	23.11	277.32
Bracken	-	0	0	0	0	0	0
Upland Heathland	High	76.68	920.16	69.97	839.64	125.6	1507.2
Ponds (Non- Priority Habitat)	Medium	482.18	3857.44	236.32	1890.56	184.01	1472.08
Fens (upland and lowland)	V. High	181.29	2900.64	167.06	2672.96	273.51	4376.16
Blanket bog	V. High	14.78	236.48	13.46	215.36	33.12	529.92
Inland rock outcrop and scree habitats	High	0.11	1.32	1.15	13.8	1.85	22.2
Other inland rock and scree	Medium	10.62	84.96	0.01	0.08	0.02	0.16
Coastal lagoons	High	3	36	4.69	56.28	8.02	96.24
Features of littoral rock	High	0.01	0.12	0	0	0	0
Features of littoral sediment	High	13.52	162.24	10.41	124.92	2.17	26.04
Features of littoral rock	High	11.03	132.36	7.05	84.6	8.62	103.44
Features of littoral sediment	High	8.72	104.64	7.93	95.16	0.44	5.28
Saltmarshes and saline reedbeds	High	95.42	1145.04	148.92	1787.04	14.86	178.32
Built linear features	V. Low	3110.9	0	2360.64	0	2370.8	0

[3] UK Habitat Classification System. Available at [https://ukhab.org].

A total of 27 habitat types were recorded across the Eastern Region.

Two habitats of 'Very High' distinctiveness, Fens and Blanket Bog, were recorded. In 2019, they had a combined area of 196.07 ha and contained 5% of the Region's biodiversity units. In 2021, they had a combined area of 306.63 ha and contained 8% of the Region's biodiversity units. It is unlikely that in three years' time these rare habitats will have increased in such a way, illustrating why further data points over time are needed to track genereal trends and trajectories at such resolution and scale. Furthermore, the difference in woodland cover from 2019 to 2021 (-510 ha) is almost double the area that vegetation management teams would typically manage over the same period (although removal of woodland by other business areas are not yet quantified). This suggests other variables exist that need to be accounted for before comparing datasets to understand the business' impacts on habitats and their associated biodiversity.

15.2 Habitats

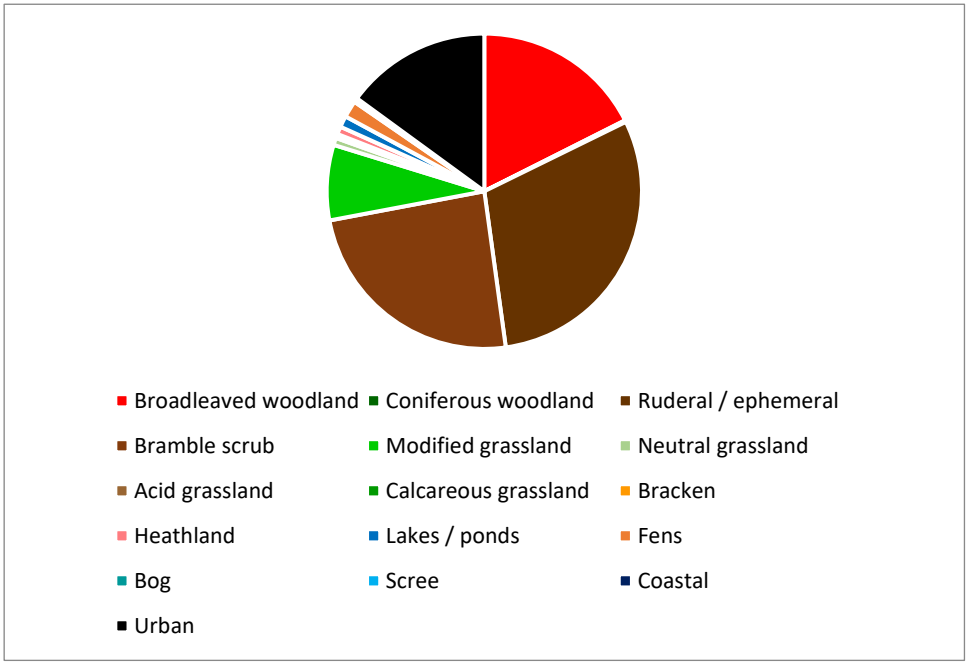

Figure 4.1: *Pie chart showing the Eastern Region's habitat proportions recorded in 2021.*

Figure 4.1 above shows that 'Ruderal / ephemeral' and 'bramble scrub' form the largest proportion of habitats recorded within the Eastern Region. Table 4.2, shows that, together, they account for 54% of the Region's area and 39% of its biodiversity units. 'Ruderal / ephemeral' habitats score 'low' distinctiveness and 'Bramble scrub' is of 'Medium' distinctiveness. This suggests these habitats present one of the greatest opportunities to improve biodiversity in the Region. However, in urban areas, they can form

part of priority habitats and can be crucial in providing connectivity between areas of higher distinctiveness. Altering these habitats will need a considered, informed approach, sympathetic to the wider landscape and in concert with wider initiatives.

In 2021, 'Broadleaved woodland' accounted for 18 % of the Region's area (Table 4.2) and contained 37 % of the Region's biodiversity units, reflecting the high value of the habitat. Woodland habitats are those most frequently managed to safeguard the operational network and is where our impacts on biodiversity are most likely to be felt, although not always in a negative way. A proportion of the loss in biodiversity through the removal of woodland would be recovered by the resulting habitat, most likely grassland or scrub. Vegetation management practices have in the past left these areas, allowing successional habitats to develop that would eventually see a return to woodland, completing the cycle over a number of years. Biodiversity calculations only provide a snapshot within that cycle, and it is only when data are captured over the lifespan of this cyclical management that the true picture of biodiversity losses and gains will begin to emerge. Our aim is to change this cyclical approach to vegetation management and instead provide an informed approach to establishing habitats we want with species that are appropriate alongside an operational railway. It is hoped that once these habitats are established, our vegetation management strategy will move from one needing to remove habitats because of the operational risk they pose to our infrastructure, to one maintaining established habitats with more biodiversity.

Figure 4.2: An illustration[4] of establishing an appropriate habitat (on the left), improving biodiversity and safeguarding railway infrastructure, versus past management cycles (on the right) leading to woodland in poor condition, without realising its biodiversity potential and posing an operational risk.

'Modified grassland' is the third-largest natural habitat, representing 8 % of lineside habitats (Table 4.2). Modified grassland has low species diversity and is characterised by few, fast-growing grass species on fertile neutral soils. However, much like 'Ruderal / ephemeral' and 'Bramble scrub', this habitat is part of priority habitats and can be crucial in providing connectivity between areas of higher distinctiveness. There is much potential to improve this habitat and, where appropriate, change it to a higher-value habitat to improve biodiversity.

The Remaining habitats are made up of high-value habitats, such as 'Bog', 'Fen', 'Lakes & Ponds', 'Heathland', species-rich grasslands, 'Scree', 'Bracken' and 'Coastal'. Although these habitats only account for 5 % of our lineside, they hold 16 % of all biodiversity recorded in 2021. Having a plan to safeguard, improve and connect these habitats will be key to meeting the Region's biodiversity targets.

Common habitat types appear to be evenly spread within each Route (see Figure 4.3, below), meaning the potential to improve these ubiquitous habitats is well balanced across the Routes and Region. However, rare habitats, generally associated with higher-value biodiversity are localised, showing an affinity to certain Routes. The Region's need to understand where all its habitats are located and how best to protect, improve and manage them at a landscape level is very important and remains a priority for the Eastern Region.

[4] Network Rail Infrastructure Limited: *Railway Sustainability Guidance Note, Woodland Design Guide and Management Note.* Network Rail, One Eversholt Street, London, 2021. Available at [https://safety.networkrail.co.uk/wp-content/uploads/2021/07/4-Woodland-Design-and-Management-Guidance-Note.pdf]

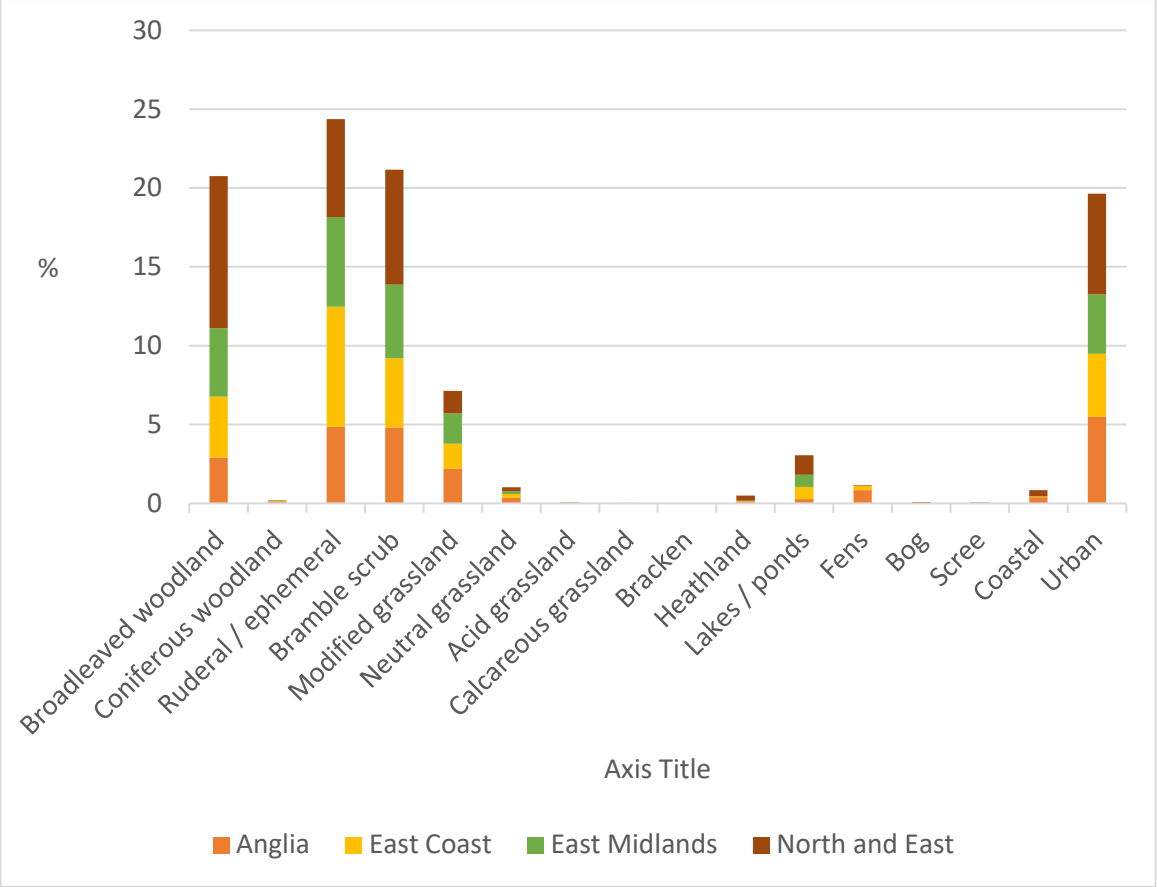

Figure 4.3: *Proportions of each habitat across all four Routes of the Eastern Region.*

15.3 Priority species and habitats

The Eastern Region is vast and contains many important species and habitats. The Environment Team are working with The Wildlife Trusts on an audit of these assets. The data collected by the audit will be held on a database referred to as a 'digital twin', as it will digitally mirror the Region's biodiversity. The digital twin will allow all teams to adequately plan for important species and habitats through the work they undertake. Below are some of the important species, species groups and habitats we seek to protect and with which we have worked in the year covered by this report.

15.3.1 Peregrine (Falco peregrinus)

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

15.3.2 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 met with Yorkshire Butterfly Conservation to understand how some of the substrates we use for access roads is perfect for rare butterflies, such as the Duke of Burgundy (*Hamearis lucina*), south of York.

(Taken from the Wildlife Trusts Website)

15.3.3 Willow tit and Dearne Valley SSSI

In Barnsley, part of our decommissioned railway estate had developed scrub habitat ideal for supporting willow tit (*Poecile montanus*). We worked with Natural England and the local Maintenance team to help designate the area as part of Dearne Valley SSSI. This will help protect this habitat for willow tit and many other species.

15.3.4 Great crested newts & other amphibians

The Eastern region pioneered a new licencing approach with NatureSpace (see Section 7.2) whereby 80 % of the licence fee funded high-quality habitat creation and restoration throughout the Region. These works were undertaken by the Newt Conservation Partnership that ensured habitat restoration in the right places. The objective of the

organisational licence is to improve the conservation status of the species and other amphibians throughout the Region, by creating bigger, better and more joined up habitats.

15.3.5 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.

15.3.6 SSSIs

The Eastern Region Environment Team continue to work with Natural England to ensure all 59 SSSIs that exist within our estate have up-to date Site Management Statements. We continue to communicate their importance to the wider business.

15.4 Invasive species

The presence of non-native invasive species (NNIS) 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. In the Eastern Region, artificial intelligence models are currently being taught to recognise NNIS from on-board train cameras, but this technology can only detect species visible from the track. The same is being developed with drone and satellite data and although it will be of great benefit in the future, this technology is still under development. This means traditional

methods of detection and treatment are currently underway, until better alternatives become available.

In the Eastern Region, treatment of NNIS is currently focussed on Japanese knotweed (*Fallopia 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.

Figure 4.4; *Drone capture of Japanese knotweed and Himalayan balsam (Impatiens glandulifera) on our estate. Most NNIS enter our estate where it intersects with watercourses, along which many NNIS are carried.*

In 2021-2022, Japanese knotweed was identified and recorded in our management systems at approximately 845 locations across the Eastern Region. Giant hogweed was identified and recorded at approximately 35 locations. In that period, 31 locations (4%) of Japanese knotweed were treated and seven locations (20%) of giant hogweed were treated.

Areas identified to manage both species in the Region were exceeded in 2021-2022. In future, we will seek to better understand where infestations are and how they impact biodiversity at those locations. This will help us decide how best to use our resources to manage their impact on biodiversity.

15.5 Demonstration sites or projects

15.5.1 Drone trials

A pilot study was undertaken to understand the accuracy of drone data to calculate the biodiversity value of vegetation management sites. Drone data captured by Anglia's Drainage and Off Track team, was used, from which one mile of lineside vegetation was selected at random. Habitats were mapped and biodiversity calculations were undertaken which were then compared to traditional site-visit calculations by an ecologist. Results showed that drone data were more accurate, as it removed surveyor bias and could more accurately map areas that were not visible from the ground.

Figure 4.5: *Habitats mapped using drone data to undertake biodiversity calculations. The estate boundary (yellow) can be clearly seen, as can the vegetation management extents (green line). This allowed for more accurate biodiversity calculations and quantification of losses than the traditional site visit, to which it was compared.*

Assumptions made for the condition of habitats were broadly correct and had negligible impact on accuracy. Using drones was faster, safer, more efficient and replicable. It was also a cost-effective approach to calculating the biodiversity value of a site and measuring change in biodiversity from large-scale vegetation management practices.

15.5.2 Hubble

Hubble is a digital lineside inspection tool developed in collaboration with Network Rail Routes, Delivery Units in Anglia, Arriva Rail London, Innovate UK and the Department for

Transport. The software is designed to process front-facing footage used on trains using algorithms to automatically detect defects and faults.

The system currently inspects and detects vegetation encroachment helping Network Rail teams prevent incidents associated with these faults, thus improving safety by reducing delays and the need for manual track inspections. In addition, as Hubble is automated, it reduces the need to process hours of footage.

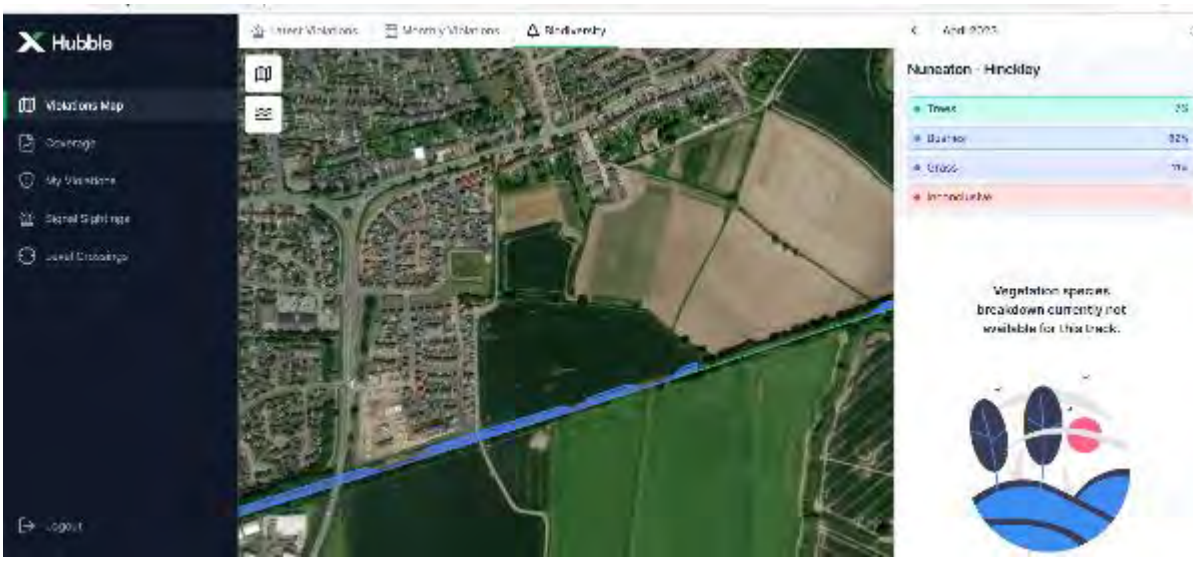

Figure 4.6: *A screenshot of Hubble's digital platform, showing habitats mapped using data captured by onboard train cameras and processed by artificial intelligence.*

Over the past year, Eastern Region environment teams have been working with Hubble's designers to identify and map broad habitats categories such as 'grass', 'bushes' and 'trees'. It can already identify individual species such as ash (*Frasinus spp.*), sycamore (*Acer spp.*), Japanese knotweed and ragwort (*Senecio jacobaea*). These data are displayed over Network Rail boundary lines and the team is trying to establish whether the software can quantify biodiversity by detecting and measuring lineside habitats.

16 Priorities for biodiversity management

The Environmental 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, which included progressing the following priorities:

16.1 Habitat Management Plans

The Region's Environment team have been working closely with the Wildlife Trusts throughout the year to determine the best approach to producing meaningful plans for our habitats, across the Region. Working at scale creates logistical challenges and this work clarified our approach to capture, store, interrogate and share information throughout the business. Habitat Management Plans will be based on this information and will need to be visible (including to our suppliers) and achievable to the wider business.

16.2 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.

16.3 Pilot areas

Over the past year we have explored the best way to identify unused plots of land and establish whether they can be used to deliver biodiversity gains. This has included submitting parcels through our Clearance process and liaising with internal and external stakeholders. Where this appears possible, sites were surveyed for biodiversity potential and the feasibility to undertake the work required.

Figure 5.1: *One of the plots identified near Sheffield for possible biodiversity gains. Plans are being discussed with the local Council and capital projects teams.*

16.4 Biodiversity Net Gain by 2035

Maintenance Teams and Asset Management teams have worked alongside their supply chains and local conservation groups to embrace new technologies and approaches to vegetation management (examples of which are contained in this report).

Figure 5.2: *Before and after photographs of improved approach to lineside vegetation practices. A change in work scope by the East Coast Off Track Asset Management Team in partnership with Works Delivery and the supply chain has resulted in an approach that not only retains vegetation but improves biodiversity whilst creating a vegetation profile safe for the railway.*

Improving management of our lineside to attain Biodiversity Net Gain by 2035 is a challenge, as only approximately 4 % of the Eastern Region's lineside is managed annually. As a Region, we are looking to work with other business areas, conservation organisations and offset delivery partners to help us reach this target.

