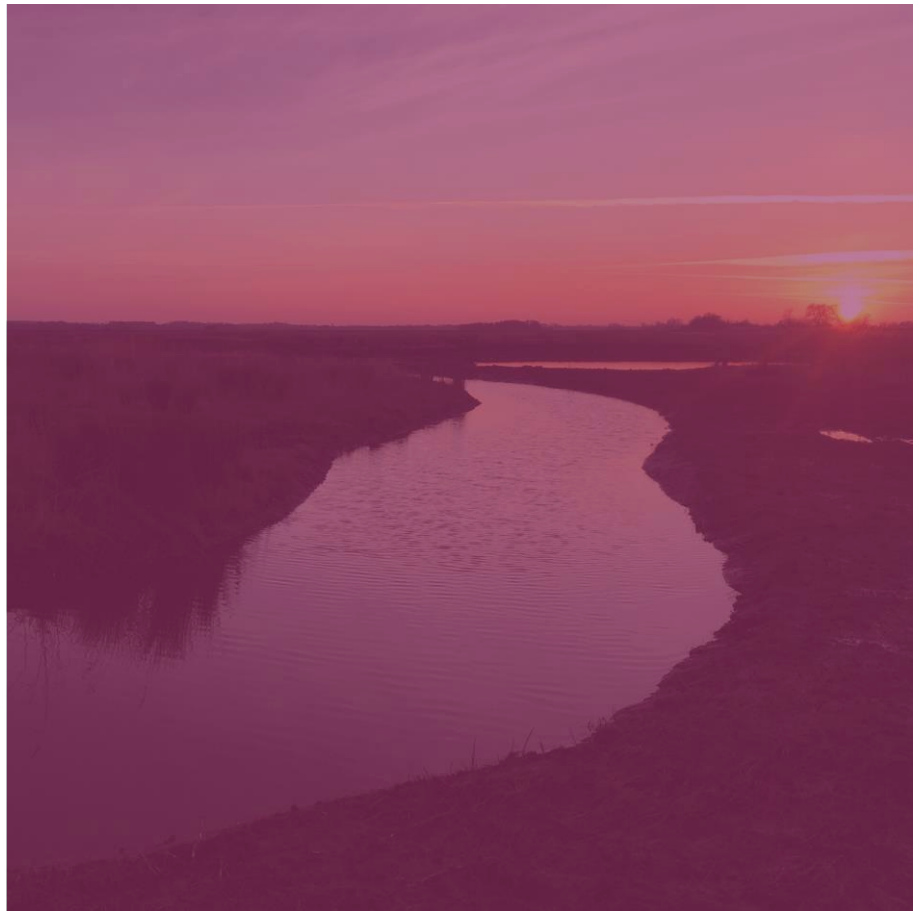


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Research &
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Network for Nature Annual Report 2022

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Executive Summary

National Highways (NH) and The Wildlife Trusts (TWT) have worked together to develop a programme of projects, a Network for Nature (N4N), with a joint ambition to unlock the biodiversity potential of habitats adversely impacted by historic road development.

The N4N portfolio comprises 26 projects¹ that have been specifically designed to create, enhance, and restore habitats across England, generating biodiversity units measured via the Defra 2.0 metric². The metric is used to assess current habitat conditions, and to measure any predicted uplift in condition following project interventions. Overall, the programme seeks to achieve 1,853 biodiversity units, within the local planning authorities the strategic road network (SRN) passes through. The overall N4N programme is costed at £7.13 million, with £6.19 million sought from NH's Environmental Wellbeing Designated Fund (EWDF).

The aim of this year 1 monitoring report is to provide the Programme Team with information on what outputs the projects have delivered collectively, as well as testing suggested measures of wider socio-economic outcomes. The data was collected via the first round of Project Annual Monitoring Reports submitted during April 2022, and the Q4 Quarterly Monitoring Report 2021-22.

Overall, the first annual report has a good range of programme level data. Alongside providing new insights into the scale and type of expected outcomes, the process has revealed areas for further improving data collection which could be addressed in future years.

Outputs & progress

- During 2021-2022, year 1 of delivery, 23 N4N projects began project activity. A further two started on April 1st, 2022.
- Projects claimed £598,495 of the £5,275,521 N4N funding allocated to project delivery.
- Over 31 ha of land is now in an improved condition, 12 ponds have been improved or newly created, over 2km of waterways cleared or managed, as well as 34 organisations engaged in N4N activity, including local authorities, landowners and farmers.

Net change in CO2 emissions

- The NH Environment & Wellbeing Fund appraisal tool has been successfully tested to quantify net change in CO₂ emissions. It is estimated that, once delivered, post-intervention habitats will sequester 1200 t CO₂-eq per year. The analysis is, however, limited to 20 per cent of the total N4N programme area, largely because the tool only includes woodland and peatland habitats³.

Designated sites

- Fifteen project sites are either part of, or adjacent to, a Site of Special Scientific Interest (SSSI).

Species & connectivity

- Projects are planning to support a whole range of flora and fauna, including flagship species: water vole, dormouse, otter and great crested newt. Many projects will be carrying out baseline species surveys during 2022.

Waterways

- Seven projects have specific objectives relating to water quality or river morphology. Six of the waterbodies associated with N4N projects are currently classified as 'moderate' in terms of

¹ As at May 2022. Further projects have been approved since this report.

² Natural England (2019) Biodiversity Metric 2.0 and the Biodiversity Metric 3.0
<http://publications.naturalengland.org.uk/publication/5850908674228224>

³ There are further exclusions due to the type of the work being carried out (see Section 3, page 11)



ecological status as assessed by the Environment Agency. One has a status of 'poor'. The chemical status of all is 'fail'. Whilst any change in the status of a waterbody cannot be wholly attributed to N4N project activity, it provides a snapshot of the condition of the waterbodies in scope.

- Three projects planned to carry out baseline MORPH assessments during spring 2022.

Flood and Drought Management

- Projects have noted difficulties in evidencing improvements to flood and drought management. Four projects believe there is scope for collecting qualitative evidence and therefore will be asked to continue to report evidence as their projects progress.

Visitors & recreational value

- The Outdoor Recreation Valuation (ORVal)⁴ tool has been applied successfully to N4N projects. It is estimated that almost 2 million people currently visit the outdoor spaces and footpaths associated with 10 N4N projects each year. This is equivalent to a total annual recreation value of £6 million.

Volunteers

- 34 volunteers were engaged in project activities during 2021-22. These people volunteered for a total of 62 days, representing an equivalent wage value of at least⁵ £4,123.

Suggested improvements to data collection

A small number of improvements are suggested to data and data collection to enhance evidence in future years, and to support final evaluation:

- An incomplete set of 'targets' means that it is not possible to review progress in terms of a percentage of outputs achieved. The ability to do so would add depth to the assessment of progress and the programme is encouraged to persist with collecting a full set of output targets.
- There are some inconsistencies in the data describing the number of hectares in scope, between the biodiversity units' assessment and that provided via project reporting. This is currently being reviewed by the programme team.
- Species data is qualitative and, due to its nature, somewhat fragmented. Further thought will be given to how this can be collated and better presented in year 2 and beyond.

⁴ [ORVal Outdoor Recreation Valuation \(exeter.ac.uk\)](https://www.exeter.ac.uk/orval/)

⁵ Lowest estimate of replacement wage value



1 Introduction

This is the first annual Network for Nature monitoring report. It presents data submitted by projects about progress during the year 2021-22.

National Highways (NH) and The Wildlife Trusts (TWT) have worked together to develop a programme of projects, a Network for Nature (N4N), with a joint ambition to unlock the biodiversity potential of habitats adversely impacted by historic road development.

The N4N portfolio now comprises 26 projects⁶ that have been specifically designed to create, enhance, and restore a variety of habitats across England generating biodiversity units measured via the Defra 2.0 metric⁷. The metric is used to assess current habitat conditions and to measure any predicted uplift in condition following project interventions. Overall, the programme seeks to achieve 1,853 biodiversity units, within the local planning authorities' areas which the strategic road network (SRN) passes through. Biodiversity units generated from N4N will play a role in mitigating historic road building activity and daily road management, as well as contributing towards National Highway's target of 'no net loss to biodiversity' by 2025.

Each of the 27 projects that comprise the N4N programme have a location-specific objective that aligns with one of three overarching project goals or types:

- Restore and enhance habitat on The Wildlife Trusts estate where it is **located within a local planning authority** that the SRN passes through
- Improve connectivity between Wildlife Trusts sites through retrofitting of existing bridges as **green bridges**
- Enhance habitat on the **roadside estate** to restore connectivity across the landscape

See Appendix 1 for an overview of project locations, funding and duration. The overall N4N programme is costed at £7.13 million, with £6.19 million sought from NH's Environmental Wellbeing Designated Fund (EWDF). The total approved funding for Network for Nature projects is £5,275,521, with an associated £941,908 in match funding contributing to total project spend.

The scope of this year 1 monitoring report is to record the progress that has been made against core programme outputs, as well as wider socio-economic outcomes.

Metrics and Measures

To demonstrate progress, two types of monitoring data are considered:

Output Metrics

- Outputs measure project activity. Outputs provide an indicator of progress against project plans, often quantified as targets. Collectively they demonstrate the scale of programme activity.
- There are **10 core outputs** and projects are also invited to report **project-specific outputs**.

Outcome Measures

- Outcome measures aim to capture the wider social and environmental benefits of N4N projects. These sit alongside the biodiversity metric, with biodiversity units remaining the primary performance measure.

⁶ As at May 2022.

⁷ Natural England (2019) Biodiversity Metric 2.0 and the Biodiversity Metric 3.0
<http://publications.naturalengland.org.uk/publication/5850908674228224>



- Alongside biodiversity units, there are a further **eight outcome domains**. The outcome domains include both quantitative and qualitative evidence, some of which (but not all) can be monetised. See Appendix 2.
- Not all projects seek to achieve all outcomes. It is therefore crucial to view the outcomes as a ‘patchwork’ of benefits which the Network for Nature programme aims to achieve. Specific challenges are associated with measuring each outcome type; therefore, a combination of qualitative and quantitative evidence will be used to evidence the impact of N4N.

In addition to this reporting, the Environmental Benefits from Nature (EBN) tool⁸ will be applied during 2022. The EBN tool, which works alongside the Defra biodiversity metric, will be applied on a project-by-project basis to look at the wider benefits of biodiversity enhancements.

This report

This report presents the data collected via the first round of Project Annual Monitoring Reports submitted during April 2022, and the Q4 Quarterly Monitoring Report 2021-22. Data covers activity during the project year 1, that is 2021-22. The aim of this report is to provide the Programme Team with information on what the projects have delivered collectively.

This first Annual Report has a different focus to future annual reports. There is an emphasis on confirming and gathering baseline data, enabling projects to evidence change as they progress in the coming years. This first report has also provided an opportunity to test the metrics and measures and to reflect on the *process* of reporting and data collection. Chapter 2 presents expenditure and outputs data, with subsequent chapters reporting on each outcome in turn.

⁸ Natural England (2021) Environmental Benefits from Nature tool (EBN tool)
<http://publications.naturalengland.org.uk/publication/6414097026646016>



2 Progress in 2021-22

The first projects began in the autumn 2021. Expenditure and progress to date reflect this timescale, with stakeholder engagement and project activity beginning on TWT sites.

Progress

Eight projects began in September 2021, with a further eleven starting before the end of the calendar year 2021. A further four started in January 2022 and two began on April 1st, 2022; their activity falls outside of this reporting period. Therefore, should the progress presented with this report appear modest, it reflects the length of time the projects have been up and running in earnest. Due to the type of projects funded by N4N it is also important to recognise that activity is further affected by seasonal factors, such that progress/activity is not expected to be linear in relation to the amount of time passed.

Spend

In 2021-2022 projects claimed £598,495⁹.

Table 1.1 Total amount projects have claimed from N4N programme

Financial Year 2021-2022				
Apr- Jun Q1	July-Sept Q2	Oct-Dec Q3	Jan-Mar Q4	Total
-	-	£120,750.11	£477,745.25	£598,495.36

Core outputs

In 2021, a set of core outputs were developed to quantify common activities across the programme. The first data was submitted by projects in April 2022 and is summarised in Table 2.1. Full data is presented in Appendix 3.

Table 2.1 overleaf details the outputs reported as achieved during 2021-22. It is difficult to assess the relative performance of the programme as planned outputs (or targets) are incomplete. Specifically, a number of projects have not quantified planned outputs. For example, of the eleven projects aiming to work with volunteers, eight have not noted approximately how many they hope to engage. Encouraging projects to quantify targets will help the programme to better measure and understand progress.

⁹ This does not represent the amount TWT has claimed from National Highways



Table 2.1 Outputs achieved in 2021-2022, whole programme

Output	Description & sub-sets	Metrics	Total Planned	2021-2022
1) Habitats improved	1a) Habitats: restored, cleared, managed, enhanced	hectares (ha)	526.77	31.91
	1b) Habitats: newly created, seeded, planted, engineered	hectares (ha)	86.422	0
	1c) Trees planted	count	1515	0
	1d) Hedgerows managed, planted	metres	5297	0
2) Ponds	2a) Ponds improved	count	69	2
		hectares (ha)	5.74	0.35
	2b) New ponds	count	22	10
		hectares (ha)	0.64	0
3) Waterways	3) Waterways cleared, managed, restored	km	33.09	2.1
4) Ditches	4) Ditches/bunding managed, restored	metres	1839	900
5) Boundaries	5) Fencing &/or security	metres	8095	913
6) Site infrastructure	6a) Visitor infrastructure e.g., bird hides, interpretation boards	£	£123,500	£2,560
	6 b) Wildlife infrastructure e.g., bat boxes, butterfly benches, turn rafts	£	£35,500	£20,435
7) Volunteers	7a) Volunteers: number of individuals (different people) volunteering directly on N4N project activity. At least 0.5 day.	count (people)	133	34
	7b) Volunteer hours: directly contributing to N4N activity	hours	820	42
8) Training	8) People trained e.g., volunteers, HE staff (Training defined as: dedicated session/event lasting greater than or equal to 0.5 day)	count	40	0
9) Organisations	9) Organisations engaged e.g., public sector stakeholders, landowners, schools, CICs	count	63	34
10) Research	10a) Ecology, environmental research papers. <i>(Over and above regular species monitoring, but specific research to add to 'knowledge base' about a particular issue / habitat / species)</i>	count	7	1
	10b) Feasibility, engineering study	count	3	0



Reflecting the early stage of the programme, the outputs are modest, but show early project activity on TWT sites. It is worth noting that some project activities are determined by seasonal factors and a full year has not passed since the first projects were approved and therefore it has not been possible for works to be carried out. Other projects reported that they still needed to go through contracting processes before practical work could start.

Habitat improvement works completed in 2021-22 have included scrub clearance works (N4N3), topping and flailing (N4N10), tree thinning and the removal of invasive species (N4N26). Similarly pond improvement works have included clearance (N4N26) and preparatory works.