16.5 Increase in ecological capability

A Key recommendation made in John Varley's independent report[5] to the Department for Transport for Network Rail was to "*have the right specialist capabilities and competencies in place*" to manage our lineside estate as an asset. To deliver this work, the Eastern Region has sought ecological expertise and resource from the Wildlife Trusts. Over the past year, an ambitious programme of works has been developed in partnership with the Trusts that will increase the Region's ecological capability to a team of up to ten people. This work will be fully funded for three years to help the Region position itself to meet its biodiversity targets and ambitions.

[5] Varley, J. (2018) *Valuing Nature – A railway for people and wildlife… The Network Rail Vegetation Management Review*. Crown Copy right 2018. Available at [Valuing nature – a railway for people and wildlife… The Network Rail Vegetation Management Review (publishing.service.gov.uk)]

17 Performance Indicators

17.1 Summary

The targets for the Region are ambitious, the scale of the Region presents a challenge, and the size of the business makes it difficult to track progress. A rushed approach to precipitate 'quick wins' would be injudicious and could result in misguided, deleterious consequences. It could also mean a missed opportunity at a point in time when opportunities to protect and improve our natural environment may be running out.

Care and consideration are needed to achieve the best outcome for biodiversity as the Region endeavours to meet its targets. The Eastern Region Biodiversity Plan has set out a road map consisting of a nested suite of deliverables, each informing the next step. The plan is key for a well-informed approach to meeting the Region's targets. It is also a plan for a legacy that will leave future generations with tools to face their challenges when managing biodiversity as an asset.

17.2 Progress towards performance indicators

17.2.1 Performance Indicators 1–6

The Eastern Region Biodiversity Plan is iterative, each step informing the next. This makes it difficult to set detailed Performance Indicators (PIs) for a process that will reveal itself once set in motion. However, there are markers along the way that will signpost whether the plan is on track to deliver. These markers are discrete bodies of work (deliverables) established, and agreed upon, in partnership with the Wildlife Trusts. Providing these deliverables are completed on time and are adopted by the business, the Region should meet its biodiversity targets in a meaningful way. It follows that each deliverable should therefore form a PI (1–6), which are contained in Table 6.2, below.

The deliverables / PIs align with our priorities for biodiversity management (Section 5, above) and most importantly, lay the foundations for the work ahead. However, most of them are markers on the horizon and currently form a blunt tool against which to measure progress. But, as the plan progresses, these PIs can be expanded to reflect the detail of work to be done, once that detail is known. An example of this, would be PI 2. *'Complete Stakeholder Engagement Events'* (see Table 6.2, below) which we know should be completed by January 2024. When we know exactly how many events need to take place in each Route, the PI can be expanded to reflect percentage completion, which will give a much clearer view on progress.

In summary, PIs 1–6 below will be delivered in partnership with the Wildlife Trusts and over the coming year we are focussed on PI 1. *'Increase ecology resource'*. Navigating the business' contract and procurement processes has encountered unforeseen delays, but the PI is progressing, and we believe will be achieved with only minor delays.

17.2.2 Performance Indicator 7

We will use our projects' Biodiversity Net Gain Assessments and their metric calculations to understand the 'biodiversity balance-sheet' at ground level. Although biodiversity calculations are being undertaken on most our projects, the reporting tools are not yet mature enough to track and measure progress at the breadth and scale the business operates. Our project teams are building these processes into the supply chain, so that tracking gains and losses from biodiversity calculations across entire programmes, becomes embedded into the *modus operandi*.

17.2.3 Performance Indicator 8

All planned treatment for Japanese knotweed and Himalayan balsam were exceeded this year, which is a positive step forward in the challenge to manage and limit the pernicious impacts of these species on native flora and fauna. Further work is required to ensure infestations of NNIS are recorded in our systems and appropriate treatment plans are agreed and actioned in future.

Table 6.1: *Key to status of performance indicators.*

Status	Definition
Completed	PI has been completed
On time	PI is showing a positive trend and/or actions are on time
No change	PI is showing little or no overall change and/or may be subject to some minor delays
Deteriorating	PI is deteriorating and/or may be subject to major delays

Table 6.2: *Eastern Region Performance Indicators.*

No	Performance indicator	Target	Status	Notes on Progress
1	**Increase Regional ecology resource**	July 2023	**No change**	Contract and procurement process has slowed progress, but still advancing with possible minor delays.

No	Performance indicator	Target	Status	Notes on Progress
2	**Complete stakeholder engagement events**	Jan 2024	**On time**	To be completed by above resource.
3	**Create Biodiversity Inventory**	Jan 2024	**On time**	This work will be continuous and ongoing but has a target 'start' of Jan 2024.
4	**Create Route Biodiversity Action Plan**	May 2024	**On time**	To be completed once PIs 1-3 completed
5	**Complete Habitat Management Plans**	June 2024	**On time**	To be completed once PIs 1-3 completed
6	**Develop approach to digital twin**	July 2023	**On time**	A considerable body of work, the PI is to decide upon the approach taken.
7	**No net loss and net gain in biodiversity as defined by a metric used in projects**	April 2024	**No change**	Metrics will be used by projects – biodiversity baseline remits are being developed with the supply chain and reporting tools are also being developed.
8	**Complete scheduled treatment of non-native invasive species each year.**	March 2022	**Completed**	42.8 ha of Japanese knotweed and 1.5 ha of giant hogweed was scheduled for treatment. Both targets exceeded.

18 Case studies

18.1 Examples of best-practice habitat management

18.1.1 Anglia Route – vegetation management

Vegetation management teams in Anglia and their specialist contractors mapped all their major vegetation management sites with drone capability. Drone data enabled the creation of three-dimensional models that could identify individual trees posing a risk to the infrastructure. It could pick out trees that were dead, diseased or dying and could quantify volumes of vegetation needing to be removed to achieve the required vegetation profile for the safe operation of the railway

Online community engagement events allowed the team to digitally show the model and share photographs with residents. The team could then discuss individual trees of interest to residents and explain why they needed to be removed or retained.

Figure 7.1: *Drone data, with blue points representing individual photographs stitched together to create the map and model, which subsequently reveal the flight path taken by the drone. Other points identify individual trees either for their health or size.*

Six lineside sites were identified for biodiversity improvement to compensate for losses sustained from vegetation management. The team worked with Buglife who undertook ecology surveys and made informed decisions on which habitats to enhance and create, using a variety of approved techniques. Long-term management is in place to secure their success.

Figure 7.2: *QTS, one of Anglia Route's specialist contractors employing various techniques to improve, or create habitats for biodiversity, including hydroseeding and planting tree whips.*

18.1.2 East Coast and North & East Routes – vegetation management

Vegetation Management teams for East Coast and North & East Routes took a bespoke approach to vegetation management. A dedicated Works Delivery team with specialist skills in woodland management appraised all sites individually. Recommendations made in site-specific Preliminary Ecological Appraisals were implemented in full, as the team created the vegetation profile required to operate the railway safely, whilst maintaining and enhancing features for biodiversity.

"Between 6.5m to 7.5m (Boundary) From the track, Willows were reduced to about 1.2m in height to be allowed to regrow, the rest will be allowed to develop into grass".

"Good practices this week, such as windrows, habitat piles, pollards, potential bat habitat created, also agreed with Contractor and Client that no eco plugs are to be used after 6.5m from track".

***Figure 7.3**: Site photos and notes made by vegetation management team at Burley, Leeds.*

A Key recommendation made in John Varley's independent report to the Department for Transport for Network Rail was:

"*Network Rail should ensure they are open and transparent in their plans for vegetation management. They must ensure they communicate effectively with stakeholders and neighbours*"

The team distributed notification letters to lineside neighbours and hosted local information events for all their work sites. This gave residents the opportunity to ask questions and understand the reason for the work and approach taken.

18.2 Examples of partnership working

18.2.1 East Midlands Route – Works Delivery and NatureSpace

In an industry first, Network Rail attained an 'Organisational Licence' with NatureSpace, providing a streamlined regulatory process for Network Rail and a step-change improvement for great crested newt (GCN) conservation.

Impacts to GCN are calculated using species distribution modelling (SDM) and habitat suitability mapping. The model characterises the landscape and its relative value to GCNs, removing the requirement for costly, site-specific survey work.

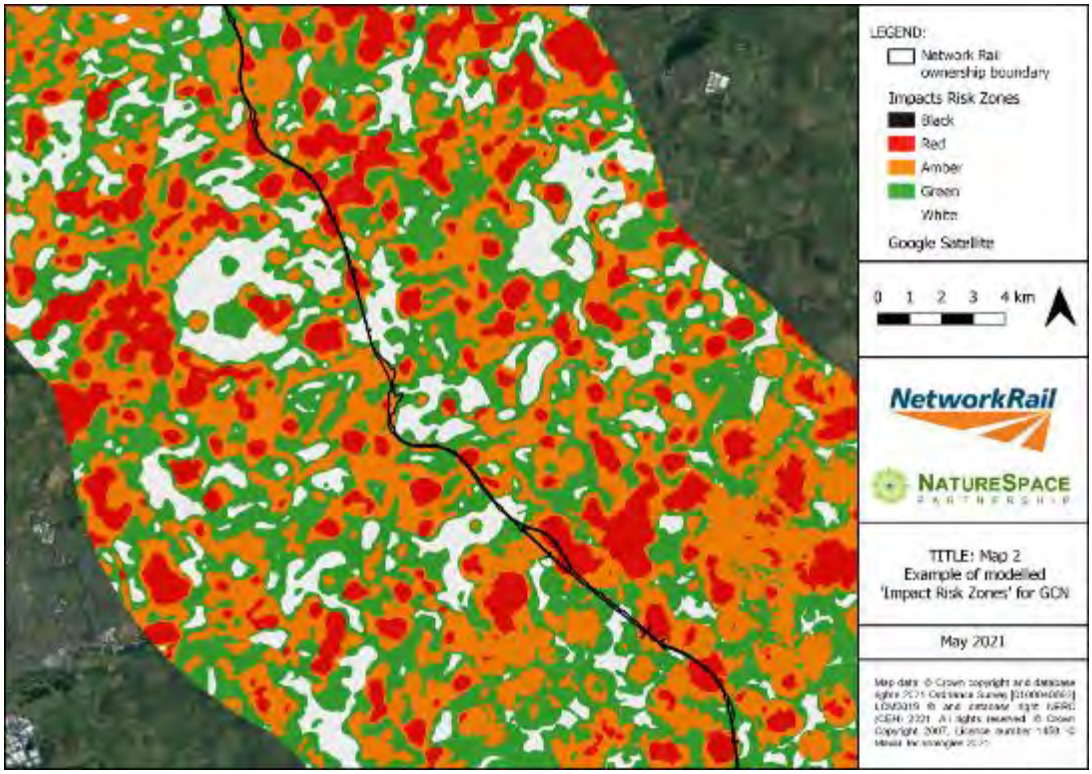

Figure 7.4: *SDM techniques and habitat suitability mapping provided by NatureSpace.*

The model calculates a proportionate compensatory payment which is made by Network Rail to NatureSpace, who manage the licence. NatureSpace pay 80 % of the compensation payment to the Newt Conservation Partnership, a not-for-profit organisation steered and staffed by experts from the Amphibian and Reptile Conservation Trust and Freshwater Habitats Trust. Compensation payments fund the creation and restoration of high-quality GCN habitats, as well as long-term management and monitoring.

The objective of the Organisational Licence is to improve the conservation status of GCN and other species that benefit from the creation and restoration of associated habitats. Compensation is guided by a wider conservation strategy that embeds the principles of the Lawton Review in 2010 ("more, bigger, better and joined") and the Government's 25-Year Environment Plan (including creating and restoring wildlife-rich habitats, taking action to recover threatened, iconic species and increasing woodland cover).

18.3 Capital Delivery – Harringay Bank Stabilisation

Capital Delivery Eastern (Renewals) worked with Amco-Griffin to replace a retaining wall adjacent to the East Coast Mainline at Kings Cross in Haringey, North London. The area behind the wall was industrial and had low biodiversity value. The team engaged ecological expertise early, allowing ecological baseline data to inform project design. They also contacted the Regional Environment Team who sought advice from the London Wildlife

Trust. Original designs backfilled with topsoil and oversewed with a wildflower mix. However, the London Wildlife Trust suggested a plan to instead create 'open mosaic' habitat.

Figure 7.5: *Open Mosaic Habitats are Priority Habitats recognised for their biodiversity, particularly invertebrates, breeding birds and botany. Typically associated with 'brown field' sites, they appear in post-industrial locations offering pockets of valuable 'wild space', in otherwise urban settings.*

The team worked with the Trust to create an open mosaic habitat that fit the specification required by the project. This resulted in a better-suited habitat that complemented local ambitions for biodiversity and increased the biodiversity value of the site by 22%.

19 Future plans

19.1 Habitat management plans

Habitat Management Plans (HMPs) will be the end product of a process the Region will establish. Producing a plan for habitats, with a view to improving biodiversity, will require an understanding of what habitats and biodiversity already exist. It is also necessary to understand local ambitions for biodiversity and wider strategical efforts at a landscape level (e.g., Local Biodiversity Action Plans, Nature Improvement Areas, Ecosystem Services etc.). This information will be captured through stakeholder engagement and collated into a Biodiversity Inventory that can be used to inform the production of a Route Biodiversity Action Plan (RBAP). The RBAP will be the Route's vision for biodiversity net gain, to be achieved by 2035. HMPs will then be produced supporting this vision, focusing the business' efforts towards realising it, in a way that links in with local and national efforts, and maximises biodiversity benefits at a landscape level. Individual projects can then produce detailed Sectional Plans (SPs) using HMPs and the RBAP, that will capture the project's contribution to biodiversity in detail (e.g., biodiversity calculations, costs, establishment, maintenance). In this way, SPs can be produced anywhere they are needed, but will always reference the same materials and pull together in a cohesive way towards achieving a

singular vision. SPs can also be used to measure and evaluate the Region's trajectory to biodiversity net gain at ground level and can be the mechanism by which plans are agreed by Asset Management and handed over to the maintainer.

A flowchart of this process can be seen below in Figure 8.1.

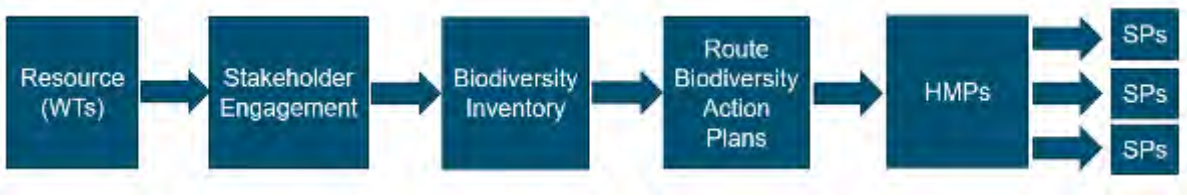

Figure 8.1: *The Eastern Region's process to produce HMPs and SPs.*

19.2 Stakeholder engagement plans for the next reporting period.

Stakeholder Engagement is at the heart of the Region's plans for biodiversity (See Figure 8.1, above). The Wildlife Trusts will lead this process for the Region, as their charitable position, leading successful conservation efforts for over 100 years means they are uniquely placed to act as biodiversity 'broker' for the business. Their brand allows them to engage with the grassroots of the conservation movement and link into opportunity mapping that would otherwise be out of reach to the business. The Region's focus over the next reporting period will be to bring in the Wildlife Trusts resource that will facilitate this engagement for the business, whilst continuing to build upon existing stakeholder engagement through the work it undertakes.

Vegetation management and sand lizard habitat enhancement – Ainsdale, Merseyside

North-West & Central Region State of Nature Report 2021/22

Contents

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2 Foreword

This report, for North-West and Central (NW&C) Region (Figure 1), provides a current account of vegetation, habitats, and species within the region and how they have changed in the 12 months from April 2021 to March 2022. It provides details of how NW&C Region is, and will continue to respond, to national biodiversity objectives to conserve and enhance biodiversity, while ensuring we can operate a resilient rail network, implementing nature-based solutions, where appropriate, to protect the infrastructure from threats such as extreme weather or public trespass, while improving the efficiency of lineside vegetation maintenance regimes. 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 the above objective, along with a number of projects planned for the coming years.

Figure 4: 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, along with our partners, aim to increase biodiversity both on and off the railway estate, to deliver a reliable, resilient service to our customers and stakeholders.

Since the completion of the inaugural 2020/21 Annual State of Nature (ASoN), the habitat area (Ha) and habitat units for all regions has been re-baselined for 2021/22, following amendments to how the satellite habitat data is collected. This re-baselining has been applied retrospectively onto both 2019/20 and 2020/21 datasets and will apply going forward, beginning with this ASoN report for 2021/22.

It is also worth noting, that we have also been provided with the habitat area and biodiversity units for 2019/2020, by the Technical Authority (TA) however this data is largely excluded from this report as it outdates the period for which Network Rail was required to produce ASoN Reports.

In 2020/21 (using the previous data collection methodology) the total area of habitats recorded in NW&C was 11194.49 Ha, which equated to 43474.9 biodiversity units. Following the re-baselining using new methodology, the new 2020/21 total area of habitats recorded was 11377.90 ha (and will remain constant in future data sets), equating to 51520.86 biodiversity units.

This year (2021/22), the habitat area remains the same at 11377.90 ha, but biodiversity units have dropped to 50068.56 biodiversity units.

Therefore, and using the new baselines; from the 2020/21, to the 2021/22 biodiversity reporting periods, biodiversity in NW&C region has decreased by 2.9%, dropping from 51520.86 to 50068.56 biodiversity units.

The most notable changes affect the following habitats: broadleaved woodland has declined, equating to a loss of 2285 biodiversity units between 2020/21 and 2021/22. This decline in broadleaved woodland is largely responsible for the overall reduction in biodiversity units in NW&C Region over the last 12 months. While conversely, neutral grassland and upland heathland habitats saw notable increases, increasing by 1534 and

925 biodiversity units, respectively. A full representation of this, and all other habitat types can be seen in Figure 2, below.

This decline in biodiversity units can likely be attributed to the loss of around 300 ha of broadleaved woodland habitat, removed or managed by maintenance teams across the region.

This 'apparent' loss of woodland needs further investigation. In reality, the way that maintenance teams, via our Internal Delivery Lineside Team, manage woodland is to take a sensitive approach via Vegetation Management Specifications (VMS) such a coppicing. Work needs to be undertaken to assess the biodiversity loss / gain from these types of operations.

3.2 Summary of ambitions for biodiversity management

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 following objectives:

- *Achieving no net loss in biodiversity on our lineside estate by 2024 and achieving biodiversity net gain of 10% in each Region by 2035* - which we will monitor and quantify annually, 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

In the last two years, teams from within the region have established numerous demonstration and pilot sites, along with enabling workstreams, that aim to provide proof of concept of how biodiversity and the railway can co-exist, and in many cases prove beneficial to its performance and resilience. This has involved action to conserve desirable species, habitat creation and restoration for biodiversity net gain and field trials of new management approaches, examples of which are provided throughout this report.

3.4 What further action will we take?

Future plans continue to focus on the implementation of HMPs to improve and increase biodiversity across the Region. 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

Following the re-baselining of habitat areas and biodiversity units (refer to Section 3.1. for details), in 2020/21 the total area of habitats recorded in NW&C was 11377.90 Ha, which equated to 51520.86 biodiversity units. In 2021/22, the total area of habitats remained constant at 11377.9 Ha, however biodiversity units dropped to to 50068.56. Equating to a biodiversity loss of 2.9 % , dropping from 51520.86 to 50068.56 biodiversity units.

Table 1 below shows NW&C Regions area and habitat data for 2019/20, 2020/21 and 2021/22, following the re-baselining of lineside habitat area and therefore corresponding biodiversity units.

Full details of how this was calculated can be found within the 'Network Rail Biodiversity Metric Calculations 2021 Report'.