Visitor infrastructure spend has included the purchase of new signage (N4N10) and benches (N4N15). Wildlife infrastructure completed to date includes the installation of turn rafts and wildlife screening (N4N19) and a bat roost and nesting features (N4N26). The installation of cattle gates and fencing at Summer Leys (N4N10) has allowed cattle to be reintroduced on the site this March, improving the grassland habitat for various species of birds, especially ground nesting birds.



Photo credit: N4N10. Cattle at Summer Leys

Stakeholders and partner engagement is underway with 34 landowners, farms, with local authorities having been consulted during project planning across two projects (N4N2, N4N26).

Project specific outputs

A particularly notable project-specific output is a new UK record of a species and genus of parasitic wasp. The parasitic wasp *Pseudoplatylabus violentus* is generally found in central and eastern Europe and this is the first recorded sighting in the UK. It is hoped that this discovery, part of the work of N4N2, will appear in a forthcoming article in the British Journal of Entomology and Natural History.



3 Net change in CO₂ emissions

20 per cent of the total hectareage of N4N programme is eligible for CO₂ emissions analysis using the NH Environment & Wellbeing Fund appraisal tool. It is estimated that, once delivered, post-intervention habitats will sequester 1200 t CO₂-eq per year.

This programme primarily focuses on impact on biodiversity, however there is overlap and changes in land will also impact the habitat's ability to sequester CO₂ from the earth's atmosphere. This may be a small contribution in terms of national and international targets, nevertheless it is still a contribution which the N4N programme is enabling.

Methodology

National Highways (NH) Environmental and Wellbeing appraisal tool was used to calculate the additional CO₂ sequestration bought about by N4N projects. The tool focuses on changes to woodlands and peatlands habitats only. These are the two habitats with associated emission factors (how much CO₂ they sequester/emit each year) that are supported by high confidence data and literature. Whilst prudent to only include evidence that is robust and relevant, it also limits analysis to 30 per cent (198 ha) of habitats across the N4N programme. Specifically, the creation of bio-rich grasslands, heathland, reedbed and ponds are not included in this analysis. The total amount is reduced further to 20 per cent, due to a limitation of the model discussed below.

The output of the Defra 2.0 biodiversity unit assessment was used to identify the woodland and peatland projects, and therefore projects suitable for the NH model. Once these were determined they were mapped to the available habitats in NH's model (see Appendix 4 for mapping assumptions). Whilst largely straightforward, a few assumptions were made based on information from interviews and correspondence with project managers. It should be noted that the classification for the biodiversity units' assessment differs from those available in NH's CO₂ model.

The biodiversity unit assessment considers three types of intervention; each has implications for how assumptions in the NH CO₂ model are handled.

- **Creation:** Habitat creation is the removal or loss of an existing habitat to create a new, different habitat. It can also involve creating habitat where none was previously present (from bare earth).
- **Succession:** An existing habitat is retained and incorporated into a distinctly different and ecologically improved habitat, thereby reducing the time to maturity of the new habitat.
- **Enhancement:** Habitat enhancement increases the biodiversity value of an existing habitat, for example by improving its biodiversity capacity or removing factors that degrade its value.

The NH model includes the option to add in costs incurred because of the intervention. For this model we have included CO₂ assumptions associated with transformation of the land, as well as the ongoing maintenance emissions for habitats undergoing a transformation to a new type of habitat (succession and creation). We do not consider additional maintenance cost for interventions classified as enhancements.

Some habitats which are considered an *enhancement* cannot be added into the model, because the model does not have an option to input changes in habitat quality for the same type of habitat, albeit in an improved condition. This is based on lack of evidence from the literature on whether there is a difference in the ability for a woodland in 'good condition' to sequester more CO₂ than if it was in 'poor condition'. As a result, 64 ha of enhanced woodland cannot be included in the model, reducing the scope of the calculation further, with the CO₂ results representing only 20 per cent (132 ha) of the total



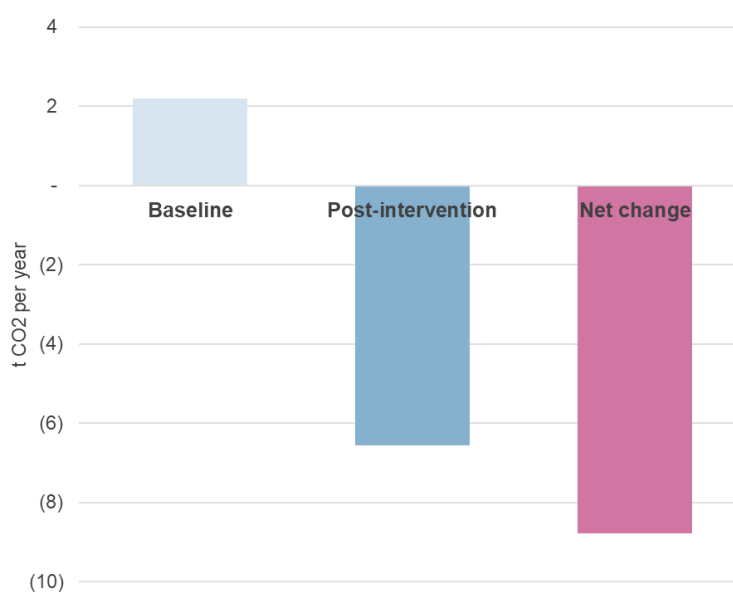
programme area. As there are different options for peatlands it is possible to calculate the impact of enhancements for the latter type of habitat.

Results

Woodland

1.14 ha of newly planted native broadleaf woodland are planned, derived from 1.1 ha of scrubland and 0.04 ha of arable/cultivated land. In the baseline 2.2 t CO₂ per year are emitted into the atmosphere. Post-intervention (including emissions of transformation and maintenance) 6.59 t CO₂ are sequestered per year. This results in a positive net change of 8.78 t CO₂ less per year – a combination of avoided emissions and sequestration.

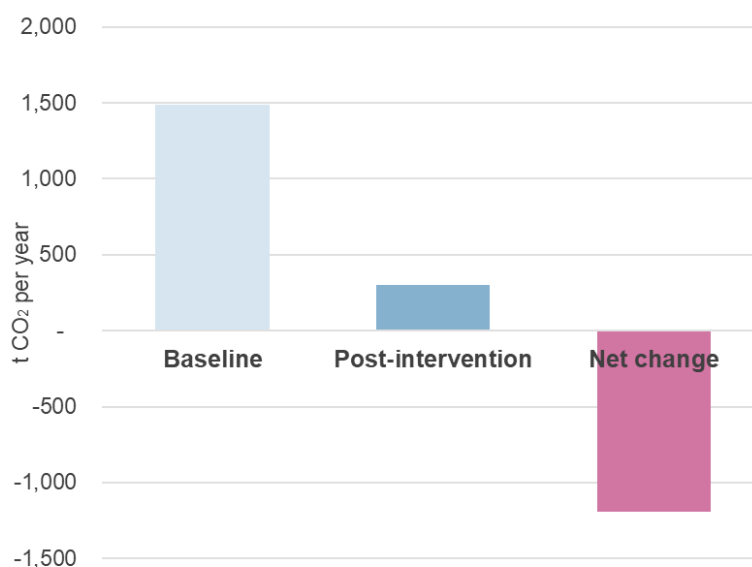
Figure 1 Net change in CO₂ emissions per year from woodland habitats





Peatland

Figure 2: Net change in CO₂ emissions per year from peatland habitats



In total 132 ha of peatland habitats are in better condition (63 ha of Near natural bog, 1 ha of Rewetted Bog, 54 ha Modified undrained bog, and 15 ha Eroding modified undrained bog) following enhancement. This results in a net positive change of 1190 t CO₂ less per year. The habitats in aggregate do not sequester CO₂ in fact they still emit it. However, as this is relatively less than emissions in the baseline, there is still a positive change known as avoided emissions.