Table 1: Regional habitat and biodiversity unit data for 2019/20, 2020/21 and 2021/22

	2019			2020			2021		
Habitat type	**Area (hectares)**	**Distinctiveness**	**Total habitat units**	**Area (hectares)**	**Distinctiveness**	**Total habitat units**	**Area (hectares)**	**Distinctiveness**	**Total habitat units**
Other woodland; broadleaved	2335.96	Medium	18687.68	2088.34	Medium	16706.72	1802.65	Medium	14421.2
Wet woodland	24.08	High	288.96	21.53	High	258.36	18.58	High	222.96
Upland oakwood	24.08	High	288.96	21.53	High	258.36	18.58	High	222.96
Upland mixed ashwoods	24.08	High	288.96	21.53	High	258.36	18.58	High	222.96
Other coniferous woodland	40.14	Low	160.56	67.37	Low	269.48	43.78	Low	175.12
Ruderal/Ephemeral	1870.18	Low	3740.36	2167.79	Low	4335.58	2407.04	Low	4814.08
Bramble scrub	3049.16	Medium	12196.64	3512	Medium	14048	3408.92	Medium	13635.68
Modified grassland	909.21	Low	3636.84	744.84	Low	2979.36	834.1	Low	3336.4
Other neutral grassland	421.34	Medium	3370.72	468.31	Medium	3746.48	660.06	Medium	5280.48
Upland acid grassland	111.13	Medium	889.04	100.79	Medium	806.32	64.74	Medium	517.92
Upland calcareous grassland	29.53	High	354.36	39.34	High	472.08	41.26	High	495.12
Bracken	0		0	0		0	0		0
Upland Heathland	162.04	High	1944.48	158.86	High	1906.32	235.98	High	2831.76
Ponds (Non- Priority Habitat)	110.04	Medium	880.32	87.33	Medium	698.64	68.6	Medium	548.8
Fens (upland and lowland)	1.39	V.High	22.24	1.4	V.High	22.4	52.83	V.High	845.28
Blanket bog	5.13	V.High	82.08	5.35	V.High	85.6	40.35	V.High	645.6
Inland rock outcrop and scree habitats	0.42	High	5.04	0.37	High	4.44	0.37	High	4.44
Other inland rock and scree	41.29	Medium	330.32	36.28	Medium	290.24	36.53	Medium	292.24
Coastal lagoons	0	High	0	0	High	0	0	High	0
Features of littoral rock	0.16	High	1.92	0.39	High	4.68	0.01	High	0.12
Features of littoral sediment	176.31	High	2115.72	182.84	High	2194.08	67.68	High	812.16
Features of littoral rock	11.95	High	143.4	15.32	High	183.84	14.77	High	177.24

Features of littoral sediment	4.61	High	55.32	4.71	High	56.52	3.55	High	42.6
Saltmarshes and saline reedbeds	112.01	High	1344.12	161.25	High	1935	43.62	High	523.44
Built linear features	1913.65	V.Low	0	1470.43	V.Low	0	1495.31	V.Low	0
Totals	11377.89	N/A	50828.04	11377.9	N/A	51520.86	11377.89	N/A	50068.56

4.2 Region habitat types

Figure 2 presents the composition of habitats on the NW&C estate and shows how the habitat types have changed from 2020/21 to 2021/22 and is also supplemented with 2019/20 data as a further point of reference.

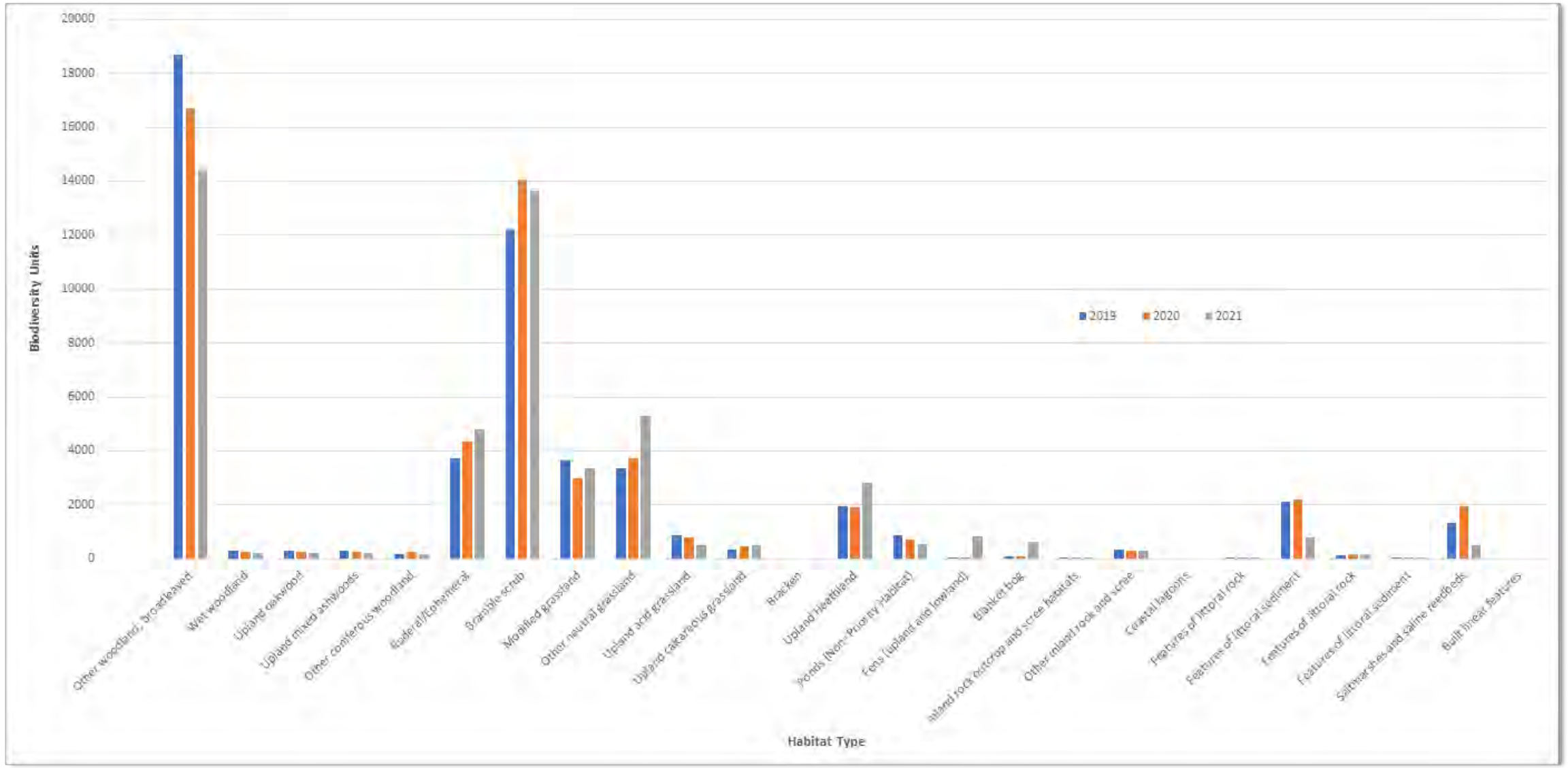

Figure 2: Comparison of 2020/21 and 2021/22 habitat data

This year's habitat data shows that the most dominant habitats on the NW&C estate comprise broadleaved woodland, ruderal (tall herb vegetation such as nettles), bramble scrub and mixed and neutral grasslands. Much smaller areas of a further seventeen habitat types make up the overall habitat composition.

Our priorities focus on effectively managing broadleaved woodland, which comprises 16 % of the regional habitat, while enhancing bramble scrub (30 %), ruderal (21 %) and grassland habitats (combined 14 %). We aim to manage the operational risk presented by woodland habitat and create a lineside vegetation structure, containing a more diverse structure of habitats, such as bramble, ruderal and grassland, to increase the resiliency of the infrastructure while increasing biodiversity.

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.

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 and Designated Nature Conservation Sites 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 3, below, displays a representative example of this.

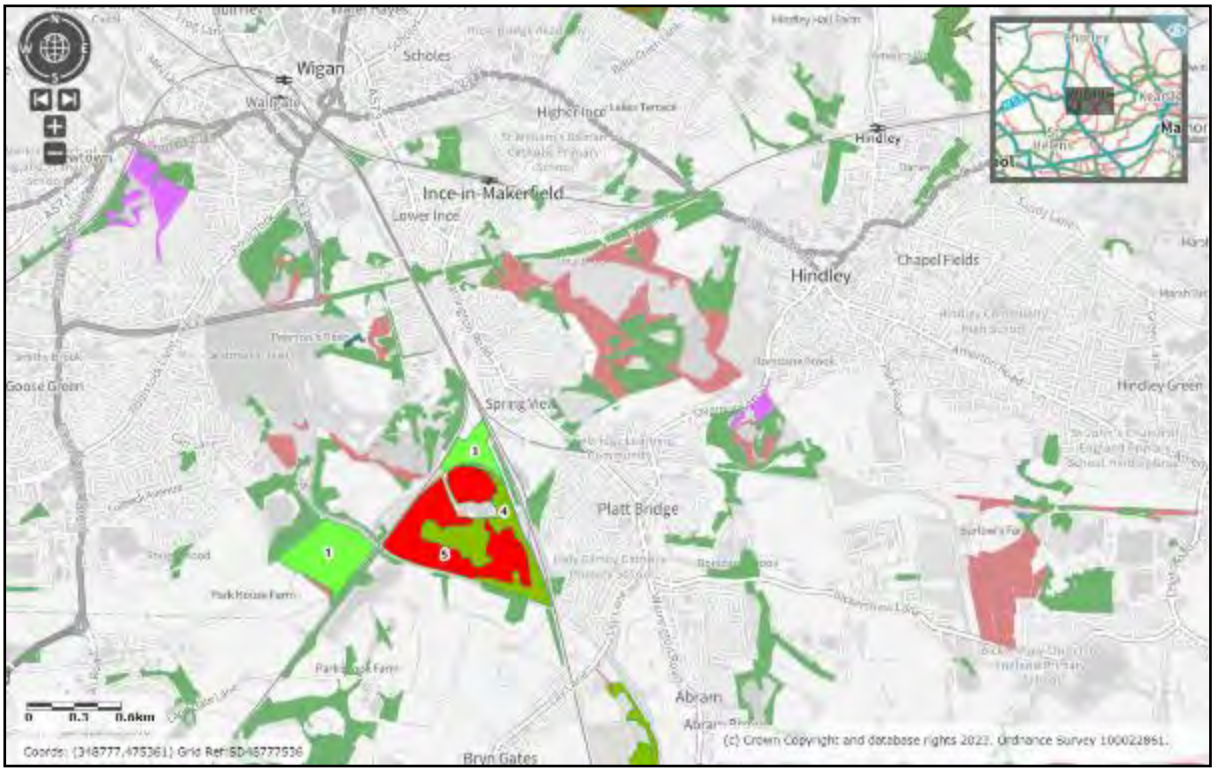

Figure 3: Representative distribution of designated nature conservation sites and priority habitats within NW&C Region

Historically, NW&C Region has had 40 SSSIs, across 7 Delivery Units (DU), which intersect or are located adjacent to the railway estate (Figure 3, 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. This year, NW&C Region was expanded to include Worcester DU. Of the 7 SSSIs which intersect the railway within the Worcester DU area, 3 SSSIs have SMSs. In the coming year, as SMSs expire, we will work to renew them and consolidate and potentially expand their breadth, to enable as much operational and capital works possible.

4.4 Invasive non-native species (INNS) 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 4 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.

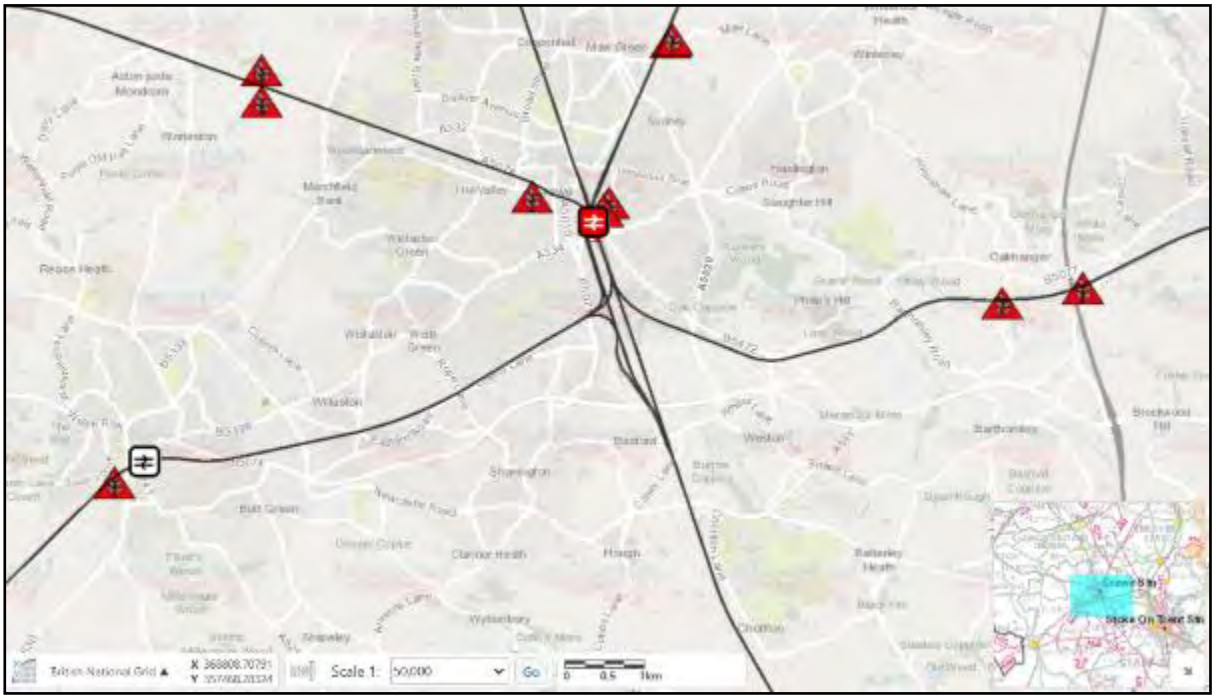

Figure 4: Representative distribution of INNS within NW&C Region

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.

4.5 Demonstration sites or projects

Below are several case studies which demonstrate the approaches adopted within NW&C region to successional planting and management of the correct habitats, in the correct locations to improve biodiversity and connect fragmented, whilst improving operational resilience.

Dutton Triangle

This site comprises an unproductive, non-strategic area of land situated within the junction between the WJL1 and CGJ1 lines. The triangle is fenced off from the adjacent public access woodland but provides no access to the track. Habitat within the woodland is dominated by mature broadleaved deciduous woodland, while ground flora is dominated by Himalayan balsam, frequent bracken and occasional patches of native scrub, bluebells, and orchid species, which were being constrained and outcompeted by the dominant and invasive Himalayan balsam (Figure 5). It is proposed that the area may be used for a storage location for spare materials, however the presence of Himalayan balsam, which could contaminate any materials, is currently preventing this.

Figure 5: Mature woodland at Dutton following initial Himalayan balsam removal

This year, we have undertaken surveys to understand the ecological value of the site. This has comprised surveys for the following species or groups of species: birds, bats, badgers, reptiles, amphibians, invertebrates, botany, and calculation of biodiversity units. Surveys found the site to be contain mature and ancient woodland and moderate floristic diversity, equating to 23.6 biodiversity units. Surveys also returned evidence soprano and common

pipistrelle bats, 19 species of birds and badgers onsite, and found it of suitability for bat roosts and common amphibians and reptiles.

This year, we have also undertaken one herbicide application and a round of mechanical Himalayan balsam removal. It is intended that by eradicating the Himalayan balsam onsite, that favourable native species of flora will colonise. Himalayan balsam removal will be repeated, as required, in coming years and ecological surveys will be undertaken bi-annually to assess the expected biodiversity improvements as native flora recolonises, encouraging greater species richness and diversity onsite.

These activities at Dutton demonstrate the NW&C approach to biodiversity improvement, by assessing the specific constraints onsite and implementing an appropriate action plan that allows improved operational use of the site, through the eradication of INNS, while ensuring valuable habitats are retained.

Tring cutting

A Biodiversity assessment conducted at Tring Cutting (Figure 6) stated that the primary biodiversity value of the area is chalk grassland, with the potential to support invertebrates including several priority species of butterfly. The report recommended that to meet the safety and management requirements of the railway and to provide suitable basking and foraging habitat for a range of species; both the east and west bank should be cleared of all mature trees and any woody vegetation which could develop into a risk feature. Areas of low vegetation such as broom, gorse or bramble were to be retained. This recommendation was carried out and vegetation was removed (Figure 7) in favour of returning this area into a more favourable and diverse chalk grassland.

Figure 6: Still from drone footage (facing south at approx. 33.0671 M.Yds) prior to vegetation management

The goal of chalk grassland management is the retention of a short sward and removal of nutrients. This prevents coarse grasses from becoming dominant at the expense of wildflowers and grasses which are indicative of the habitat. It also removes the operationally problematic species, allows easier inspection of the cutting by geo-tech teams and provides a reduction in risk to the railway from vegetation. At Tring we will be exploring future management options, including potential for spot spraying using drone technology.

Figure 7: Tring Cutting Vegetation Management in Action

Eden Rivers Trust Partnership

To actively address instances of asset failures due to flooding events, inter-disciplinary teams from within NW&C Region have begun working with the Eden Rivers Trust (ERT), and other stakeholders such as National Highways and the Environment Agency, to identify nature-based solutions to the impact of flooding events on infrastructure within the Eden catchment. To identify and prioritise locations all stakeholders provided information to the ERT regarding asset failures incurred due to flooding events, including the frequency and impact of such failures. The ERT then undertook a high-level assessment of the catchment, focussing on three key environmental opportunities: habitat connectivity, carbon storage and sequestration, and storage or slowing of floodwaters. Opportunity areas for each of these aspects could be ranked in terms of their individual impact, and then overlaid to understand their combined impact We could then overlay the location and impact of historic asset failures to gain a full understanding the locations which presented the greatest opportunities, where high impact asset failures, fell within areas of high overall environmental benefit (Figure 8). Using this initial assessment, we are planning future work with the ERT to fully scope and implement a program of habitat creation and improvement, working with neighbouring landowners, to deliver nature-based solutions and improve asset resilience.

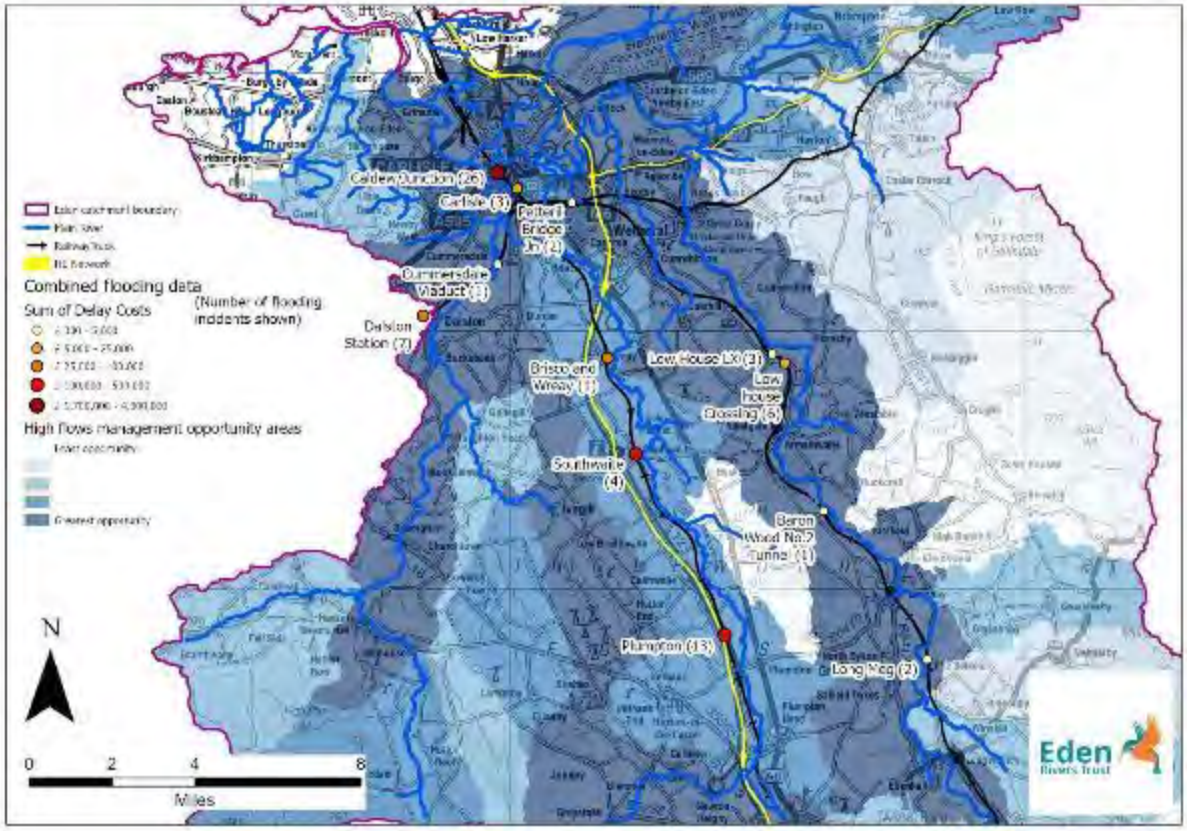

Figure 8: High-level scoping exercise undertaken by the ERT

Natterjack Toads - Sellafield

In March 2022, Works Delivery Off Track were involved in a project a Sellafield Nature Reserve bounding our CBC1 line, where the boundary fence was no longer fit for purpose. The reserve is managed by the Amphibian and Reptile Conservation (ARC) Trust who could no longer graze the site and keep it in suitable condition for natterjack toads (Figure 9) due to the fence line. Our land along the west Cumbrian coast provides important refuge and hibernation habitats for natterjack toads. To rectify and improve this situation, WD off track liaised with the ARC Trust and the boundary fence was renewed. In addition, the team cleared the nature reserve of vegetation ready for the natterjack breeding season ahead, ensuring that the habitat was now suitable for the species.

Figure 9: Natterjack toad found on site near Sellafield nature reserve after the works to restore the habitat had been completed

5 Priorities for biodiversity management on this region

The priorities for managing biodiversity by the end of CP6 is to focus on delivering no net loss 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:
    - Designated sites such as Special Areas of Conservation (SAC), Special Protection Areas (SPA), SSSI, or other local nature conservation designations, and their condition,
    - Protected or priority species and habitats,
    - INNS,
    - Weather attributed Schedule 8 delay minutes and payments,
    - 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 Habitat Management Plans (HMP) and Vegetation Management Plans to reflect the above and ensure maintenance regimes are implemented to establish and/or maintain any created or managed habitats in compliance with NR/L2/OTK/5201 – Vegetation Management, as well as the objectives of the HMP.
- Working with key local stakeholders to help identify opportunities and work together on delivery.
- Habitat data monitoring - due to the re-baselining of habitat area and biodiversity units, and the perceived loss of around 300 Ha of woodland, and 1452.3 biodiversity units, we shall continue to monitor annual habitat data, to better understand how on-the-ground woodland, 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 Report on Performance Indicators within reporting period

6.1 Summary

NW&C Region has two performance indicators by which it measures progress regarding the achievement of national biodiversity targets, and compliance with the Biodiversity Standard (NR/L2/ENV/015) mandate, of having the entire route under a HMP. Both performance indicators are presented in Table 2 and discussed in Section 6.2, below.

6.2 Progress towards performance indicators

Percentage of region covered by Habitat Management Plans

NW&C region contains 2267 miles of lineside estate (both sides of the line). Through the implementation of pilot schemes, such as those described in Section 4.5, and through the compliance of Capital Delivery projects to the biodiversity standard, several which are discussed in Section 7, we estimate to have approximately 197 miles of our lineside estate under HMPs, which equates to 8.7 % of the region. However, some areas of lineside estate, under HMP, which comprise this 197-mile total, are on newly constructed railway estate, which is currently not in operation, e.g., East West Rail (EWR), so the above figure may be subject to minor fluctuation in future reporting periods.

HMPs will continue to be produced over the coming year for sections of lineside, in advance of any vegetation management work, within a given section.

No net loss in biodiversity on our region by 2024 as defined using a habitat metric

From the 2020/21, to the 2021/22 biodiversity reporting periods, biodiversity on NW&C region has decreased by the 2.9 % , dropping from 51520.86 to 50068.56 biodiversity units.

This decline in biodiversity units can likely be attributed to the loss of around 300 ha of broadleaved woodland habitat, through chainsaw and mechanised felling undertaken by maintenance teams across the region.

Key:

Status	Timescale	Progress
Completed	E.g., 2023/24	PI has been completed in 20XX/XX
Improving	On time	PI is showing a positive trend and/or actions are on time
No change	In progress, minor delay	PI is showing little or no overall change and/or may be subject to some minor delays
Deteriorating	Major delay	PI is deteriorating and/or may be subject to major delays

Table 2: NW&C Biodiversity Performance Indicators

Performance indicator	Status	Timescale	Progress
Percentage of region covered by Habitat Management Plans	In progress	On time	8.7 % of NWC region is under an HMP.
No net loss in biodiversity on our region by 2024 as defined using a habitat metric	Decline	On time	2.9 % reduction - 51520.86 units (2020/21) to 50068.56 units (2021/22).

7 Case studies

7.1 Examples of best practice habitat management approaches

In the last 12 months, 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 and those in Section 7.2, provide some examples of these workstreams.

East West Rail – Biodiversity Net Gain, Ecological Compensation Sites and Data Management

East West Rail (EWR), a new railway which will connect Oxford and Cambridge, is the first project on the NW&C portfolio to deliver biodiversity net-gain in earnest. The project has created multiple ecological compensation sites (ECSs) along the route to offset its impact, many of which we have a legal obligation to manage and monitor for up to 30 years. Management of the sites is split between NR, and numerous neighbouring landowners, an example of which is shown in Figure 10.

Figure 10: Bat house in an ECS on EWR

To ensure these sites are managed correctly, the project team has produced HMPs for on and offsite ECSs and worked with the local off-track maintenance teams in Bletchley to

secure funding for the ongoing management of sites managed by NR, and payment arrangements for local landowners managing ECSs on our behalf. Furthermore, maintenance task management system, Ellipse, has also been utilised for the first time within the region to generate a tailored, rolling work bank for the management of each ECS, based on each sites unique HMP, setting the precedent and procedure for similar works in the future.

To ensure that other functions within NR follow a consistent approach to data management, the regional sustainability team has also worked with Ecologists from EWR to generate a system through which all ecological records collected by Ecologists can be transferred in NRs GeoRINM Viewer (GRV) and displayed visually onto maps of the rail network. We have also begun the process of creating a new layer within GRV, into which maps of the ECSs will be added and displayed visually on maps of the network, each containing a links to site specific management plans, which is an additional process which will be followed on future projects.

Works Delivery: Transposition of Vegetation Management Strategies in Habitat Management Plans

NW&Cs Works Delivery Drainage and Offtrack (DOT) function has utilised a document titled Vegetation Management Strategies (VMSs), to detail ecological constraints alongside a vegetation cutting plan for all vegetation management work that the function undertakes. VMSs, however, are limited as they do not detail future vegetation or habitat management procedures to ensure the vegetation management structure remains compliant, while safeguarding any ecological features present, which is a key requirement of HMPs and the Biodiversity Standard. We have therefore been working with colleagues from the DOT function to amend the VMS system, enable HMPs to be written when vegetation management work is specified by the client.

7.2 Examples of partnership working

Many of the locations at which we have delivered biodiversity and habitat improvements have been undertaken in partnership with both governmental and charitable organisations, with whom we share environmental and socio-economic development aspirations. By working with these organisations, we're able to pool resources to implement nature-based solutions to the problems we are attempting to overcome. The case studies below provide examples of these:

Capital Delivery: Headbolt Lane Station - Mersey Rivers Trust

NR committed to providing a Net Positive Biodiversity gain for the Headbolt Lane project. Headbolt Lane New Station is an infrastructure project that will extend the MerseyRail network from the existing terminating station at Kirkby to a new station to be constructed at Headbolt Lane in Kirkby. The NR project team, and principal contractor, Buckingham Group Contracting, commissioned Mersey Rivers Trust (MRT) to scope interventions to reclaim the biodiversity credits associated with the construction of the new station.

Six public parks in the local area of Kirkby were selected, on which the Rivers Trust, supported and funded by the project will undertake several interventions which will deliver biodiversity improvements, improve local water quality, and reduce flood risk to the railway and local residential areas. Details of the interventions proposed for each site are provided below and proposed examples are also shown in Figure 11:

- Mercer's Dell - creation of wetland scrapes along Kirkby Brook, rewilding mown grassland and planting hedging along the park boundary.
- Mill Dam Park - creation of a large offline wetland pond with a mosaic of habitats including wet woodland, bogs, deep water, and reed beds.
- Northwood Forest Hills - re-landscape and manage a series of existing ponds and wet woodland, INNS Himalayan Balsam control and wildflower planting.
- Millbrook Millennium Green - re-landscape and manage a series of existing ponds and reed beds.
- Eddie McArdle Playing Fields - creation of wetland scrapes along Kirkby Brook and re-naturalise riverbed by removing concrete play areas.
- Saxon Green - Himalayan Balsam control, wildflower planting, rewilding, and wetland management.

Figure 11: Reedbed and riverbed habitats to be enhanced by the Mersey Rivers Trust (MRT) (Photographs courtesy of MRT)

Works Delivery - Sand Lizard Habitat Creation – Natural England & Sefton Council

In partnership with Natural England and Sefton Council, we identified a section of railway adjacent to Sefton Coast Special Area of Conservation (SAC) & Site of Special Scientific Interest (SSSI), at Ainsdale, Merseyside. The site is known to support populations of sand lizard, which are rare in north-west England. Records from Natural England indicated numbers of sand lizards within the SAC & SSSI have declined due to the growth and succession of large trees and garden escapes, many of which were also causing operational problems such as leaf-fall, leading to adhesion issues, and encroachment over signal aspects

Working in collaboration with Natural England and Sefton Council, we undertook a targeted approach to vegetation management, targeting the largest and most problematic areas of vegetation, within and immediately adjacent to the railway boundary (Figure 12). The intention is that this will deliver resilience to the performance of trains and improve the habitat suitability for sand lizards by removing areas of dense vegetation canopy, creating open areas of basking, breeding habitat.

Figure 12: Before and after vegetation management (left) and an example of one of the new sandpits (right)

Following vegetation management, sand lizard habitat was improved further by creating several sandpits along the railway boundary to provide several new areas of egg-laying habitat for the sand lizards (Figure 12). Following completion of these works, we will continue to collaborate with Natural England to monitor the success of the sand lizard population recovery.

Biodiversity Steering Group

A NW&C Biodiversity Steering Group, which has representatives from the Routes, Works Delivery (DOT and Civils) and Directorate of Safety & Engineering, had been working effectively through 2022. The group has been set up to help steer a collective and co-ordinated approach to the way that biodiversity is managed across the Region. The remit of this steering group is:

- To act as advocates for the sustainability strategy and its deliverables and providing constructive input to the development of biodiversity improvements
- To work collaboratively to achieve implementation of the agreed approaches to biodiversity
- To act as the single regional voice that represents the Region
- To follow up and engage with the potential actions where required.

The group has enabled the teams to facilitate conversations about the biodiversity standard and the region's readiness to implement this. As well as identify new opportunities to enhance biodiversity, for example, potential salt marsh restoration in Cumbria.

8 Future Plans

8.1 Habitat management plans

In the next reporting period (April 2022 – March 2023), we will report further on work undertaken, which will increase the amount of lineside estate under HMPs. This will include the continuation of projects which began during this year, the undertaking of Capital Delivery projects which include vegetation management, or the completion of further pilot projects. Some examples of which, are provided below:

Commonwealth Games Vegetation Management

Ahead of the Commonwealth Games, held in Summer 2022, Central Route undertook approximately 87 miles of vegetation management works on routes into Birmingham City Centre (Figure 13). Works included the removal of vegetation, to 2.75m from all Overhead Line Equipment (OLE), and the removal of all hazardous trees. The intention was that the works would deliver greater resilience to vegetation induced operational issues, such as obscured signal sighting, or vegetation striking trains and/or OLE.

Figure 13: Rail network serving Birmingham City Centre and Commonwealth Games stadia

In line with the priorities set out in Section 5 of this report, the sections of line, on which vegetation management was undertaken, were assessed as to their ecological qualities and appropriateness of the management techniques and proposed vegetation structure. Following this assessment, HMPs were implemented to maintain compliance with the vegetation management standard, while ensuring ecological features were conserved and enhanced.

Stourbridge

The Stourbridge project planned in biodiversity improvements including 150m of new native hedgerows and a 2000m^2 species rich grassland habitat. The hedgerow was to comprise native shrubs of local provenance, resulting in gain of 0.2 biodiversity units. Figure 14 shows the first saplings planted along the fence line. The grassland area was to be cleared of remnant scrub and prepared for sowing with a seed mix, to be decided after soil analysis. This was predicted to created 2.0 biodiversity units.

Figure 14: first saplings of the new hedgerow planted along the boundary fence line

Once the biodiversity units lost and gained were balanced against each other, the project would result in a gain of 0.3 units. Follow up survey works would be required to confirm this and inform the habitat management plan going forwards.

Further work at Dutton Triangle

Upon receiving the findings of the baseline ecological surveys for the triangle of land at Dutton, initially discussed in Section 4.5, we will assess the ecological features and how they may be impacted by the proposals for the parcel of land. Again, in line with the priorities outlined in Section 5, any required vegetation management will be assessed as to its impact upon habitats or species present, and a HMP produced, to enable operational use of the site, but also to conserve and enhance any valuable ecological features which may be present.

Tree Veteranisation Trial at NAJ2

Veteranisation is the act of intentionally causing damage to young trees that would normally take years to occur naturally, whether it is woodpecker holes, broken branches, bark stripping etc. This naturally occurring damage helps to create areas of deadwood within a living tree, a critical habitat for a wide range of wildlife, such as bats, fungi, and insects.

A site in NW&C of unmanaged broadleaved woodland was selected for a trial of this process. The site hosts a range of native tree and shrub species and is protected from public and rail disturbance due to the nature of its boundaries. The trees were cut, bark stripped, bore holes made and some were 'folded' to create the effect of years of natural weathering and damage (Figure 15). Continuing monitoring of this site will allow the region to identify quantifiable deliverable habitat gains which can be implemented lineside within normal VMS works, where safe and appropriate to do so.

Figure 15: Veteranisation techniques. Left: bark removal and strip cavity creation. Right: recreation of large animal damage

8.2 Stakeholder engagement plans for the next reporting period.

This final section provides details of work to be undertaken on existing and new projects with partners and stakeholders, with shared objectives to deliver greater biodiversity, often combined with other socio-economic benefits.

Eden Rivers Trust Partnership

In addition to the high-level scoping work which we have undertaken with the ERT, as discussed in Section 4.5, the 2023-24 reporting period will see this work expanded. As we now hold information of the greatest areas of opportunity for connecting natural habitat, storing carbon, and alleviating flood risk, aligned to locations of poor operational resiliency, we have scoped an additional piece of work within the catchment of the River Caldew, a tributary of the River Eden. This piece of work will entail detailed field surveys and landowner liaison to design and implement interventions to deliver operational and environmental benefit.

Headbolt Lane

As part of the Headbolt Lane project, we will continue to work in partnership with the MRT and our Principal Contractor to design and implement the proposed biodiversity offsets, to maximise the environmental, social, and economic benefits, described in Section 7, while

ensuring that the impact to biodiversity incurred by the project is offset, delivering biodiversity net gain.

Harbury Cutting

As part of the Harbury cutting project works the SSSI area was restored to a favourable condition, ecology surveys were completed to establish the species present on the site. In addition, on-going discussions are required internally and with organisations such as the wildlife trusts, to manage the site appropriately going forward. The current aim is to have agreements in place to manage the site with grazing animals, so as not to allow the site to fall back into unfavourable condition.

Scotland's Railway State of Nature Report 2021/22

Contents

9 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	31 Jan 2023
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Version number	Approved by Date	Description	Prepared by	Reviewed by	Authorised by
1		First Draft	Laura Moore	Keira McLuskey	
2		2nd draft with updated habitat data	Laura Moore		

10 Foreword

As part of the Network Rail Biodiversity Action Plan (BAP), each region will produce an annual State of Nature Report. This is the second annual report for the Scotland region, covering the period April 2021 to March 2022.

It outlines the state of nature on the Scotland region's estate and our ambitions and plans 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.

11 Executive Summary

11.1 Overview

Scotland's Railway covers a large geographical area from the Borders to Thurso at the far tip of the Northeast of Scotland and covers a total of 7,581 hectares of with a biodiversity value of 39577.18.

Figure 5: *Scotland region*

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.

The region incorporates a range of habitats including deciduous woodland, arable and improved grasslands, as well as urban areas and these habitat types and designated sites support a range of species from mammals and invertebrates to plant and fungi, including notable and protected species such as beaver, bats, otter, 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 help contribute to reversing an alarming trend of global biodiversity loss .

The largest lineside habitat type within the Scotland region is deciduous woodland, which accounts for 30 per cent of the land cover and compared with the other regions, Scotland records the highest proportion of deciduous woodland land cover. This type of habitat support species of bats, birds, but notably in Scotland this type of habitat supports protected species like the red squirrel and pine marten.

Built up environments and gardens are the next most predominant land cover type within the region. Outside London, Scotland's Railway operates the largest suburban rail network and provides access along busy commuter routes to our seven cities. Within these urban environments 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.

11.2 Summary of ambitions for biodiversity management

Our strategic commitment is to enhance biodiversity across the region. Our delivery priorities are aligned to this commitment and Scotland's Railway is therefore working towards:

- Achieving no net loss in biodiversity on our lineside estate by 2024.
- Working towards compliance with the Network Rail Biodiversity standard NR/L2/ENV/122 across all business units.
- Ensuring the Network Rail standard NR/L2/ENV/015 is embedded within all project design and construction activities across the region.
- Completing Biodiversity Net Gain calculations for all Capital Delivery projects.

11.3 Summary of achievements for biodiversity management

Through project and maintenance activities, and our partnerships with external stakeholders across the region, there have been a number of achievements in 2021/22 with regards to the management of our lineside estate and improving biodiversity.

Some of our achievements over the past year have included:

- Completion of the West Highland Line and Dalgety Bay pilots which will inform how we manage our lineside, ensuring we effectively maintain lineside vegetation to ensure the safe operation of our railway, while safeguarding and promoting biodiversity.
- The remediation of the landslip site at Fairlie in which raised beds have been installed on the slope which have been planted with native, railway compatible species. Installing the planted raised beds will increase the stability of the slope, improve visual amenity, and promote local biodiversity.
- The commitment of over £300,000 for Forestry and Land Scotland (FLS) to use in the most ambitious biodiversity enhancement project ever to take place on Scotland's Railway.

11.4 What further action will we take?

Over the next year we aim to establish a methodology for producing Habitat and Vegetation Management Plans within the region, and test this with a pilot. This work is being undertaken by consultants instructed by Network Rail and will help us better understand the most efficient and effective way to produce meaningful habitat and vegetation management plans for the full region

We will continue to improve engagement on the management of biodiversity across the region, focussing on upskilling staff and providing additional guidance and training materials on biodiversity, such as ecological guides that help with the identification of protected and invasive species found across the Scotland region, and provide guidance on the action to be taken if encountered.

To maximise our footprint both inside and outside of our lineside boundary, to mitigate any unavoidable loss of biodiversity across the region and deliver improved biodiversity through habitat creation and restoration, we will continue to partner with external stakeholder, such as FLS and The Tree Council.

12 State of nature on Scotland's Railway

12.1 Biodiversity metric calculation for the region

From late 2019 into early 2020, the UK Centre for Ecology and Hydrology (UKCEH), in partnership with Network Rail, undertook a remote sensing survey of the entire rail network. This survey produced a land cover map displaying 21 different habitat types found within 1km either side of the rail network. The outputs from this survey were then used to calculate a baseline for the region using the Defra 3.0 biodiversity metric, which utilises data on habitat type to calculate the biodiversity value of a particular area.