It is estimated that, once delivered, post-intervention habitats will sequester 1200 t CO₂-eq per year. This value is dependent on the mapping assumptions between biodiversity unit analysis and the NH model. While best efforts have been made, changes to what the baseline and post-intervention habitats are, and the assumptions built into the NH model, will impact the results presented here.



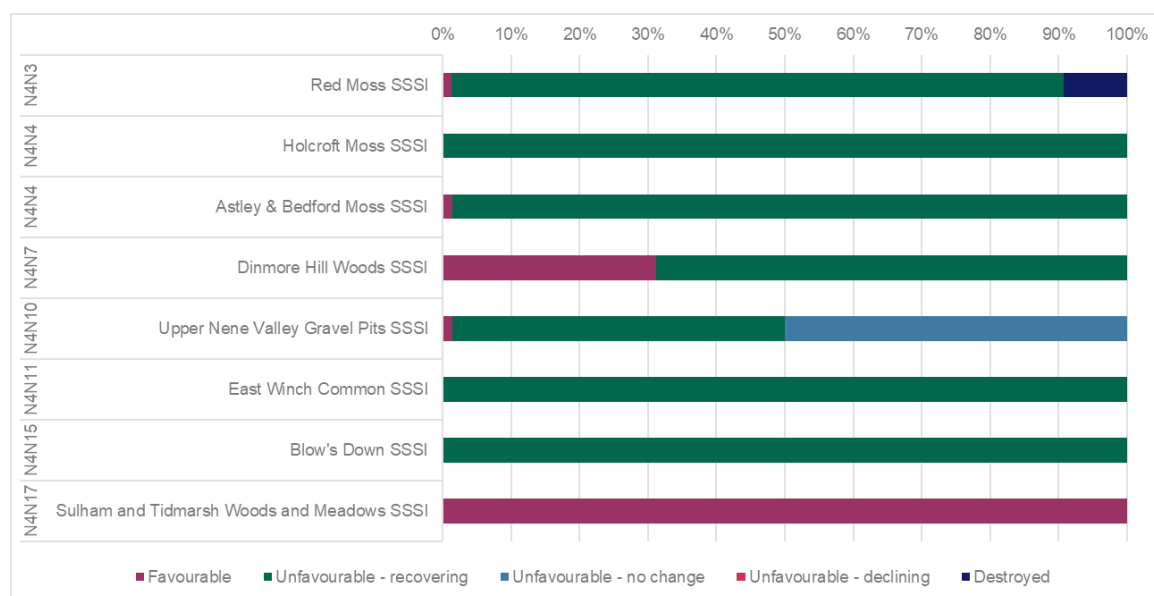
4 Designated Sites

Fifteen project sites are either part of, or adjacent to, a SSSI.

Sites of Special Scientific Interest

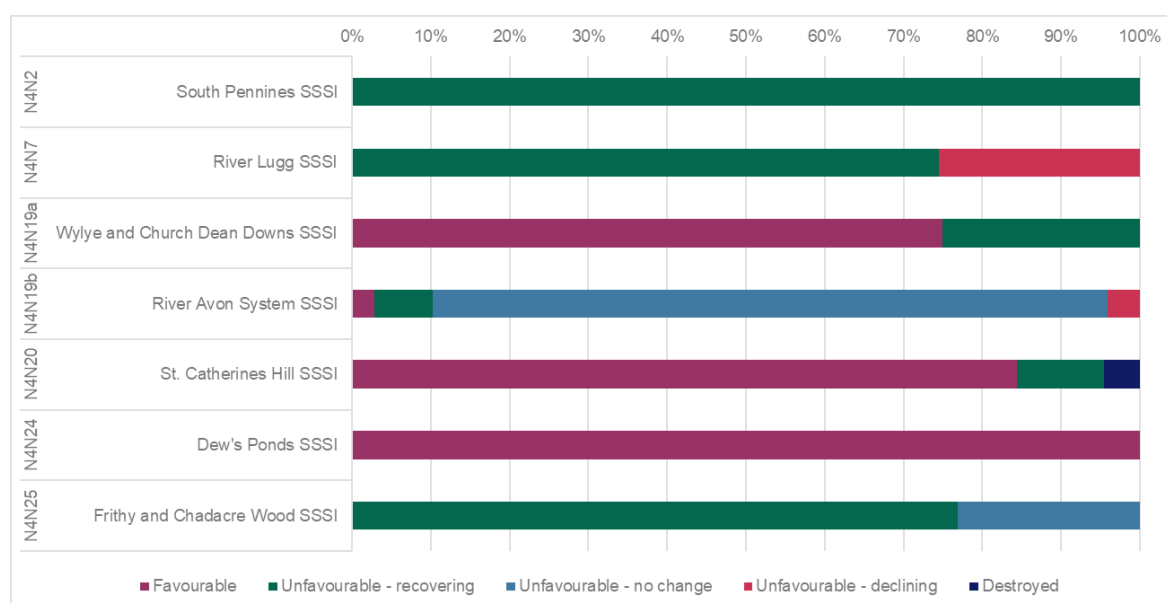
Eight project sites overlap to some extent with a Site of Special Scientific Interest (SSSI). The status of these sites is shown in Figure 4.1.

Figure 4.1 Status of SSSI which are part of Network for Nature project areas



Seven project sites are adjacent to SSSIs. The status of these sites is shown in Figure 4.2.

Figure 4.2 Status of SSSI adjacent to Network for Nature project areas





Overall, 13 N4N projects are working on, or next to SSSIs, supporting and enhancing biodiversity and improving ecological connectivity from the SSSI to the wider landscape.

A NH Regional Infrastructure Fund metric is: *'Counts of the number of schemes: Site of Special Scientific Interest brought into a favourable condition'*. Although not a defined objective of N4N, projects clearly aim to support or maintain the local SSSI status. The status can be revisited at project close to see if any schemes/projects have supported SSSIs to move into a favourable condition.

Other site designations

Network for Nature sites are also protected under other international and national designations as listed below in Table 4.3, recognising overall, the ecological or geological value of N4N projects.

Table 4.3 Other site designations

Special Areas of Conservation (SAC)	Special Protection Areas (SPA)	Ramsar Sites	Local Nature Reserves (LNR)
Manchester Mosses SAC River Lugg SAC	Upper Nene Valley Gravel Pits SPA	Upper Nene Valley Gravel Pits Ramsar	Queenswood Country Park LNR Woodgate Valley LNR Quinton Meadows LNR Blow's Down LNR Lemsford Springs LNR Stanborough Reedmarsh LNR Smallbrook Meadows LNR

Local Wildlife Sites

- Holcroft Moss
- Old Flatts Farm Marsh
- Queenswood Country Park LWS
- Illey Meadows and Kitswell Dingle
- Black Horse Field
- Lower Illy and Weston Dingle
- Illy Brook
- Manor Abbey Woodland
- Lyecklose Lane Wood, Lapal Lodge
- East Winch Common
- Silfield Newt Nature Reserve
- Lemsford Springs LWS
- Stanborough Reedmarsh LWS
- Black Brook Pavilion LWS
- Langford Lakes CWS
- Union Farm Wetlands CWS
- Blythburgh Marshes
- Corely Moor LWS
- Riddy LWS
- Thacka Beck NR
- Keyfield Groves



5 Species & Connectivity

Most species baseline assessments were due to take place in spring 2022¹⁰. The scope of N4N projects includes some notable flagship species.

N4N projects are seeking to support a whole range of species, with increased populations as an indicator of success. The programme evaluators will not carry out ecological monitoring but draw on project data to tell the project stories.

As projects did not start until autumn 2021, most species baselines were taking place in spring 2022. This section provides an indication of the data provided by projects, for a small selection of flagship species.

- **Water vole** Protected in the UK under the Wildlife and Countryside Act, 1981. Priority Species under the UK Post-2010 Biodiversity Framework. Water voles are listed as endangered on both the Great Britain and the England Red List for Mammals.
 - **N4N16:** Evidence of Water Vole was confirmed by Herts & Middlesex Wildlife Trust at Lemsford Local Nature Reserve in April 2022 with a full survey to be completed in May 2022. Currently the channel lacks suitable feeding and burrowing habitat throughout the two sites. Human disturbance is impacting on habitat and possibly distribution. The river corridor lacks sufficient marginal habitat, limiting connectivity for water vole movement.
 - **N4N27:** “Likely” that water voles are still nearby. If area was left as it is (i.e., exposed), prey species will be less likely to use it if predators are present. Improving connectivity would reduce exposed distances between habitats.
 - **N4N18:** Surveys were to take place in April 2022
- **Otter:** European Protected Species under Annex IV of the European Habitats Directive
 - N4N7: Extract from Swift Ecology regarding otter. *“No evidence of holts or lay-up sites was found, but there are several areas of dense scrub near the river and along the banks which could potentially offer opportunities for otters to rest in from time to time; however, the likelihood of regular use of the site by otter is considered to be low. In addition, prints of domestic dog were also found in several locations along the west riverbank, and at least two walkers and their dogs were seen walking along the river during the survey; consequently, any regular (e.g., daily) presence of domestic dog may deter otter from using this area to rest in.”*
- **Dormouse:** Protected in the UK under the Wildlife and Countryside Act, 1981. Priority Species under the UK Post-2010 Biodiversity Framework. Listed as a European Protected Species under Annex IV of the European Habitats Directive.
 - **N4N18** Dormice records for 2021-22 identify the presence of dormice at 11 locations in the project area, based on People’s Trust for Endangered Species (PTES) dormouse surveys by trained ecologists. There are known populations on the eastern side of M5, and there is evidence that they are travelling linear way alongside the motorway but not across it. The aim is to see dormouse populations travelling across the bridge, and evidence this within the population demographics of the dormouse.

¹⁰ After the projects reports had been submitted.



- **N4N17** Project will start baseline surveys in year 2 of the project. Planned activity includes hedgerow planting to improve connectivity across the 65 ha site. An indicator of success would be the presence/increase of bats and dormice.
- **N4N20** has noted that they will monitor dormice, although they are not a target species for the project.
- **Great crested newt:** Protected in the UK under the Wildlife and Countryside Act, 1981. Priority Species under the UK Post-2010 Biodiversity Framework. Listed as a European Protected Species under Annex IV of the European Habitats Directive.
 - **N4N14:** Currently undertaking GCN surveys
 - **N4N23:** None present currently, arable fields.
 - **N4N24:** Species data will be ad hoc
 - **N4N25:** Species data will be ad hoc

Similar data is provided for bats, birds, invertebrates and fish covering a large number of different species. Information on plant species is less specific. A focus for year 2 report could be better interpretation of the species data, for example qualitative analysis across bird data.



6 Waterways

Seven projects have specific objectives relating to water quality or river morphology. Three projects were due to carry out baseline MoRPh¹¹ surveys in spring 2022¹². Baseline water quality has been recorded using Environmental Agency 2019 classification.

Water objectives

Seven N4N projects include project specific objectives directly related to waterways. Overall, projects are supporting over 17km of England's rivers.

Table 6.1 Waterway objectives

Ref	Project name	Relevant project objective	Length of river (m)
N4N1	Whittle Dene Semi Natural Woodland Restoration	Improve water quality in the Whittle Burn.	<i>No annual report</i>
N4N6	Rotherham Rivers 3	1,290m river improved ecological condition.	2580 ¹³
N4N7	The Lugg Living Landscape	Reduction of pollutants entering Oak Tree Farm and the floodplain of the River Lugg from the A49.	465
N4N8	M5 Clean Rivers Project	Waterbodies will have improved ecological status.	11,740
N4N16	River Lea Habitat Restoration	2.3km stretch of chalk river in improved condition, demonstrated by improved/stabilised populations of key species.	2300
N4N19(b)	Smallbrook Meadows	Re-meander the path of the river.	200
N4N27	Riddy Connectivity Restoration	Riddy Reconnection of habitats either side of the A1 road bridge on the River Ivel. Reduce the impact of grazing on water vole habitat and sedimentation.	<i>No annual report</i>

Project objectives fall in to two broad categories: those seeking to improve water quality, and those seeking to enhance the physical habitat and hydro-morphological¹⁴ functioning of rivers and streams.

Baseline waterways condition

The baseline water quality, as measured by the Environment Agency's river catchment data, is listed in Table 6.2 overleaf. The baseline year is 2019. It is not currently clear when the next river status

¹¹ Modular River Physical Habitat field survey (MoRPh): <https://modularriversurvey.org/river-condition/>

¹² After the projects reports had been submitted.

¹³ The agreed objective only includes half of the section of the total restored section.

¹⁴ The hydrological (water flow, energy etc) and geomorphological (surface features) and attributes of rivers, lakes, estuaries and coastal waters.



assessments will be carried out, but potentially these could be as late as 2027, to coincide with the national target of 'good' ecological and chemical status of all rivers in UK.

Six of the waterbodies are classified as 'moderate' in terms of their ecological status, while one has a status of 'poor'. The chemical status of all is 'fail'. Whilst any change in the chemical status of a waterbody cannot be wholly attributed to N4N project activity, it provides a snapshot of the status of the waterbodies in scope.

Where water quality is a specific objective (N4N6, N4N7 and N4N8), project teams could be encouraged to comment further on the specific reasons for classifications and how their project activity relates to the assessment.

Three projects plan to undertake a MoRPh assessment during spring/summer 2022. None have been completed to date. Repeating the MoRPh assessment at project close will provide valuable evidence of qualitative waterways outcomes.

Table 6.2 Baseline status of waterways

Ref	Water body name	Environment Agency Classification ¹⁵	River condition MoRPh ¹⁶
N4N1	Whittle Burn Catchment (tributary of Tyne) Water Body	Classification in 2019 Overall: Moderate Ecological: Moderate Chemical: Fail	No annual report
N4N6	Doe Lea to the Don confluence	Classification in 2019 Overall: Moderate EA ecological: Moderate EA Chemical status: Fail	MORPH assessment to take place during spring low flows 2022
N4N7	Lugg - conf R Arrow to conf R Wye	Classification in 2019 Overall: Moderate EA ecological: Moderate EA Chemical status: Fail	Not applicable as project is not working in channel
N4N8	Bourn Brook from Source to R Rea	Classification in 2019 Overall: Moderate EA ecological: Moderate EA Chemical status: Fail	Not applicable as works are off the river to improve quality not morphology.
	Stour (Worcs) source to conf Smestow Bk	Classification in 2019 Overall: Poor EA ecological: Poor EA Chemical status: Fail	
N4N16	Thames Lee Upper Lee Upper Lee (from Luton Hoo Lakes to Hertford)	Not applicable	MORPH assessment being completed in Apr/May 2022
N4N19 (b)	Wylfe Trib (The Were or Swan)	Classification in 2019 Overall: Moderate EA ecological: Moderate EA chemical status: Fail	MORPH assessment being carried out in 2022

¹⁵ <https://environment.data.gov.uk/catchment-planning/>

¹⁶ Modular River Physical Habitat field survey (MoRPh): <https://modularriversurvey.org/river-condition/>



N4N27	Ivel (DS Langford to Roxton) Water Body	Classification in 2019 Overall: Moderate Ecological: Moderate Chemical: Fail	<i>[To be confirmed, possibly carry out a small-scale assessment]</i>
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Economic valuation

As detailed within the Network for Nature Methodology Report, economic benefits of improvements to waterways could be quantified *if* there is an improvement in the Environment Agency assessment of their water quality. The valuation of water quality incorporates the recreation, aesthetic and existence value of the water body.