Following this initial analysis, the Scotland region previously reported baseline figures of a total of 7,581 hectares of habitat with a value of 39577.18 baseline habitat for the 2020 reporting period (2019 data).

The UKCEH have since improved the methodology around the interpretation of the remotely sensed habitats and how the areas of habitat are calculated, which has resulted in the re-baselining of this initial data.

The re-baselined data and subsequent annual data sets for the Scotland region for the following years are presented in Table 1 below:

Table 3: *Scotland region total area and habitat units 2019-2021*

Year	Total area (hectares)	Total habitat units
2019	7538.97	43036.38
2020 (re-baselined)	7538.96	43521.5
2021	7538.97	40669.04

A detailed composition of the current score, for the 2021 data set is provided in Table 2 below.

Table 4: *Scotland region 2021 habitat types, total habitat area and habitat units*

Habitat type	Area (hectares)	Distinctiveness	Total habitat units
Other woodland; broadleaved	1819.86	Medium	14558.88
Upland oakwood	18.96	High	227.52
Upland birchwoods	18.96	High	227.52
Upland mixed ashwoods	18.96	High	227.52
Wet woodland	18.96	High	227.52
Other Scot's Pine woodland	14.49	Medium	115.92
Other coniferous woodland	28.97	Low	115.88
Ruderal/Ephemeral	1467.89	Low	2935.78
Bramble scrub	1610.84	Medium	6443.36

Habitat type	Area (hectares)	Distinctiveness	Total habitat units
Modified grassland	586.17	Low	2344.68
Other neutral grassland	6.57	Medium	52.56
Upland acid grassland	136.88	Medium	1095.04
Calcareous grassland	1.03	High	12.36
Bracken	97.61	Low	195.22
Upland Heathland	390.43	High	4685.16
Ponds (Non- Priority Habitat)	7.59	Medium	60.72
Fens (upland and lowland)	40.63	V.High	97.76
Blanket bog	242.2	V.High	2756
Inland rock outcrop and scree	1.95	Medium	15.6
Other inland rock and scree	192.89	High	2314.68
Coastal lagoons	0.67	High	8.04
Features of littoral rock	7.86	High	94.32
Littoral mixed sediments	50.95	High	611.4
Features of littoral rock	11.84	High	142.08
Features of littoral sediment	9.96	High	119.52
Saltmarshes and saline reedbeds	82	High	984
Built linear features	653.85	V.Low	0
TOTAL	7538.97	**TOTAL**	40669.04

12.2 Region habitat types

16 habitat types are found across the Scotland region with the overall majority split across 3 classes: broadleaved woodland which accounts for 25%, bramble scrub which accounts for 21% and 19% is ruderal / ephemeral habitat in the region. Figure 2 displays the proportion of the remaining habitat types in the Scotland region.

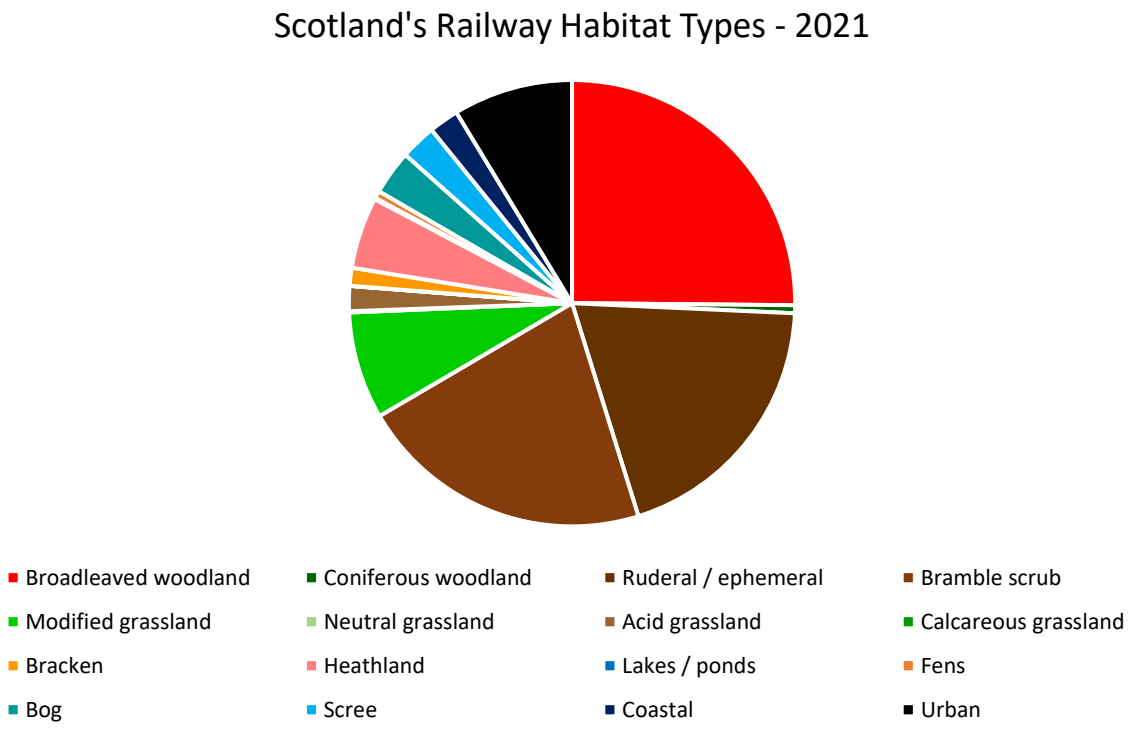

Figure 6: *Scotland's Railway habitat types*

Other prominent habitat types recorded in the region include heathland, modified grassland and urban habitats. Both arable and improved grasslands can be found across the entire region however, these are less frequent along the route of the West Highland Line. Heathland and bog are characteristic of the Scottish uplands, and compared with other regions, Scotland records over 75 % of all bog lineside habitats. Both these habitat types support a range of important bird and invertebrate species.

The remote sensing survey data allows for the mapping of habitats across the region, highlighting the connectivity between existing habitats, and where there may be opportunities to better connect habitats, informing how we manage our lineside.

Figure 7*: Woodland habitat connectivity*

Like other regions across the network, Scotland's Railway has the potential to act as a vital wildlife corridor by offering connectivity between habitats. Figure 3 shows a section of the West Highland Line where a large area of woodland, in which there are records of the protected red squirrel, is well connected along the route of the railway.

However, across the region, there are areas which are less well connected, where the habitat is more fragmented, limiting the movement of species. An example of this can be seen in Figure 4, where the landscape largely comprises built-up environments with smaller pockets of woodland and grassland scattered around with poor connectivity.

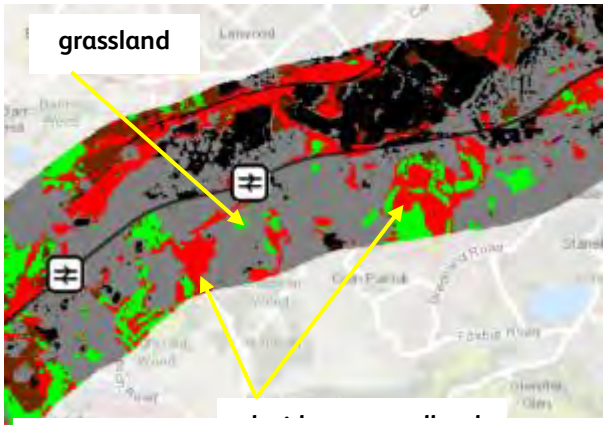

Figure 8: *Poor habitat connectivity*

12.3 Priority species/habitats in the Scotland region

The Scotland region provides habitat which supports an array of priority species considered to be of principal importance for biodiversity conservation in Scotland. Examples of these types of 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 northwest highlands, and the red squirrel, found across the region in coniferous, broadleaved and mixed woodland areas.

Our lineside is 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.

12.4 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. INNS are a growing problem for the region and our strategy is not to eradicate the species, but to control the spread of these species and work 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.

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 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.

The management of INNS within each DU is assured internally on an annual basis and work is underway to geographically map the spread of INNS within the region and monitor the spraying of INNS sites within each of the DUs.

12.5 Demonstration sites or projects

12.5.1 Dalgety Bay

Dalgety Bay is one of Scotland's most problematic areas during the Autumn period because of overgrown vegetation and leaf fall on the line, and despite tree management in this area, it has not stopped these issues from continuing.

The Dalgety Bay location was therefore selected as a site to trial new lineside techniques and was one of the first major Scottish trials of multiple off-setting and biodiversity mitigation options on scale since the issue of the biodiversity standard NR/L2/ENV/122.

The works included the management of high leaf fall trees (mostly sycamore) and included the following measures to manage and enhance biodiversity:

- 17 bat boxes were installed – bat activity surveys and climb and inspect surveys found no bat roosts prior to works. So far four boxes have been confirmed as being used by at least five bats, and bats were found roosting end of summer, in autumn and winter (Figure 5).
- High stumps were left on site with cuts and incisions for fungi and invertebrates (Figure 6).
- Features suitable for roosting bats or nesting birds were retained along with most of the tree, where possible, or repositioned/reattached to a neighbouring tree if removed.
- Multiple habitat piles of various sizes were created throughout the site (Figure 7).
- Six bird boxes were installed throughout the site.
- Some trees were reduced in height and had features added imitating natural breaks and fractures to promote natural succession of standing tree decay.
- Over 2600 new trees were planted throughout the site, species including hazel, hawthorn, alder, rowan, birch, Scots pine, resulting in more diverse woodland that will attract more wildlife. Network Rail will maintain these for up to five years.

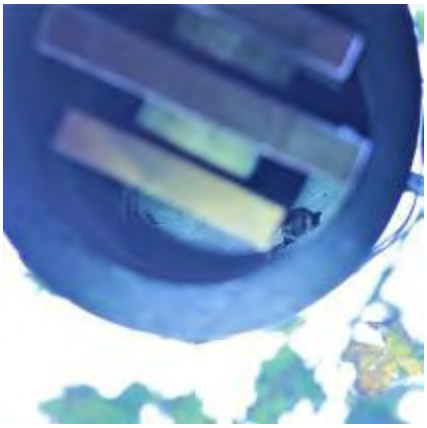

***Figure 9**: Bat using a bat box installed at Dalgety Bay*

***Figure 6:** Tree stump with incisions to promote invertebrates*

***Figure 11:** Habitat pile at Dalgety Bay*

12.5.2 West Highland Line

A trial vegetation management project was undertaken at a site along the West Highland line, at a site with vegetation encroachment issues and dominant leaf fall species, which, if ignored, could lead to safety implications to the operational railway due to overgrown

vegetation obscuring driver's view, and leaves on the line affecting train braking distances and acceleration.

Over a 10-week period selected woody vegetation within a minimum of four-metres of the track was cleared, and any trees that could strike the line will be pruned or felled to remove the risk to the railway in the event of a failure. This was determined by an arborist on site.

Post-felling, the lineside area was replanted with native trees and shrubs including holly, hawthorn, blackthorn, rowan, hazel and elder to increase species diversity in this location. The 'restocking' aims to transform the lineside from a species-poor scrub/woodland to a species rich one that is more beneficial to the surrounding wildlife and safer for the operation of services on the line.

Figure 12: *Habitat piles at pilot site on West Highland Line*

Ahead of this work, Ecologists conducted surveys for breeding birds and other protected species, and identified any trees to be retained for biodiversity, such as trees with bat roost potential.

Habitat piles were created throughout the site (Figure 8) to enhance the already present natural features, and bat and bird boxes were also installed throughout the site to create and maintain existing wildlife corridors.

This enhanced habitat will be beneficial for several species including nesting birds, foraging bats, and various invertebrate species. It will also provide cover for badgers and hedgehogs.

The project will see Network Rail plant and maintain this area through a site-specific schedule for up to ten years to manage the regrowth of woodland, improve biodiversity and offset the impact of the work on the local environment.

13 Priorities for biodiversity management on this region

In July 2021 the region launched Scotland's Sustainability Strategy which aligns with and supports the delivery of the national Network Rail Environmental Sustainability Strategy

2020-2050. Like the national Strategy, Biodiversity is one of the 10 priority areas of Scotland's Railway Sustainability Strategy.

To support the delivery of the Strategy, the Scotland's Railway biodiversity working group was established. This multi-disciplinary working group is responsible for devising and implementing a delivery plan which will outline the actions to be taken to achieve the targets set out within the Strategy.

During the remainder of the current Control Period, the delivery plan will focus on achieving the objective of improving biodiversity with a target of no net loss. This will be delivered through the:

- Promotion of the national Biodiversity Standard NR/L2/ENV/122 , working towards compliance across all business units
- Increasing the track miles with viable survey data by March 2023
- Assessing the additional training needs required to upskill relevant staff across the region and improve engagement in managing biodiversity
- Establishing a long-term Scotland's Railway Sustainable lineside strategy by March 2024
- Introducing Key Performance Indicators (KPIs) on the management of biodiversity for our supply chain
- Developing a methodology for producing Habitat and Vegetation Management Plans across the region

14 Case studies

14.1 Examples of best practice habitat management approaches

14.1.1 Introduction of pine marten dens on the WCK line

Figure 13: *Pine marten den along the WCK line*

The railway is a convenient corridor for commuting to a lot of species, including pine marten, which is known to occur in the Scottish Highlands. In many places it crosses open agricultural land, with very limited areas for shelter, like crevices in mature trees, rock faces, even buildings which will often be used as dens. In recognising this, our Ecologists have been identifying locations throughout our infrastructure to add pine marten dens, as shown in Figure 9.

Initially dens have been added along the WCK line where there is a good habitat for the species and the surface area within the boundary is large enough to avoid impact to the railway when adding this feature. The success of the trial will be dependent on the use of the den by local pine marten in line with the NatureScot protected species guidelines, which will require monitoring following consultation with NatureScot.

14.1.2 Hedgehog highway

Hedgehogs are a much-loved wild mammal found across Scotland, however population numbers have been in decline mainly due to habitat loss and fragmentation. A concerned local resident contacted Network Rail after noticing that hedgehogs were becoming trapped under a boundary fence at Lanark station. One of our teams, which included one of our in-house Ecologists, visited the site to help understand the situation and come up with ways to prevent hedgehogs becoming trapped.

Figure 150: *Hedgehog hole installed in the fence along with signage*

A hole was added to the bottom of the fencing at the station along with some signage, (Figure 10) which has since helped the hedgehogs move safely between their foraging habitats and their nests.

The initiative has been supported by HogWatch Scotland who monitor hedgehog numbers, raise awareness, and provide courses to educate and raise awareness in schools and across communities.

Following its success, Scotland's Railway will be creating these 'Hedgehog Highways' on fencing renewals as this will help hedgehog move between habitats and access food-rich environments.

14.1.3 Biodiversity enhancement through landslip remediation at Fairlie

A landslip at Fairlie in North Ayrshire seen 7000 tonnes of earth and spoil engulf the railway from the slope above following heavy rainfall impacting the surrounding landscape and resulting in the loss of trees and plant species (Figure 11).

Figure 161: *Fairlie landslip site*

Following events such as this, it is current practice to leave the slope bare following remediation. However, as part of the remediation of this site, raised beds have been installed (Figure 12) and planted with native plants and hedging, which will be spread across different levels of the regraded slope at the site. The aim is to significantly improve the visual impact of the substantial remedial work that was needed following the slip.

The planting includes a range of species compatible with the railway environment, like hawthorn, blackthorn, hazel and crab apple, all with good root systems which will help promote stability of the regraded slope. The work will help the lineside move from a species poor scrub to a species rich area which will be of benefit to the surrounding wildlife.

The works represents an investment of more than £100,000 to mitigate the biodiversity loss to the surrounding landscape and to offset the carbon impact of the project to reinstate the slope.

Figure 172: *Raised beds installed as part of the Fairlie landslip remediation*

14.2 Examples of partnership working

Scotland's Railway are investing in a biodiversity enhancement project near Glenfinnan viaduct by committing over £300,000 for Forestry and Land Scotland (FLS) to use in what is the most ambitious biodiversity enhancement project ever to take place on Scotland's Railway.

The two-year project, expected to begin early 2023, will enhance the ecology surrounding the iconic Glenfinnan viaduct, helping us offset the safety-critical removal of trees and vegetation across our network while protecting, supporting, and expanding natural habitats and woodland.

The work will involve removing non-native plant species, managing deer browsing, fencing improvement work, enhancing wet woodland and tree planting. This will take place across an area of roughly 200 hectares, managed by FLS, within Scotland's endangered Atlantic rainforest zone.

In the short term, the project will help remove threats to vulnerable and internationally important woodland and peatland habitats. Longer-term, it'll deliver biodiversity benefits by increasing carbon storage and enhancing climate resilience, helping to protect, enhance and expand these unique habitats for generations to come.

15 Future plans

15.1 Habitat management plans

The Scotland region has obtained a temporary variation against Biodiversity standard NR/L2/ENV/122 Module 2 Habitat Management Plans, which revises the compliance date to the beginning of the next Control Period.

This will allow us to best plan how we produce joint Habitat and Vegetation Management Plans for the region in the most efficient and effective way. It is intended that we will conduct a pilot. to identify a methodology for producing plans for the entire network that will help us to effectively manage biodiversity on our lineside.

15.2 Stakeholder engagement plans for the next reporting period.

We have already identified key stakeholders such as Forestry and Land Scotland (FLS), who we currently engaging with and will continue to do so to help us to improve biodiversity.

We will develop our partnership with the Tree Council to deliver biodiversity enhancement projects through tree planting activities. We will do so by delivering a series of community

tree planting projects, which will be undertaken by Network Rail volunteers in partnership with both the Tree Council and Glasgow City Council.

Our Biodiversity Working Group, made up of representatives from across Scotland's Railway including ScotRail and Transport Scotland, as well as Network Rail delivery and strategic teams, continues to provide a forum to share progress against our CP6 biodiversity strategic delivery plans as well as providing opportunities to share best practice in biodiversity management in the region, and will continue to do so over the remainder of the Control Period.

15.3 Ecological data

As previously mentioned within section 4.4, data on the whereabouts of INNS sites within the region, and the spraying of these sites will be geographically mapped to visualise the spread of INNS within the region and monitor the spraying of INNS sites within each of the DUs.

In addition to this we also intend to create a similar platform for capturing ecological surveys within the region. This will establish how much of the network we have surveyed and will also facilitate the sharing of ecological data in the region.

Lichens growing on lineside fencing

The railway contains a variety of natural and artificial substrates suitable to support a wide diversity of lichen species.

Southern Region State of Nature Report 2021/22

Contents

16 Personnel & Document Control

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1.0	12/03/2023	V1	MOC	SB	SB
1.1	28/03/2023	V1.1		SB	SB

17 Foreword

This report, for Southern region, covers the period April 2021 to March 2022.

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*

18 Executive Summary

18.1 Overview

The south area of England served by the Southern Region network is a rich area for wildlife. This part of the country contains a landscape of contrasts and a diversity of habitats.

The area of estate owned by Southern Region is approximately 7,859 hectares. Remote satellite assessments have identified 17 habitat asset classes as present on the Southern Region estate. Four habitat classes dominate: Bramble Scrub, Deciduous Woodland, Modified Grassland, and Heathland.

18.2 Summary of ambitions for biodiversity management

In 2021, we published our Regional Sustainability Plan 2020-24 which outlines our ambitions for a lineside managed sustainably for safety, performance, the environment, our customers and our neighbours.