The viability of the application of this measure depends on a) the assessment schedule of the Environment Agency classifications; b) whether project activity is targeted at and is of sufficient scale to creating a change from 'poor' to 'good'; and c) whether other 'upstream' activity remains constant. This scenario may be possible for projects N4N6, N4N7 and N4N8, although project managers have clearly laid out the challenges.

Box 6.1 Worked Example used in the Methodology Report 2021

The water body section affected by the River Lea Habitat Restoration project N4N16 is the 'Lee (from Luton Hoo Lakes to Hertford)'. In 2019, the Environment Agency gave the water body an overall ranking of moderate for its ecological status and failing for its chemical status.

Table 6.3 shows the net present value (NPV) of water quality (recreation, aesthetic, and existence value) for the water body, if its overall ranking moves from moderate to good. The central assumption of 10-year time horizon equates to NPV of water quality of £250,000.

Table 6.3: NPV of water quality of River Lea	
	10 years
Baseline	£1,758,252
Intervention	£2,009,696
Net change	£251,444

Note that the test calculation above assumes that only 50 per cent of the length of the water body is affected, since the planned activity is halfway along the stretch of water. The level of attribution selected is 'low'¹⁷ with a discount rate of 3.5 per cent.

¹⁷ 25 per cent using available ready reckoners.



7 Flood

Two projects note some potential for outcomes relating to flooding.

Flood objectives

Four N4N projects have stated project objectives related to flooding. A further two are actively considering how flood risk management will form part of the project.

Table 7.1 Project objectives relating to flooding.

Project Ref	Project Name	Flood objective (or comments)
N4N1	Whittle Dene Semi Natural Woodland Restoration	Slow run-off from arable land and improve water quality in the Whittle Burn
N4N8	M5 Clean Rivers Project	<i>Analysis during project planning will provide evidence of water storage capacity.</i>
N4N16	River Lea Habitat Restoration	<i>Working with the Environment Agency. Interested in working on natural flood risk management and some modelling of it.</i>
N4N19	Langford Lakes Wetland Project	Increase flood storage capacity within the flood plain.
N4N19 (b)	Smallbrook Meadows	Flood water storage improved
N4N26	Reconnecting Fillongley	Slow the run-off from the M6.

During discussions about monitoring projects have noted the difficulties in evidencing achievement against flooding objectives, with only N4N16 and N4N26 noting any scope for monitoring change over the projects' duration.

Project N4N26, Reconnecting Fillongley, is working with a Local Flood Action Group and is considering the intangible community impact of flooding. In this project area there are two communities affected by flooding, in part due to run-off from the M6. The aim of the work is to help reduce the flood peak, by increasing the volume of pools and increasing rough areas that hold water between communities and the road. The project is engaging the Flood Action Group in practical wildlife and habitat monitoring, with the overarching objective of reducing community anxiety about flooding.

N4N16 notes that it will be engaging with the Environment Agency to discuss natural flood risk management.

Drought resilience

Two projects, N4N24 and N4N23, specifically note the value of creating wet features, benefiting wildlife by providing more freshwater in the landscape.



8 Visitors' Recreational Value

Of the 10 N4N projects included in this outcome, it is estimated that almost 2 million people visit these areas and footpaths per year, equivalent to a total annual recreation value of £6 million.

The aim of this exercise is to understand the monetary value of natural spaces: how much people value natural spaces and how much they are willing to spend on being out in nature. Through knowing the monetary value associated with these activities it becomes more feasible to compare with other priced goods and services, as well as understanding how much should be invested in these natural areas.

However, as these sites are non-market goods (publicly accessible without a price/entrance fee) it is not possible to directly infer how much they value the service. Therefore, techniques such as the travel cost method must be used to reveal the price individuals attach to non-market goods. What people pay to travel to the natural areas represents their willingness to pay for these services and hence to derive the associated monetary value, which we refer to as the recreational value. One such model that deploys this technique is the Outdoor Recreation Valuation (ORVal) model.

ORVal Model

The ORVal model designed by the Land, Environment, Economics and Policy (LEEP) Institute of Exeter University is freely available online¹⁸ and estimates the number of visits and recreational value of a range of natural sites (e.g., national parks, SSSIs etc.) and footpaths in the UK. It assumes that the recreation value is equal to travel costs. The model is underpinned by a Recreation Demand Model, an econometric model created using data available from the comprehensive Monitor and Engagement along with the Natural Environment (MENE) survey².

It is important to note that, while useful, the recreational value only represents half of the story. The impact of the intervention from the N4N programme is told through the narrative of the site, which cannot always be monetised but can/will be monitored by surveying visitors' experiences.

Methodology

The ORVal model was used to determine the estimated number of visits and welfare value from N4N sites. Those projects that mentioned visitors and community engagement as an outcome of their work through initial consultations held by ERS with project managers are included in this analysis. The methodology used to collect the data is below:

1. Search associated grid reference and post code of project in ORVal model,
2. Select the site in the model corresponding to site images provided by project managers, as well as boundaries from N4N's project online map³,
3. Where images have not been provided by projects or the available site on ORVal do not match the image, the next best alternative is selected as a proxy.
4. Proxy sites are one or more smaller sites within the area or footpath cutting through the site and/or are adjacent to site boundaries.
5. Once areas and paths are selected the estimated number of visits and welfare value are recorded.

¹⁸ [ORVal Outdoor Recreation Valuation \(exeter.ac.uk\)](https://www.exeter.ac.uk/leee/orval/)



Results

Baseline recreational value

Table 8.1 shows the baseline recreational value of each of the 10 projects. Some projects have multiple sites and paths, representing projects covering numerous sites and larger areas. In the case of N4N10, there are three sites: Summer Leys, Nene Wetlands and Titchmarsh; however, the ORVal model has several smaller sites for Nene Wetlands, hence there is an additional site in the analysis. This project also includes several footpaths, capturing adjoining paths next to and between sites.

The different projects have a range of values due to their size and popularity. N4N28 has the smallest recorded estimated visits and welfare values per year, 50,000 and £120,000 respectively. N4N10 has the largest recorded estimate visits and welfare values per year, 805,000 and £2,640,000 respectively.

Note that several projects (N4N20, 22, 28, 29) do not have any available sites for the Baseline in the ORVal model since they are not currently open for public access. In some cases, footpaths were available and have been included.

Table 8.1: Baseline recreational value of N4N projects

	Number of sites	Number of footpaths	Total estimated visits	Total welfare value (£)
N4N10	4	4	804,747	2,639,949
N4N15	0	0	193,373	542,323
N4N16	1	0	42,306	166,778
N4N17	1	0	57,042	183,262
N4N18	3	0	217,457	633,620
N4N20	0	0	-	-
N4N22	0	1	309,562	1,073,818
N4N26	1	2	60,440	173,717
N4N28	0	1	49,502	121,602
N4N29	0	1	182,240	547,210
Total	10	9	1,916,669	6,082,279

Baseline recreational value

The post-interventional recreational value depends on the project activities/improvements carried out as part of the N4N programme. Each project has a specific focus when it comes to visitors, but in general all aim to improve the visitor experience in some way.

A handful of projects are installing more interpretation content to increase visitors' awareness and engagement with the local wildlife. N4N20 is installing bird hides to improve opportunities to view the birds; N4N28 is focusing on engagement and awareness of pollinator species and N4N18 is focusing on engagement and awareness of dormice.

It should be noted that this intervention is likely to increase the recreational unit value of these sites, based on the assumption that greater awareness and engagement with nature increases the relative enjoyment of natural space. However, since it is not possible to include these factors in the model, any 'post-intervention' recording of the values from ORVal will not include this activity. Nevertheless, it will be possible to increase the overall recreational value if visitor numbers were to increase, as a result of the increased interpretation of the site – hence recording of visitor numbers and annual monitoring of sites by project managers. The expectation is that the post-intervention calculation for these sites the value will increase. Furthermore, recording the stories of visitors who engage with these activities will contribute to the value created and captured.



Some sites lack the infrastructure for visitor access or are unsafe. Projects N4N7, N4N11 and, N4N16 will improve access to sites, while N4N17 will seek to improve the safety of the site for all visitors. Additional access sites points are a feature of the ORVal model and can be included once work has been completed. The expectation is that it will increase recreational value and produce a net additional benefit.

The projects which do not currently have sites in the ORVal model, i.e., N4N20, 22, 28, 29, will be added manually and included in the 'post-intervention' calculation, showing the net additional benefit of the works carried out.

At present it is estimated that almost two million people visit N4N sites every year, bringing an estimated recreational value of £6 million. It is expected that interventions of the N4N programme will bring about a positive increase to both the baseline estimated visits and recreational value. Project activities are also expected to improve the visitor experience, by raising awareness and engagement of natural sites, as well as improving access. Although it is not possible to completely capture these changes in the ORVal model, their value will be recorded through the stories of visitors who engage with the sites.



9 Volunteering

The volunteering undertaken for N4N projects during 2021-22 had an equivalent wage value of £4,123.

Equivalent value

A total of 62 volunteering days, defined as a minimum of 7 hours, have been completed across three projects (N4N7, N4N22 and N4N26). Tasks included: water vole and bird species monitoring, and practical habitat enhancements.

The 'value' to TWT, and therefore in turn NH, can be proxied using the replacement cost approach, as described by the Office for National Statistics¹⁹. This method applies a market wage to calculate what voluntary work would cost had the work been paid. The market wage can be taken as either the minimum wage, mean wage, median wage, or a market wage for voluntary work.

Taking the lowest of these, replacement wage values, 62 volunteer days, involving a 7-hour day, paid at the current minimum wage of £9.50 per hour represents a value of £4,123.

Monetisation of Life Satisfaction Impacts

Nine projects indicated that they would be able to distribute a survey to project volunteers.

An HM Treasury Supplementary Guidance²⁰ document published in July 2021 (after the completion of the Network for Nature Methodology Report) provides more precise guidance on the valuation of wellbeing, and how benefits can be monetised for publicly funded projects.

This guidance will be used to inform the survey tools and the possible monetisation of wellbeing benefits to volunteering.

¹⁹ Foster, R. (2013). ONS. Household Satellite Accounts – Valuing Voluntary Activity in the UK.

²⁰ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005388/Wellbeing_guidance_for_appraisal_-_supplementary_Green_Book_guidance.pdf



10 Summary & conclusions

Overall, the first annual report has provided a good range of programme level data. The process has revealed some areas for further improving data, as well as some insights into the scale and type of expected outcomes.

Outputs & Progress

- During year 1, 25 N4N projects began project activity. Over 31ha of land is now in an improved condition, 12 ponds have been improved or newly created, over 2km of waterways cleared or managed, as well as 34 organisations engaged in N4N activity, including local authorities, landowners and farmers.
- An incomplete set of 'targets' means that it is not possible to review progress in terms of the percentage of outputs achieved. This would add depth to the assessment of progress against plans and the programme is encouraged to persist with collecting a full set of output targets.
- Total output habitats (ha) do not align with the habitat (ha) figures used within the analysis of biodiversity units. This data inconsistency needs to be resolved and is currently being reviewed.

Net change in CO₂ emissions

- The NH tool has been successfully tested. It is estimated that, once delivered, post-intervention habitats will sequester 1200 t CO₂-eq per year. However, the analysis is limited to 20 per cent of the total N4N programme area, as it only includes woodland and peatland habitats and those undergoing a change, rather than improved condition.

Species & Connectivity

- Projects are encouraged to record and report species baselines, as many plan to do in 2022.
- Species data is qualitative and, due to its nature, somewhat fragmented. Further thought will be given to how this can be collated and presented better in year 2.

Waterways

- Three projects plan to carry out baseline MORPH assessments during spring 2022.
- The baseline water quality status of relevant waterways has been recorded. The Environment Agency assessment schedule is not yet confirmed, therefore the viability of revisiting this measure is uncertain. Furthermore, the attribution of any change in water quality to N4N project activity is likely to be low. However, as a publicly available dataset, it is not resource intensive to collate and therefore continues to be included.

Flood and Drought Management

- Projects noted the difficulties in evidencing improvements to flood management. Four projects believe there is some scope for collecting qualitative evidence and will be asked to report evidence.

Visitors & recreational value

- The ORVal tool has been successfully tested. It is estimated that almost 2 million people visit the outdoor spaces and footpaths associated with 10 N4N projects each year, equivalent to a total annual recreation value of £6 million.



Volunteers

- 34 volunteers were engaged in project activities during 2021-22. They volunteered for a total of 62 days, representing an equivalent wage value of £4,123.
- Projects confirm volunteer surveys are viable and will add a qualitative perspective.

Appendix 1: N4N Projects Overview



Ref	Project Name	Trust	Confirmed funding	Match	Start date	End date
N4N1	Whittle Dene Semi Natural Woodland Restoration	Northumberland	£ 104,400.00	£ 8,400.00	01/09/2022	31/05/2025
N4N2	M56-A56 Pollinator Networks	Lancashire	£ 210,214	£ -	01/01/2022	31/12/2023
N4N3	Red Moss SSSI	Lancashire	£ 93,634	£ 11,000.00	11/10/2021	31/03/2025
N4N4	Improving the Connectivity and Biodiversity of the Manchester Mosses SAC	Lancashire	£ 294,589	£ 42,000.00	13/10/2021	31/12/2024
N4N6	Rotherham Rivers 3	Sheffield & Rotherham	£ 522,095	£ 201,658.00	06/09/2021	31/05/2025
N4N7	The Lugg Living Landscape	Herefordshire	£ 338,000	£ 292,400.00	06/09/2021	31/01/2024
N4N8	M5 Clean Rivers Project	Birmingham & Black Country	£ 235,000	£ -	02/11/2021	01/06/2024
N4N10	Nene Valley Wetland Restoration Project	BCN	£ 241,800	£ -	06/09/2021	30/06/2025
N4N11	East Winch Common SSSI	Norfolk	£ 180,600	£ -	01/10/2021	30/03/2025
N4N13	Wymondham Green Bridge Conversion	Norfolk	£ 64,800	£ -	30/11/2021	31/03/2025
N4N14	Sillfield Newt Reserve (VAT)	Norfolk	£ 44,040	£ -	31/12/2021	31/12/2024
N4N15	Blows Down	BCN	£ 65,950	£ 6,500.00	06/09/2021	30/06/2025
N4N16	River Lea Habitat Restoration	Herts & Middlesex	£ 267,030	£ -	06/09/2021	01/05/2025
N4N17	The Woodland Wonders of Moor Copse	BBOWT	£ 259,832	£ -	06/09/2021	31/12/2024