Southern is committed to the following deliverables:

- Achieving no net loss in biodiversity on our lineside estate by 2024, and achieve biodiversity net gain of 10 % in each Region by 2035
- Recruitment of in-house ecologists to improve the management and assurance of our ecological risks and mitigation plans
- Creation of Habitat Management Plans covering the Region, with a focus on high value biodiversity sites including Sites of Special Scientific Interest (SSSIs) and Local Wildlife Sites (LWSs)
- Implementation of actions to enable the delivery of biodiversity net gain on major Capital Delivery projects
- Delivery of initiatives with partners and stakeholders as part of our wider sustainability strategy which aims to protect biodiversity and gives back to local communities by creating and supporting green spaces and volunteering opportunities.
- Establishment of processes to measure the value, condition and benefits generated by wildlife and nature on our network, and improved reporting and communication of these benefits and value delivered

18.3 Summary of achievements for biodiversity management 2021/22

18.3.1 Improved understanding of the biodiversity asset

We have focussed closing data gaps and completed a significant project to work with multiple biological data providers to harmonise and collate more than two million records of Priority, Protected and Common species of animals, plants and fungi located within 500m of our running rails.

18.3.2 Railway Nature Sites

The Region has identified more than 100 locations on the network with good intrinsic biodiversity value and for potential to be managed principally as nature conservation areas. We have termed these potential locations 'Railway Nature Sites'. Works this reporting period have formally established 25 RNS locations.

18.3.3 Biodiversity in Blockades

We have developed approaches to make good use of planned periods of engineering works, where train operations are halted, to concurrently deliver biodiversity enhancements safely and efficiently.

18.3.4 Stakeholder initiatives

Our stakeholder initiatives portfolio continues to blossom with projects progressing in all Routes, and our main challenge being to resource our response to new and expanding opportunities. Priority partnership schemes include a Kent Pollinator Project, Surrey Hills AONB Landscape Connectivity scheme and Chichester Wildlife Corridor (Sussex Route); and a Biodiversity Collaboration with Southern West Rail (Wessex Route). Our flagship Regional partnership initiative is a portfolio of tree planting and community engagement schemes with the Tree Council.

18.3.5 Empowering our workforce

An important focus for our biodiversity programme is to equip our workforce with basic knowledge on biodiversity, on the risks posed to ecological features by operational activities, and on the practical actions that can be implemented to protect and enhance biodiversity. This year, we delivered updated Protected Species Awareness training courses that were attended by more than 300 staff and delivered topic briefings to more than 130 staff.

18.4 What further action will we take?

Our focus for 2023 is to:

- Create and publish a wider Land Management Strategy for Southern, to commence from the start of the new Control Period (2024). We recognise that responsibility for managing land and biodiversity is currently complex and split between various parts of the organisation. We are seeking to apply a key principle of managing biodiversity as a system, regardless of ownership of individual elements, which is spread across Sustainability, various Asset Management disciplines, and Property functions. Our new Strategy will define collectively agreed outcomes for biodiversity, set out a trajectory that will lead us to achieve the the necessary capabilities, and be grounded in a robust approach to monitoring biodiversity characteristics, problems, risks and opportunities.
- Establish strategies and organisational arrangements between the Region and Natural England that will permit our workforce to deliver vital maintenance, refurbishment and enhancement of the rail network whilst reducing delays, costs, risks and uncertainty for projects associated with the standard, development-focused, Wildlife Licensing model.
- Create and start to introduce new, standardised ways of working for Infrastructure Maintenance colleagues where Protected Species are likely to be present, with a focus on our highest-risk Species – Hazel Dormouse, Great Crested Newt, and Badgers. Our Ecological Work Instructions (EWIs) will set out the tasks that need to be delivered by staff to minimise and avoid adverse impacts to Protected Species, and to minimise or eliminate the likelihood of an offence being committed under nature conservation legislation.
- We will complete our work on establishing a series of 50 Railway Nature Sites around the Region, high value sites for nature which will be ring-fenced and safeguarded for the benefit of the railway and the communities we serve.
- We will complete our Control Period tree planting programme, in partnership with the Tree Council. Our planting plan for 2023 aims to deliver a further 30,000 trees, to be planted working with local communities, taking us past 100,000 planted trees in total since the partnership began.

19 State of nature on Southern region

19.1 Biodiversity metric calculation for the region

A baseline register of the habitat classes present on Southern Region network, and their spatial extent (area in hectares), was created through the processing of satellite images and described in our first state of nature report. Improvement in satellite data interpretation was applied to the baseline and this year's data; imagery and habitat calculations have been re-baselined.

As a result of this re-baseline, Southern Region is now estimated to own a total of **7859** hectares of habitat with a value of **50,126** Baseline Biodiversity Units.

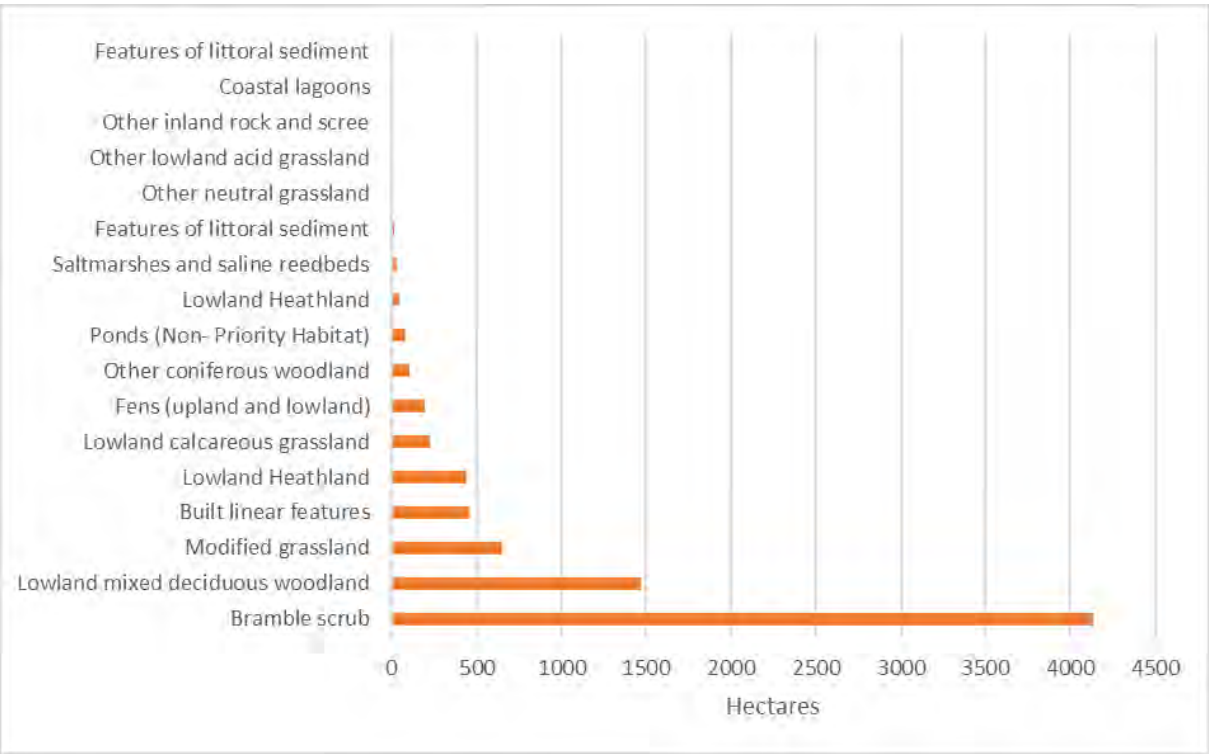
The composition of the score, and changes in the score, are provided in the table below.

	Area (Hectares)			*Habitat Units*		
Habitat type	**2020**	**2021**	**Change**	**2020**	**2021**	**Change**
Lowland mixed deciduous woodland	1475	1468	-8	17702	17611	-91
Other coniferous woodland	178	100	-78	714	401	-313
Bramble scrub	4089	4131	42	16358	16525	167
Modified grassland	877	653	-224	3508	2611	-897
Other neutral grassland	0	9	9	1	75	74
Other lowland acid grassland	1	4	3	7	30	23
Lowland calcareous grassland	163	227	64	1950	2724	773
Lowland Heathland	224	444	220	2691	5328	2637
Lowland Heathland	38	42	4	453	505	53
Ponds (Non- Priority Habitat)	140	80	-60	1123	642	-482
Fens (upland and lowland)	36	194	158	573	3097	2524
Other inland rock and scree	0	1	1	1	11	10
Coastal lagoons	1	1	1	6	15	9
Features of littoral sediment	22	16	-6	267	195	-72
Features of littoral sediment	1	1	0	11	12	1
Saltmarshes and saline reedbeds	159	29	-131	1913	344	-1569
Built linear features	454	459	5	0	0	0
Totals	7859	7859	0	47278	50126	2848

19.2 Region habitat types

Remote satellite assessments have identified 17 habitat asset classes as present on the Southern Region estate. Four habitat classes dominate: Bramble Scrub, Deciduous Woodland, Modified Grassland, and Heathland.

Habitat asset classes on Southern Region as identified by remote assessment



19.3 Priority Habitat & Species on the Region

125 Sites of Special Scientific Interest (SSSI) are within or adjoining our estate boundaries, to which we have a statutory duty not to cause damage or degradation. More than half of these Sites are located within Wessex Route (56 %), with the remainder then divided between Kent (25 %) and Sussex Routes (18 %). The SSSIs that intersect with our estate are organised by Natural England into management units and we have direct management responsibility for 220 hectares-worth of these.

As an 'arm's length' public body of the Department for Transport, Network Rail is required, under the Natural Environment and Rural Communities (NERC) Act 2006, to have regard to the conservation of biodiversity in England, when carrying out its statutory functions of operating and maintaining the railway.

The NERC Act contains a list of 943 species which are of principal importance for the conservation of biodiversity in England, drawn up in consultation with Natural England.

Of the priority species listed in the NERC Act, at least 118 species (13 %) are currently known from biological records to utilise the estate of Southern Region.

We have initiated and continue to work with a diversity of partners on conservation initiatives for a number of Priority Species on this list:

- Dormouse
- Great Crested Newt
- Sand Lizard
- Nightingale
- Farmland Birds (Turtle Dove, Reed Warbler, Corn Bunting)
- Kent Rare Moths (Black-veined Moth; Bright Wave; Fiery Clearwing; Fisher's Estuarine Moth; Marsh Mallow Moth; Sussex Emerald; Straw Belle; White-spotted Sable)
- Long-tailed Blue butterfly
- Striped Lychnis moth
- Lizard Orchid

19.4 Invasive species on the region

Invasive non-native species of plants and animals are found throughout the Region and represent a significant challenge to biodiversity management. We are legally required to not facilitate the spread of such species but the majority that are found on the railway are widespread and it is unlikely that any can be completely eradicated from the Southern estate.

Reflecting their widespread status in wider biological records, the principal plant species of concern and control effort in Southern are Japanese Knotweed, Giant Hogweed, Himalayan Balsam, Rhododendron, Ragwort, and Buddleia.

Our lineside maintenance plan delivered cutting and mechanical treatment of more than 130,000m^2 (13 hectares) of these invasive plants.

The principal animal species of concern in the Region is the Oak Processionary Moth. We have undertaken control work across Kent, Sussex and Wessex involving spraying of hundreds of infected oak trees.

19.5 Demonstration sites and projects

19.5.1 Kent Vegetation Management Pilot

Our flagship demonstration project is the Kent Vegetation Management Pilot, which comprises a total of 69 trial sites, each 1/8 of a mile long (approximately 200m) and of various widths. Site implementation was spread over three separate tranches, with the project starting in 2020 and subsequent tranches in 2021 and 2022.

Detailed botanical and invertebrate monitoring surveys were completed across 32 sites, and we are now in a position to compare and contrast the initial success habitat management techniques, and how habitats and invertebrate communities have responded. Key findings include:

- Overall, more than 140 species/genera of invertebrate identified across the project sites, with the highest recorded diversity at a site currently at least 48 species.
- For plants, more than 300 species/genera have been identified across the project sites, with the highest recorded diversity at a site currently at least 65 species.
- There was increased plant and invertebrate abundance measures across all Pilot sites.
- A relationship can be observed between plant and invertebrate species richness on sites (higher plant species richness = higher invertebrate species richness).

- There was an increase in the area of neutral grassland habitat on sites.
- There was a decrease in the area of scrub habitat.
- There was a reduction of tussocky grassland and dense scrub across sites.
- There was a shift towards open, more species rich grassland and woodland communities.

Example site progression from a poorly vegetated site with ballast and bare ground, to wildflower/grassland mix

The project is testing combinations of different types of management interventions (Habitat Management Techniques, HMTs) to achieve the following key habitat management outcomes:

6. Enhance woodland
7. Enhance scrub
8. Transform scrub to grassland
9. Transform scrub to woodland

1. Enhance grassland
2. Transform grassland
3. Enhance wetland
4. Conserve existing habitat
5. Enhance brownfield

Monitoring during the season has generated the following key observations:

- There has not yet been a significant effect on species abundance measures through delivery of any of the individual HMTs.
- There were almost significant increases in plant abundance measures for ‘Transform scrub to grassland’ and ‘Enhance grassland’ sites
- Measures of plant abundance in ‘Enhance wetland’ and ‘Conserve existing habitat’ sites have responded the least to HMT applications.

- Invertebrate abundance has increased as general response to all HMTs albeit this cannot yet be classed as a significant change.

The lack of statistical significance is likely due to insufficient replication of HMTs at this stage (not enough sites available for each HMT to be analysed). This is expected to be resolved by inclusion of the final tranche of sites into the analysis next year.

Data on seeding success was also available for the first time, and the following was observed:

- Seeding success was highly variable across sites (0-48 % of species sown found growing).
- Overall seeding success was low (20 % success across tranches) but was similar between tranches (22 % and 19 %).
- Some species were more successful than others (ranging between 0-100 % success) but with overall only 33 out of 70 species sown have been found growing across the sites and out of those, only 13 species had a germination success rate of 50 % or more.

Overall, the monitoring data is starting to fill a pot of learnings, which will be structured to help provide our estate managers with recommendations on how to manage and improve lineside habitats. The monitoring has highlighted that:

- Certain wildflower species are likely to be more successful than others in the railway environment, and that broadcast seeding of commercial, off-the-shelf mixtures may be inefficient. We have in response developed a 'railway seed mix' for ongoing testing, as part of the Kent Pilot but also for inclusion as part of other ecology initiatives and select operational jobs.
- Structural changes to the habitats need to be balanced against biodiversity measures; any larger roll out of the project's recommendations will need to consider a mosaic approach for enhancement works, rather than transforming large blocks of lineside habitat, so that all species groups and habitat functions (nesting/refuge as well as feeding) are considered.
- 'Enhance wetland' sites require further attention and research as measurable change in these habitats has so far been minimal. We plan to undertake more detailed studying of reedbeds in 2023 to assist with this.

20 Priorities for biodiversity management on the Region

Our strategic priority is to deliver against the objective of delivering no net loss in biodiversity by 2024 and achieving biodiversity net gain by 2035. Our delivery priorities are aligned to these outcomes and include:

- Improving workforce capability and engagement in managing biodiversity as an asset.
- Providing our workforce with wildlife identification skills and knowledge required so that they can discharge duties to biodiversity competently, safely and efficiently.
- Sharing best and good practice, relevant analysis, and lessons learned in order for the workforce to benefit from the experience of others and apply best practice on a day to day basis.
- Developing Regional policy, procedures and work instructions so that the consideration of biodiversity is appropriately captured and addressed within all the work that we do.
- Setting and monitoring a requirement for engineering projects and maintenance interventions to produce enhanced biodiversity assessments, proportionate to the size or scale of the project or intervention.
- Integration of biodiversity management in the business planning process through creation of Habitat Management Plans (HMP). HMPs will set out objectives, priorities and investment requirements over the short and longer terms. In order to see that the activities set out in HMPs are fully embedded within Route activities and receive the appropriate level of priority and funding, deliverables will be incorporated within Route Strategic Asset Management Plans and other Route Strategies. In this way, biodiversity management will become part of business as usual.
- Improved strategic planning for biodiversity management with external stakeholders. We will achieve this through providing and supporting platforms for discussion and information sharing between responsible and interested parties across the Region, and by engaging with external stakeholders and groups to support and enhance work in this area.

21 Report on Performance Indicators within reporting period

Southern Region has completed the creation of 'generic' Habitat Management Plans, that cover management objectives and prescriptions required to achieve these objectives, for all the high-level habitat types that have been identified through remote satellite mapping (see Section 4). Therefore, 100 % of our estate has a management plan aligned. Our challenge for the final year of this Control Period is to identify priorities for delivery and to successfully obtain funding for plan implementation as part of CP7 Business Plan submission, with a view to commencing works at scale from 2023/24.

These 'generic' Plans are being supplemented by 'localised' Habitat Management Plans, and Species Management Plans, which we are implementing through our Environmental Sustainability Plan and in partnership with a diversity of external stakeholders

Performance indicator	Unit	Target	Actual	Status	Commentary
No Net Loss	Biodiversity Unit	47,278	N/A	Unknown	Likely declined
Net Gain	Biodiversity Unit	52,006	N/A	Unknown	Likely declined
Regional HMP coverage	%	100 %	100 %	Achieved	Generic HMPs created

22 Case studies

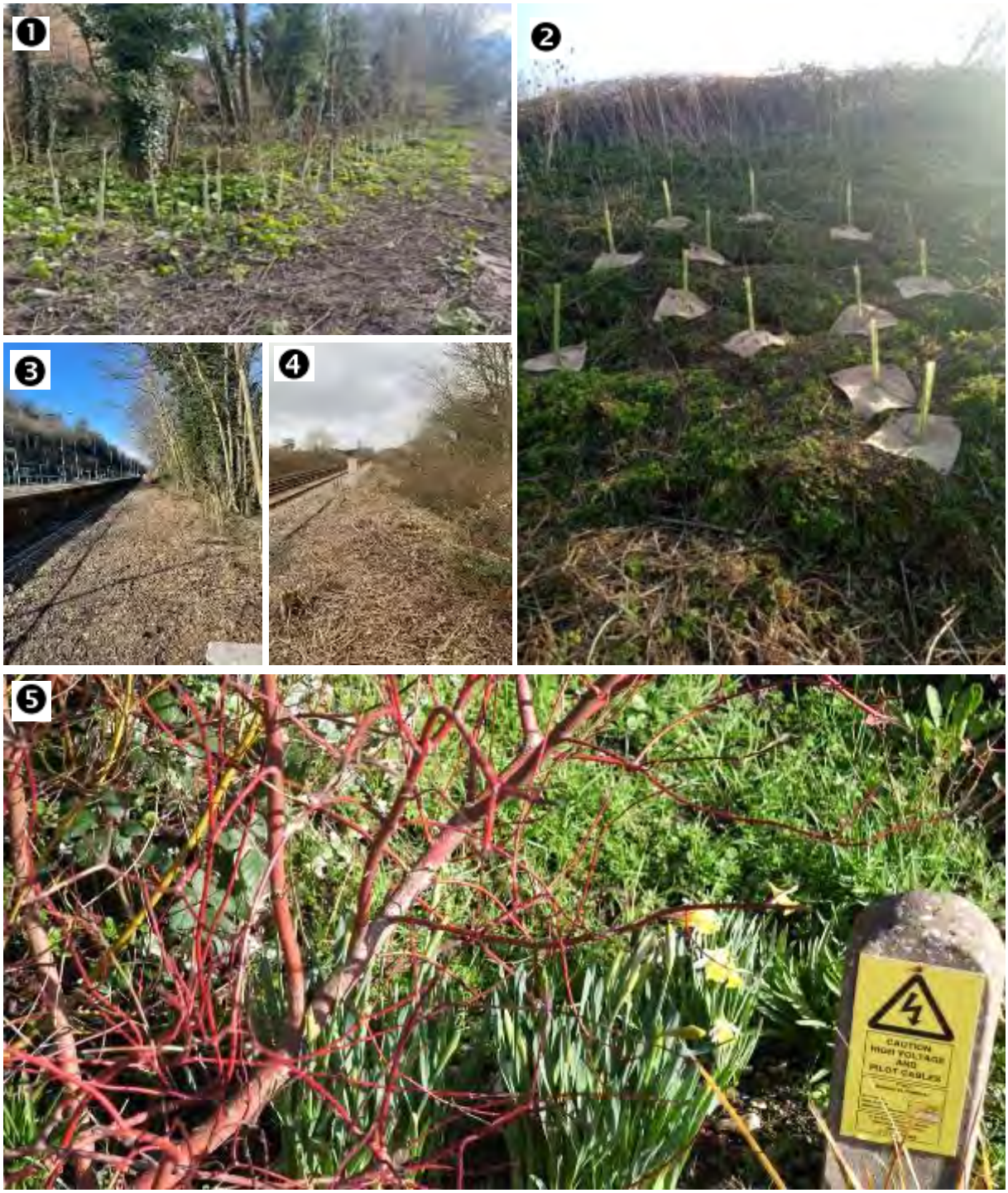
22.1 Biodiversity in Blockades - optimising use of railway access

Southern Region has a programme of 'blockades' - planned periods of time where we close the running of the railway, ranging from three days up to sixteen days, to deliver essential upgrades and enhancements to the rail infrastructure.

Southern recognised a potential opportunity to deliver enhancements for a different type of asset and posed a challenge: might we use the valuable window of time presented by a blockade to deliver works to improve the condition and value of lineside biodiversity.

The Ecology Management, Works Delivery, and Possessions Management teams of the Region have subsequently collaborated to develop business processes and plans for biodiversity enhancement in blockades, and have been testing approaches in select schemes. Some early learnings from our Kent Vegetation Management Pilot have been brought to bear and are showing promising signs of success in application.

Ground preparation/planting/seeding



❶❷ Whip Planting

❸ Ground preparation + seeding with wildflower mix for pollinators and birds

❹ Invasive buddleia and bramble removal

❺ Planting and seeding along station platform verges

Ecological Arboriculture

❶ Monolith creation

❷ ❹ Lightning strike simulation with nesting slot

❸ Nesting cavity

Ecological Feature Creation

❶ Simple ground hibernacula

❷ Hedge laying

❸ Dead hedging

22.2 Capital Project Works

Bracewell Road Embankment

Stabilisation works necessitated installation of concrete augured piles and regrading of the embankment profile. Pre-works ecological surveys identified that the habitat comprised mixed dense scrub and scattered trees. Although the habitat was not suitable to support protected species, it was identified as having value as a green corridor with the potential to support commuting and foraging. In consultation with lineside neighbours and working with Network Rail and the Tree Council guidance, a landscape replanting plan was developed comprising wildflower grassland meadow seed mix, scrub and woodland saplings and specimen trees at the embankment toe.

British native species were selected to attract wildlife, support the wider food chain and the ecosystem all year round (e.g. pollinators, nectar-rich and berry producing plants). The design also aimed to complement and enhance the existing retained shrub and scrub vegetation growing within the rail corridor and to be visually appealing.

Use of the Defra Biodiversity Metric delivered a 1.72 % biodiversity net gain.

22.3 Examples of partnership working

22.3.1 Tree Council

Our leading-edge partnership with The Tree Council continued and the initial seed we planted in 2020, watered with a £1million pledge to set up local planting schemes across the Region, has grown and started to bloom into something that will leave a legacy for future generations.

The partnership worked on 20 projects at 77 locations across the Region, undertaking 112 volunteer days, with 50,563 native trees planted during the overwinter season (Table 3). The projects supported core themes around Nature Recovery, Community Planting, Landscape Connectivity, Amenity Planting, Nature Based Solutions, Urban Resilience and Food Security.

Tree species planted

Tree species	total	% of Total	Rank
Crataegus monogyna (Quick Thorn)	7746	16.0 %	1
Prunus spinosa (Blackthorn / Sloe)	6577	13.6 %	2
Fagus sylvatica (Common Beech)	5523	11.4 %	3
Acer campestre (Field Maple)	5163	10.7 %	4
Corylus avellana (Hazel)	3751	7.8 %	5
Cornus sanguinea (Common Dogwood)	2903	6.0 %	6
Malus sylvestris (Crab Apple)	2531	5.2 %	7
Sambucus nigra (Elder)	2254	4.7 %	8
Carpinus betulus (Hornbeam)	2233	4.6 %	9
Ligustrum vulgare (Common Privet)	2122	4.4 %	10
Frangula alnus (Buckthorn)	2116	4.4 %	11
Rosa canina (Dog Rose)	2083	4.3 %	12
Euonymus europaeus (Spindle)	2047	4.2 %	13
Other	3514	2.6 %	

For the next year, the planting target is 30,000 more trees, meaning the partnership will have delivered more than 100,000 native trees, far outstripping our initial target of 25,000. We will also be seeking to increase the numbers of volunteers engaged and provide a varied, seasonal year-round programme of opportunity.

"Southern's innovative partnership with The Tree Council brings great benefits for people and the planet. Our collaboration has, to date, established 78,187 trees, with 33 communities, including more than 766 volunteer hours. From increased carbon sequestration to habitat creation, attenuated flooding and improved air quality, together we are improving wellbeing in underserved communities and conserving wildlife for generations to come." - **Ian Turner, Head of Major Planting & Ecology Projects, The Tree Council**

23 Future plans

23.1 Land Management Strategy

During 2023, we will create and publish a wider Land Management Strategy for Southern, to commence from the start of the new Control Period (2024). We recognise that responsibility for managing land and biodiversity is currently complex and split between various parts of the organisation.

We are seeking to apply a key principle of managing biodiversity as a system, regardless of ownership of individual elements, which is spread across Sustainability, various Asset Management disciplines, and Property functions.

Our new Strategy will define collectively agreed outcomes for biodiversity, set out a trajectory that will lead us to achieve the necessary capabilities, and be grounded in a robust approach to monitoring biodiversity characteristics, problems, risks and opportunities.

23.2 Biodiversity Net Gain Strategy

An important input to our cross-discipline Land Management Strategy is our new Biodiversity Net Gain Strategy, due to be complete in the first half of 2023. Our objective is stated straightforwardly: against a baseline starting position for our estate established for the start of 2024/25, deliver a 10 % biodiversity net gain by 2035.

Conceptualisation and implementation of a strategy to deliver this objective is much more complicated, as the approach needs to set-out an uptick in the volume of proactive habitat management we undertake while offsetting a complex myriad of operational and engineering activities that adversely impact biodiversity value.

The Strategy will cover how Southern will tackle this complexity to deliver the required measurable improvement for biodiversity. Consideration will be given to the creation and enhancements of habitats as part of planned management action as well as in association with major infrastructure projects; principles will be established for achieving the BNG target though on-site lineside enhancements, by providing enhancements to agreed sites elsewhere, and through the procurement of biodiversity offsets.

23.3 Stakeholder engagement plans for the next reporting period.

Southern Region recognises that engagement and partnership with a wide range of stakeholders on all significant biodiversity-related matters is central to the successful implementation of our Regional biodiversity plan and achievement of our key net gain objective.

Opportunities to work with stakeholders throughout the next reporting period include:

- Meeting formally with strategic Biodiversity Partnerships, Local Authorities, key landowners (farming estates), and nature conservation groups to consult on inclusion of perspectives, knowledge and needs from beyond those held within the railway corridor.
- Meeting less formally with other stakeholder and community groups, and sharing of knowledge, actions and achievements through our communications channels to keep our key stakeholders updated, engaged and informed.
- Educating lineside neighbours and our customers about biodiversity management practices, and values, on and near the railway, and how they can support and inform our work.
- Expanding volunteer opportunities for our workforce and stakeholders such as ‘Friends of’ groups, and at community events such as tree planting days.
- Implementing interpretive signage at high biodiversity value railway sites and stations (in partnership with our Train Operator colleagues).
- Hosting engagement and educational activities on biodiversity management.

Wales & Western Region State of Nature Report

Contents

24 Personnel & Document Control

Main Report author	Angharad Owen
Position	Environment Manager, Wales & Western
Date	27/07/2023
Report reviewer	Felix Chamberlain
Position	Head of Sustainability and Social Value, Wales & Western
Date	28/07/2023
Report authoriser	
Position	
Date	

24.1 Document Control

Version number	Approved by Date	Description	Prepared by	Reviewed by	Authorised by
1	27/07/2023	Habitats & Species sections, Case Studies section.	James Darke	Angharad Owen	Angharad Owen
2	28/07/2023	DRAFT State of Nature report for review	Angharad Owen	Felix Chamberlain	Felix Chamberlain

25 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.

The following report outlines the State of Nature for the Wales & Western region between the period April 2021 to March 2022. It aims to outline the State of Nature of the region's estate, the ambitions and plans we have to protect, maintain, and enhance 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 Wales & Western Region serves Wales, the Thames Valley, West of England, and the South West Peninsula. The Region is made up of two Routes:

- Our Wales & Borders route, which link 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 18: Extent of the Wales & Western Region. Network Rail image

In addition to the commitment for each Region to produce a State of Nature, in December 2019 the Wales Route were required to produce a summary report[6] to fulfil the 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.

26 Executive Summary

26.1 Overview

Across the Wales & Western Region, the delivery teams have progressed with commissioning targeted baseline ecology surveys of our lineside estate. Due to the prioritisation of targeting vegetation management in areas where Ash Dieback is causing a threat to the line, the baseline surveys have become more targeted to those particular areas. The objective in Wales is to complete the baseline ecology surveys to boundary by the end of CP6. In Western the aim is to complete baseline ecology surveys across the Route by the end of CP7.

[6] Network Rail, Wales Route Environment (Wales) Act 2016: Section 6 duty summary report (December 2019) - Network Rail

The habitat mapping data produced by the Centre for Ecology & Hydrology (CEH) on behalf of Network Rail, assessed sixteen habitat types, with bramble scrub being the most abundant habitat reported covering approximately 26 % of our lineside. A 2 % reduction in broadleaved woodland, was also reported.

Rare and priority species recorded across the Region include Bristol whitebeam, Cut-leaved selfheal, Large Blue butterfly, the Dingy Skipper moth, Reed bunting and Linnet.

26.2 Summary of ambitions for biodiversity management

- The Region will actively engage with key external and internal stakeholders in relation to Biodiversity.
- Aim to have sufficient Ecology resource in order to be compliant with the ENV122 standard.
- 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.
- Retention of a corridor of vegetation along the boundary of our land holdings wherever it is practicable to do so.
- 'Maintain and enhance' as 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.

26.3 Summary of achievements for biodiversity management

- In order to inform the vegetation management works, the Region are procuring and undertaking ecology surveys of ELRs ahead of works which are to boundary in order to provide mitigation for ecological constraints identified on site. These surveys will also provide data to inform other projects delivered in those areas and whether permissions are required in order for works to proceed. Ultimately identifying ecological constraints as early as possible when planning of works will avoid delays to programme.
- Across the Region we have several European Protected Species (EPS) mitigation licences which enable works to proceed.
- In Wales we have built constructive working relationships with key stakeholders including NRW and WG.

- Across the Region we are working towards promoting to external stakeholders that Network Rail are working towards managing biodiversity and ecology as an Asset and to improve our compliance with wildlife legislation.

26.4 What further action will we take?

The focus for the coming financial year is to deliver the demonstration projects to inform future biodiversity and habitat management across the Region, with a focus on a pragmatic approach to sympathetically work with the existing habitats present on site - with the right habitat in the right place. We are aiming to work with nature rather than change the habitats or plant species that will not survive without excessive maintenance required and without aiming for floriculture.

The Region will continue to progress with delivering the ELR ecology surveys in Wales which is being managed with direct input from the Ecologists in the Delivery Units. For Western, Works Delivery have been progressing with coordinating the ELR surveys ahead of the vegetation management works. These surveys will inform future works and allow mitigation to be planned ahead of time and permissions to be acquired where there are ecological constraints identified.

We will continue to embed requirements to positively manage our assets to 'maintain and enhance' biodiversity and be compliant with external legislation with regard to ecology. We are also focusing on the Cultural Change around embedding requirements for positive management for biodiversity and ecology, and also embedding Ecologists within the Delivery teams who act as the first point of call for provision of advice.

Through consultation with NRW and WG, we will work towards resolving the question around using the Biodiversity Metric 3.0 for calculating Biodiversity in Wales.

27 State of nature on Wales & Western region (period between April 2021 – March 2022)

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 handled, and the guidance provided by the 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 as a way to calculate a value for biodiversity by either Welsh Government or Natural Resources Wales and they are looking to use a quantitative measure. During the reporting period of April 2021 – March 2022, the issue of how to record and report on biodiversity had not been resolved in Wales, and therefore Network Rail continued to request for the Biodiversity Metric tool to be used (both internally and externally) for projects across the Region. Regional staff will continue to consult with external stakeholders to resolve this issue in Wales.

Figure 1 illustrates that the majority of the Wales Route is adjacent to coastal habitats, and this has resulted in liaison with NRW and WG in relation to permitting works to maintain our infrastructure. The centre of Wales Route is a rural area, and the ELR which runs along the border is mostly rural but passes through major border towns. In March 2020, the Core Valley Lines (CVL) was transferred across to be managed by Transport for Wales (TfW).

In some areas, Network Rail property in the Wales & Western region supports distinctive habitats and species of principal importance, including some rare and endangered species.

27.1 Wales Route and Section 6 duty

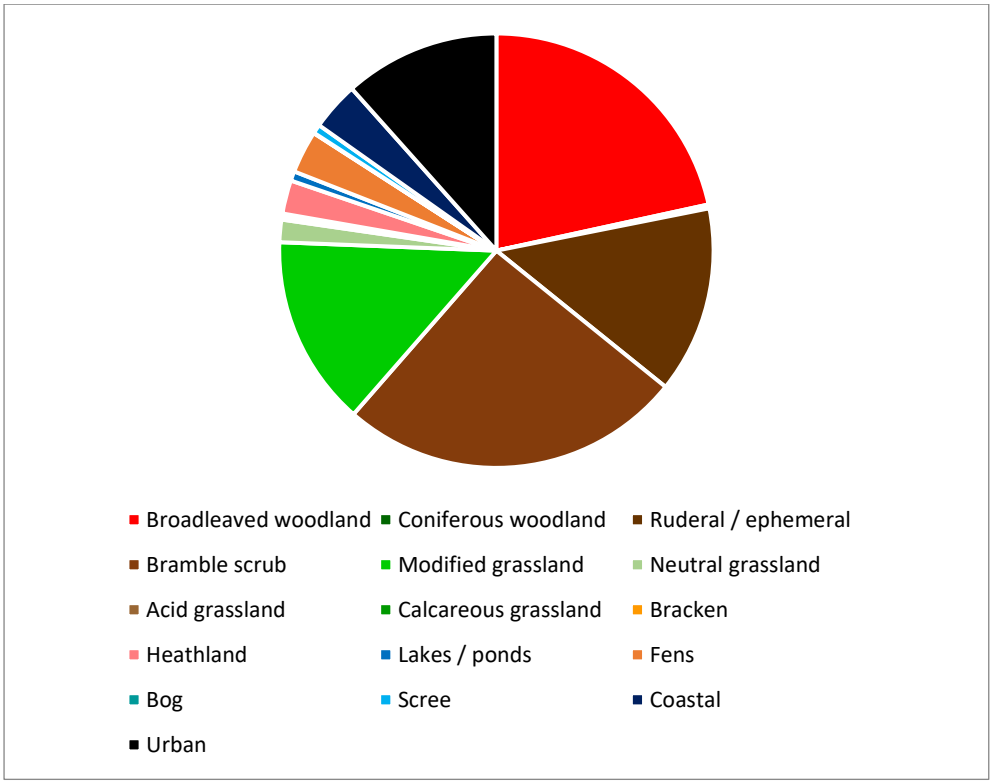
With reference to the Section 6 Environment (Wales) Act 2016 Summary report produced in December 2019, the Wales Route has progressed with commitments which would enable the Wales & Borders route to fulfil their Section 6 duty.

27.2 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.

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. The Figure 2 illustrates the types of habitats which occur in the region and their relative proportion.

Figure 2: Habitat type and proportion in the Wales & Western region



In the Wales & Western region, the 'Other woodland, broadleaved' habitat category provides the highest amount of habitat units, due to the large area it covers, its condition and its medium distinctiveness. Although the cover of Bramble scrub on the lineside is larger than the woodland category, the habitat scores fewer units due to its poor condition. Modified grassland provides a large number of habitat units despite its low distinctiveness, due to its large area. Despite its limited extent within the Network Rail land holdings, Fen habitat scores highly due to its very high habitat distinctiveness rating.

Lowland raised bog, Coastal lagoons and Inland rock outcrop habitats contribute the least to the overall habitat score of the region due to their low areas.

Habitat in the region has a total area of 9,174.08 ha and a habitat unit value of 47,533.94.

Table 1 DEFRA Biodiversity metric scores for habitats identified in the Wales & Western region 2021

Habitat type	Area (hectares)	Distinctiveness	Condition	Habitat units
Other woodland; broadleaved	1,901.08	Medium	Moderate	15,208.64
Bramble scrub	2,351.92	Medium	Poor	9,407.68
Modified grassland	1,302.04	Low	Moderate	5,208.16
Fens (upland and lowland)	289.25	V.High	Moderate	4,628.00
Ruderal/Ephemeral	1,276.97	Low	Poor	2,553.94
Upland Heathland	182.09	High	Moderate	2,185.08
Saltmarshes and saline reedbeds	168.33	High	Moderate	2,019.96
Other neutral grassland	153.12	Medium	Moderate	1,224.96
Features of littoral rock	60.69	High	Moderate	728.28
Features of littoral sediment	60.50	High	Moderate	726.00
Lowland Heathland	46.57	High	Moderate	558.84
Ponds (Non- Priority Habitat)	65.31	Medium	Moderate	522.48
Other inland rock and scree	61.00	Medium	Moderate	488.00
Features of littoral sediment	29.71	High	Moderate	356.52
Lowland calcareous grassland	22.02	High	Moderate	264.24
Wet woodland	19.80	High	Moderate	237.60
Lowland mixed deciduous woodland	19.80	High	Moderate	237.60
Upland oakwood	19.80	High	Moderate	237.60
Lowland beech and yew woodland	19.80	High	Moderate	237.60
Upland acid grassland	19.28	Medium	Moderate	154.24
Other Scot's Pine woodland	13.19	Medium	Moderate	105.52
Features of littoral rock	8.53	High	Moderate	102.36
Other coniferous woodland	13.19	Low	Moderate	52.76
Lowland raised bog	2.98	V.High	Moderate	47.68
Coastal lagoons	2.73	High	Moderate	32.76
Inland rock outcrop and scree habitats	0.62	High	Moderate	7.44
Built linear features	1,063.76	V.Low	N/A - Other	0.00
TOTAL	**9,174.08**			**47,533.94**

Connectivity

Remotely sensed habitat data, together with habitat specific connectivity mapping, available on the GeoRINM Viewer, can identify locations to prioritise opportunities for habitat restoration and creation.

For example Figure 3 habitat data shows relatively large areas of semi natural grassland adjacent to modified grassland and coniferous woodland, with examples of each of those habitat types within Network Rail's land boundary. Figure 4 shows high local connectivity for semi natural grasslands in this area, indicating a greater impact if grassland restoration or creation was to occur. This could be a viable option after management of coniferous woodland near the line, for example.

Figure 3 Remotely sensed habitat data showing semi-natural grassland (acid) and coniferous woodland extent near Llanwrtyd Wells on the Central Wales Line

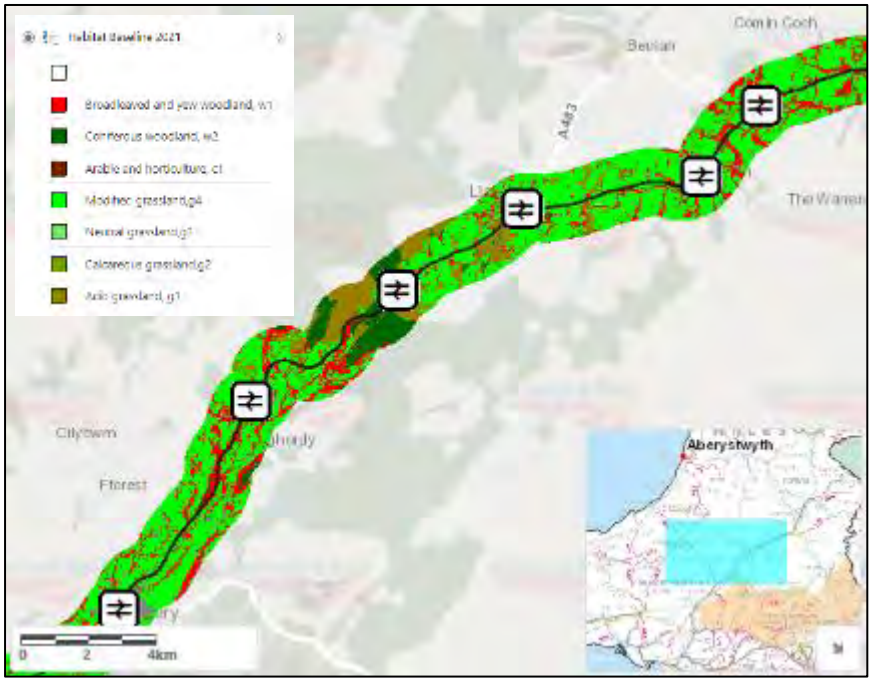
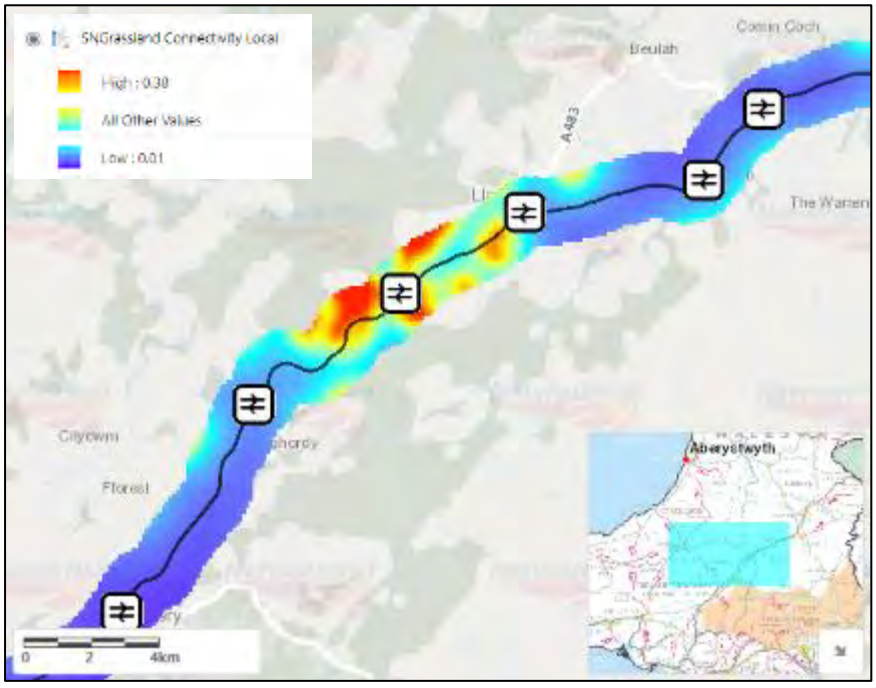


Figure 4 Semi-natural grassland local connectivity score based on proximity of the same habitat type



Region habitat types

Of the 16 habitat types assessed in the Wales & Western region in the reporting period using the CEH habitat mapping data and other criteria, Bramble scrub had the largest contribution, covering 26 % of the lineside area. This habitat has had one percent increase since the previous year. Bramble scrub is a very common habitat and can be found across the region, usually bordering woodlands, as part of mosaics with other scrub types and as part of neglected grasslands. Broadleaved woodland was the second most abundant habitat, covering 22 % of the regions lineside, a reduction of 2 % from 2020. Broadleaved woodland can be found as various types and ages across the region. Its type changes according to variables such as soil type, geology, climate, and management.

Modified grassland and Ruderal / ephemeral habitats contributed 14 % each, to habitat cover in 2021, which was an increase in 5 % for modified grassland and a decrease of 1 % for ruderal/ ephemeral in the last year. Modified grassland is a common habitat across the region and can occur either where existing grassland is managed for amenity or agriculture, or new grasslands are created. Ruderal / ephemeral habitats can also occur across the region and usually depend on disturbance of ground to persist.

Urban habitat covers 12 % of the lineside in 2021, a small increase since 2020.

Fens and coastal habitat both contributed 4 % cover in 2021, which was a doubling of the cover of fen habitat and a 6 % reduction in coastal habitat since 2020. Fen is a less common habitat in the region, requiring high groundwater levels, groundwater rich in minerals and sometimes associated with calcareous geology. Coastal habitats are a common occurrence on Network Rail land in Wales due to the location of a large proportion of the line mileage.

Three percent of the lineside cover in Wales & Western has been mapped as heathland, this habitat was assessed as just 1 % in 2020. The heads of the South Wales valleys are an area where this habitat is common. It also occurs in the Western region in Cornwall. The habitat is often present on low nutrient acidic soils and forms a distinctive habitat type which supports many specially adapted species. Neutral grassland contributed 2 % cover in 2021, no change since 2020.

Cover of lakes/ ponds and scree on the lineside was just 1 % in 2021, a similar estimate to the previous year.

Coniferous woodland, bracken, acid grassland, calcareous grassland and bog were surveyed as each covering less than 1 % of the lineside in 2021. Acid grassland cover has reduced by 1 % since 2020. Acid grassland and Coniferous woodland are common around the South Wales valleys. Calcareous grasslands are restricted to areas of calcareous geology and examples occur in the Avon Gorge and near Castle Cary in Somerset.

27.4 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.

27.5 Priority species on Wales & Western Region

There are several examples of Species of Principal Importance under the NERC and Environment (Wales) Acts, and species listed under Schedules 1, 5, 8 or 9 of the Wildlife and Countryside Act (1981) (W&CA) which have been recorded on and around the lineside in the region. Some of these occur in designated sites such as SSSIs and SACs, others occur in suitable habitat on the lineside. The following text provides examples of

such species and a description of where they have been recorded within the Region. Table 2 provides a list of example species which have been recorded on or near Network Rail land holdings. Examples of rare and priority species can be found in Table xx below.

Table 2 Examples of rare and priority species which occur on Network Rail land within the Wales & Western region.

Common Name	Scientific Name	Route	Notes
Bristol Whitebeam	Sorbus bristoliensis	Western	Endangered, Section 41
Cut-leaved Self Heal	Prunella laciniata	Western	On Somerset rare plant register
Large Blue	Phengaris arion	Western	European Protected Species
Dingy Skipper	Enynnis tages	Wales	Section 41
Reed Bunting	Emberiza shoeniclus	Wales	Section 41
Linnet	Carduelis cannabina	Wales	Section 41

The Portishead Branch Line runs through the Avon Gorge SSSI, and much of the lineside in that area is part of the designated site. Bristol Whitebeam, an endemic tree to the UK which grows only in the Avon Gorge occurs within the woodland which occurs on the lineside. Whitebeams in the Avon Gorge have been the subject of a mitigation plan to ensure that the population size of these species are not affected by works on the line.

Photograph 1: Avon Gorge

Cut-leaved Self Heal is a plant of good quality calcareous grasslands and occurs within The East Polden Grasslands SSSI, part of which is on the lineside of the Castle Cary Line in Somerset. The plant is noted as rare on the Somerset Rare Plant Register.

The Large Blue butterfly is a European Protected Species and is also dependent on good quality calcareous grassland containing Wild Thyme and Wild Marjoram for its life cycle. It is present on the lineside, both inside and outside designated sites on the Castle Cary Line. Work to monitor the species to inform management works for the future is being planned.

Photograph 2: Large Blue butterfly

Network Rail land in South Wales contains ex-industrial brownfield sites, these places, such as disused sidings, can have diverse flora and invertebrate populations due to the history of the site, the range of substrates and regular ground disturbance which happens as part of normal rail activity. Llandeilo sidings, near Llanelli supports the Dingy Skipper butterfly which is a species of principal importance and dependent on the Birds'-foot Trefoil plant to feed its caterpillars.

During a bird survey of a coastal site on the South West Main Line in Wales, breeding Linnet and Reed Bunting were recorded using habitat on the lineside. Both these are species of principal importance. Linnet has a Red UK Conservation Status and Reed Bunting has an Amber Rating[7].

[7] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Nable, D. & Win, I. (2021) The Status of our Bird Populations: the fifth Birds of Conservation Concern in the United

27.6 Rare and priority habitats on the Wales & Western Region

Coastal saltmarsh

Examples of where Coastal Saltmarsh can be found adjacent and within the Network Rail boundary include the Avon Gorge, on the Western Route, and Ferryside on the Wales Route. This habitat of principal importance usually occurs on sandy and muddy substrates on the upper shoreline and is inundated by the higher tides of the year.

Photograph 3: Saltmarsh adjacent to the Railway

Lowland calcareous grassland

Examples of Calcareous grassland can be found near Combe on the Cotswold Line, within the Avon Gorge on the Portbury Line and near Charlton Mackrell on the Castle Cary Line. This habitat can be very diverse, containing up to 40 plant species per m2[8] and can support correspondingly diverse insect populations, including many species of butterfly, such as the Marbled White and the Common Blue.

Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. British Birds 114, 723-747.

[8] https://cdn.forestresearch.gov.uk/2022/02/bpg_18.pdf

Photograph 4: Calcareous grassland

Lowland mixed deciduous woodland

Woodlands present on the lineside in the Avon Gorge are a good example of this habitat, which includes most semi natural woodland in the southern portions of the Wales & Western region. Woodlands can include many species of trees and shrubs and can also have a distinctive ground flora, including well known plants such as Bluebell and Wild Garlic.

27.7 Invasive species on the region

- The RAM GDL team are working with Mott MacDonald to develop an approach to automatically locate Japanese knotweed using machine learning algorithms, in conjunction with Network Rail's existing resources of aerial imagery and associated data. The model performs best in urban or inter-urban areas and less so in the rural areas on the Network. This algorithm is being refined and this project team will continue to work towards a final model. The output of this project will inform the future targeted management of this INNS.
- Since 2019 in Wales, we currently carry out a substantial work bank focussed on JKW every year. The sites are in the 100's and the work is carried out by suitably qualified personal from Construction Services. 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 outside companies (i.e. 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.

27.8 Demonstration sites or projects

During April 2021 to March 2022 the following demonstration sites were being progressed under the Biodiversity Implementation Programme (BIP) funded through the TA. Regionally these demonstration sites are referred to as 'Pilot Sites'.

Cliff Farm on the South Wales Main Line (SWM2)

The Cliff Farm Pilot Site was identified after a Contractor had identified dead, decaying and dying trees as needing to be removed for safety reasons. This site is adjacent to the Severn Estuary SSSI, SAC/ SPA Ramsar designated sites and close to a large rock netting scheme A preliminary ecological appraisal (PEA) was undertaken at the site by Network Rail ecologists in the DEAM team which identified woodland habitat of principal importance, presence of European Protected Species, many breeding bird species (some of which were declining in the area), presence of scarce tree species, and a diverse ground flora. The Environment Manager in the DEAM team recommended an Arboricultural survey was undertaken by a suitably qualified individual, and biodiversity enhancement options for the site were identified following the ecology surveys. Recommendations from the Ecologists included more sympathetic management such as identifying other options such as pollarding rather than just removal of the DDD trees.

Photograph 5: Cliff Farm on the South Wales Main Line (SWM)

South Marston on the Main Line (MLN1)

The South Marston Pilot Site, located on the Main Line was part of the main line electrification programme in 2018/ 19. The area included stands of semi-improved grassland which were being encroached by Bramble and declining in condition. The Pilot Sites project undertook works to benefit biodiversity at this site. Grassland management was designed to increase botanical diversity within the sward, by removing the thatch, reducing mulching effect, reducing nutrients, and allowing light into the bottom of the sward to improve conditions for germination of seeds. Phase 1 ecological surveys identified the potential presence on Great Crested Newt *Triturus cristatus* on the site and surveys were procured to determine presence. Works were undertaken under a District Level Licence (DLL).

Llandeilo Sidings on the South Wales Main Line (SWM2)

Llandeilo Sidings have fallen out of use since around 2016. Willow and Silver Birch scrub have covered the sidings tracks and the surrounding land has been used for storage. Phase 1 and 2 ecological surveys were undertaken to identify opportunities and constraints for enhancing biodiversity at the site. The Dingy Skipper butterfly was found here during a specialist invertebrate survey in 2021 procured by the DEAM ecology team. This insect is a species of principal importance (Environment (Wales) Act 2016) and its caterpillars live on Common Bird's-foot Trefoil which is present in species-rich grassland on the site. Habitat management works at this site managed and fenced the most promising areas of grassland and improved the habitat by selective scrub removal and grass cutting late in the season. Relatively small but important, high biodiversity areas alongside the railway infrastructure such as Llanelli Sidings can provide connections to larger areas of habitat nearby through sympathetic management.

Photograph 6: Llandeilo Sidings on the South Wales Main Line

A brief summary of the other Pilot Sites progressed during this reporting period:

- **Llangennech on the Llanelli to Llandeilo Line (LLA)** - opportunity for biodiversity enhancement of a large overflow ditch was identified.
- **Chipping Campden on the Cotswold Line (OWW)** – revision of landscape plan to provide additional benefit for biodiversity, incorporating natural regeneration into a planting design.
- **Bath Road on the Main Line (MLN1)** – Biodiversity enhancement following a drainage scheme on an embankment.
- **Combe on the Cotswold Line (OWW)** – location on our lineside where rare Meadow Clary has been recorded.

28 Priorities for biodiversity management on this region

- Expanding our internal Ecological technical resource to provide support across the teams and functions.
- Development of Habitat Management Plans (HMP) which will inform the Vegetation Management Plans (VMP) which are requirements under Standard 5201 and ENV_122. This will be an ongoing programme of works past CP7, and these plans will require revision when major schemes change the estate or new constraints, or opportunities are identified.

- Completion of baseline surveys across the Wales & Borders Route by the end of the Control Period which will inform the HMP and VMP for each ELR.
- DEAM Ecology team to continue to work on habitat enhancement for biodiversity.
- Continue to build on external relationships with key stakeholders and seek opportunities to work with for instance Local Nature Partnerships.
- Push forward with the Cultural Change which is led by the Biodiversity Implementation Programme which is the regional tool for implementation of the Sustainable Land Use Programme. This is managed by the DEAM Biodiversity team.
- Completion of the 'Pilot Site' projects funded by the Technical Authority since May 2020, with funding ending in March 2022.
- Ecologists to continue to work with the C&P team on new supplier Frameworks to ensure that the minimum requirements set by the Wales Route Ecologist in 2019 for Ecological resource is delivered by the Contractors.

29 Report on Performance Indicators within reporting period

Performance indicators specifically in relation to Ecology and Biodiversity have not been finalised for the Region against the scorecard. Reporting as part of the Change programme under 'business change initiatives' is regularly updated by the Environment Manager (Ecology) in the DEAM organisation through communication with the Change team project manager.

30 Case studies

30.1 Examples of best practice habitat management approaches

Habitat restoration at South Marston MLN1

The South Marston Pilot site, located on the MLN1 main line near South Marston village, was part of the main line electrification programme in 2018/ 19. The area includes stands of semi-improved grassland which were being encroached by Bramble and losing condition. The Pilot Sites project undertook works to benefit biodiversity at this site.

Grassland management at the site was decided upon following an initial site survey by one of our internal Ecologists in the DEAM team. The management was designed to increase botanical diversity within the sward, by removing the thatch, reducing mulching effect, reducing nutrients, and allowing light into the bottom of the sward to improve conditions for germination of seeds.

Photograph 7 Grassland management at South Marston

'Hay cut' management can improve conditions for the diversity of flowering plants with associated benefits for invertebrates. Management such as this will also stop succession to Bramble, scrub and eventually woodland, so improving the situation for lineside maintenance.

Phase 1 ecological surveys identified the potential presence on Great Crested Newt *Triturus cristatus* on the site and Phase 2 eDNA surveys undertaken by contractors could not rule out their presence. District Level Licences for Great Crested Newt were available in this area from Natural England and were utilised to protect programme timing and operatives from potential breaches of legislation.

This project demonstrated how lineside vegetation management can maintain and improve biodiversity in grasslands.

30.2 Examples of partnership working

Welham Cutting on the Castle Cary Line (CCL)

At Welham Cutting in Somerset, grasslands on the lineside and beyond support a nationally significant population of the Large Blue butterfly. Parts of the lineside in this area are included in the East Polden Grasslands Site of Special Scientific Interest (SSSI).

The DEAM ecologists and Works Delivery have been planning works to enhance the site's habitats for the Large Blue.

Network Rail have been planning work which will focus on the removal of 53 Ash and Field Maple trees to reduce shading of the grassland. Network Rail ecologists have undertaken preliminary surveys and commissioned Phase 2 protected species surveys.

Investigations at the site have uncovered challenges, such as potential presence of protected species, protected sites, access constraints, difficult cuttings and embankments to circumnavigate. At the location of this site there is limited access available if we were plan for the work to undertaken and accessed from the railway line. Licences, assents, and precautionary methods have been planned and the DEAM team has liaised with Ground Control, Natural England and Somerset Wildlife Trust (SWT) to create a method which will overcome many of the logistical and legal problems of the site to deliver this important work in partnership with Network Rail's neighbours and wider stakeholders.

All trees are planned to be section felled, avoiding damage to the adjacent SSSI. Following agreement from the DEAM Earthworks and Drainage engineers, Natural England and SWT, arisings are planned to be left on site in secured piles at the embankment toe on Network Rail land, located to ensure safe access to culverts and the embankment for ongoing inspections. This removes the need for chipping, RRVs and possessions and will allow the works to proceed. Access for operatives across the SSSI on foot has been agreed with SWT and Natural England, with disturbance kept to a minimum to avoid disturbance to the ants who form an important part of the Large blue butterfly's life cycle. Being able to leave arisings on site will halve the price of the work through reductions in transport costs and possessions. With tree felling being a contentious issue in the current climate, lineside neighbours have been sent communications ahead of the works which explain the reasons why the work needs to be done and the benefits to their local reserve.

Photograph 8: Large Blue habitat at Welham Cutting

31 Future plans

31.1 Habitat management plans

The regional strategy for completing habitat management plans is to base around the areas where there are protected sites within and adjacent to Network Rail's boundary, and against those areas where the baseline ELR surveys are completed. The output of the habitat management plans will aim to inform the management per 1/8th of a mile to compliment and overlap with management of other assets 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 so as to filter the information so that it can be understood by individuals across the business functions.

31.2 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 include continued engagement with Welsh Government, Transport for Wales, NRW and charities including the RSPB and Wildlife Trusts. Due to limited internal Ecological resource this engagement will continue to be based on business needs. Once we have additional Ecologists in post who can have meaningful discussions with external stakeholders and can strategize effectively to identify opportunities which a non-technical expert might not recognise, then stakeholder engagement will be stepped up.

31.3 Increasing internal Ecologist resource

The overarching strategy and biodiversity work is managed by the DEAM Ecology team which are a regional resource working across Wales & Western. The Ecologists in this team are recruited and mentored to provide specialist technical expertise in relation to biodiversity and habitat management. The DEAM Ecologists also undertake site survey, reporting, support the project managers and also work on solutions to mitigate for delivery of works to proceed.

In Wales, the Maintenance team have recruited four new internal Ecologists to work with the Offtrack teams in the Summer of 2020, and they will be based in the depots to allow visibility and easy access to advice in relation to Ecology when delivering works. This has not been replicated in Western, but there are plans to recruit in the near future.

The Capital Delivery teams have three Ecologist roles, with two of these currently vacant due to secondments.

The Region is reviewing the need for additional ecological resource to enable compliance with both the new internal Standard ENV_122 and also compliance with external legislation and policy. Additional ecological resource will enable active engagement with external stakeholders and also the technical knowledge to recognise opportunities, but also risks to the business, which a non-technical expert in ecology and biodiversity might not recognise.