N4N18	Dormouse Reconnected (VAT)	Somerset	£	407,601	£ 4,000.00	03/01/2022	30/06/2025
N4N19	Langford Lakes Wetland Project	Wiltshire	£	231,270	£ 67,186.00	06/09/2021	01/06/2025
N4N19(b)	Langford Lakes Wetland project extension (Smallbrook Meadows)	Wiltshire	£	85,000	£ 6,500.00	01/11/2021	01/06/2025
N4N20	J10 Chalk Grassland Restoration	Hants and loW Wildlife Trust	£	200,000	£175,000.00	06/09/2021	01/03/2024
N4N21	Shap Fells Peatland Restoration	Cumbria Wildlife Trust	£	400,000	£ -	01/10/2021	31/10/2023
N4N22	Bringing Biodiversity Back to the Broads	Suffolk Wildlife Trust	£	100,596	£ 56,864.00	06/09/2021	01/02/2023
N4N23	South Elmham Hall wildlife pond network	Suffolk Wildlife Trust	£	47,400	£ -	30/01/2022	30/11/2023
N4N24	Bamfield-Blythburgh Farm Cluster	Suffolk	£	128,000.00	£ 18,000.00	01/04/2022	29/02/2024
N4N25	Suffolk Wool Towns	Suffolk	£	56,400.00	£ -	31/10/2021	31/03/2024
N4N26	Reconnecting Fillongley	Warwickshire Wildlife Trust	£	364,831.00	£ 50,000.00	31/12/2021	01/02/2025
N4N27	Riddy Connectivity Restoration	BCN	£	31,300.00	£ 2,400.00	01/01/2022	31/12/2024
N4N28	Cumbria Wildflower Meadow Restoration	Cumbria	£	165,300.00	£ -	01/04/2022	31/03/2025
N4N29	Badley Habitat Mosaic Creation	Suffolk	£	88,000.00	£ -		
			£	5,227,681²¹	£ 941,908		

²¹ Programme total funding is £5,275,521. The difference of £45,268, is due to a planned project awaiting final sign off.



Appendix 2: N4N Outcomes

Table A2.1

	Outcome	Economic value	Quantitative	Qualitative
Biodiversity gains	1. Biodiversity Units	Value for money assessment	Biodiversity Units	Supporting narrative
	2. Carbon Sequestration	Net change in CO2 sequestered	Net change in tonnes of CO2 sequestered	-
	3. Site Designation	-	-	Status of site
	4. Connectivity	-	-	Qual. project level evidence
	5. Range of species	-	Diversity and population of species	Qual. project level evidence
Wider Environmental	6. Waterways	Net change in recreation and aesthetic value of water	Kilometres of affected water bodies	e.g., EA Classification on water quality Filtering harmful pollutants Morphology
	7. Flood / drought management	-	-	Resilience of area against flooding
	8. Visitors	Recreation value of visiting sites Wellbeing value from walking	Number of visitors Frequency of walking	Self-report wellbeing, enjoyment, and connectedness to nature from visiting sites and road users
Society	9. Volunteers	Value of labour contribution Wellbeing value of volunteering	Number of hours Number of volunteers	Self-reported wellbeing, enjoyment, and connected to nature from volunteers

Appendix 3: Outputs by project



	Theme	Habitats								Water											
	Output	1) Habitats improved								2) Ponds				3) Waterways		4) Ditches					
	Description & sub-sets	1a) Habitats: restored, cleared, managed, enhanced		1b) Habitats: newly created, seeded, planted, engineered		1c) Trees planted		1d) Hedgerows managed, planted		2a) Ponds improved				2b) New ponds				3) Waterways cleared, managed, restored		4) Ditches/bunding managed, restored	
	Metrics	hectares (ha)		hectares (ha)		count		metres		count		hectares (ha)		count		hectares (ha)		km		metres	
		Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22
N4N1	Whittle Dene Semi Natural Woodland Restoration	3		1		1500				3		0.1						0.1			
N4N2	M56-A56 Pollinator Networks	111	0																		
N4N3	Red Moss SSSI	8	4.98	1.27	0					tbc	0	1.09	0							378	0
N4N4	Improving the Connectivity and Biodiversity of the Manchester Mosses SAC	49.22	19.72																	1461	900
N4N6	Rotherham Rivers 3	24.43	0	5.7	0			1077	0	tbc	0	1.88	0					1.29	0		
N4N7	The Lugg Living Landscape		0.09	7.69	0			360	0	1	0	0.2	0	8	0	0.5	0				
N4N8	M5 Clean Rivers Project																	29.2	0		
N4N10	Nene Valley Wetland Restoration Project	38.5	7.07							2	0	0.15	0								
N4N11	East Winch Common SSSI	1.5	0							6	0	0.34	0								
N4N13	Wyndham Green Bridge Conversion																				
N4N14	Sillfield Newt Reserve	0.1	0							6	0	0.23	0	1	0	0.04	0				
N4N15	Blows Down	7	0	0.75	0																
N4N16	River Lea Habitat Restoration	6.7	0															2.3	0		
N4N17	The Woodland Wonders of Moor Copse	4	0											2	0	0.1	0				
N4N18	Dormouse Reconnected	5.05	0	3.65	0	monitor	0														
N4N19	Langford Lakes Wetland Project	9.4	0	0.092	0																
N4N19(b)	Smallbrook Meadows	0.8										0.05						0.2			
N4N20	J10 Chalk Grassland Restoration			39.1	0																
N4N21	Shap Fells Peatland Restoration	50	0																		
N4N22	Bringing Biodiversity Back to the Broads	133	0							20	0	0.018	0		10		0		2		
N4N23	South Elmham Hall wildlife pond network									17	0	0.8	0						0		
N4N24	Bamfield-Blythburgh Farm Cluster	43		6.7		monitor				6		tbc		1		tbc					
N4N25	Suffolk Wool Towns	5.25								6		0.0092									
N4N26	Reconnecting Fillongley	15.22	0.05	3.03	0			2400	0	tbc	2	0.82	0.35						0.1		
N4N27	Riddy Connectivity Restoration					15	0	860	0												
N4N28	Cumbria Wildflower Meadow Restoration	6	0	15				600	0												
N4N29	Badley Habitat Mosaic Creation	5.6	0	2.44	0	monitor	0			2		0.05									
	Total Sum	526.77	31.91	86.422	0	1515	0	5297	0	69	2	5.7372	0.35	12	10	0.64	0	33.09	2.1	1839	900

	Theme	Physical Infrastructure						Engagement				Knowledge Base							
	Output	5) Boundaries		6) Site infrastructure				7) Volunteers				8) Training		9) Organisations		10) Research			
	Description & sub-sets	5) Fencing &/or security		6a) Visitor infrastructure e.g. bird hides, interpretation boards		6 b) Wildlife infrastructure e.g. bat boxes, butterfly benches, turn rafts		7a) Volunteers: number of individuals (different people) volunteering directly on N4N project activity. At least 0.5 day.		7b) Volunteer hours: directly contributing to N4N activity		8) People trained e.g. volunteers, HE staff (Training defined as: a dedicated session/event lasting greater than or equal to 1/2 day)		9) Organisations engaged e.g public sector stakeholders, landowners, schools, CICs		10a) Ecology, environmental research papers. (Over and above regular species monitoring but specific)		10b) Feasibility, engineering study	
	Metrics	metres		£		£		count (people)		hours		count		count		count		count	
		Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22	Planned	2021-22
N4N1	Whittle Dene Semi Natural Woodland Restoration							tbc		tbc				2					
N4N2	M56-A56 Pollinator Networks	2500m	0					10	10	150	0	8	0	25	25	1	1	1	0
N4N3	Red Moss SSSI								0										
N4N4	Improving the Connectivity and Biodiversity of the Manchester Mosses SAC								0										
N4N6	Rotherham Rivers 3	m	0					tbc	0	tbc	0								
N4N7	The Lugg Living Landscape	m	313	£ 5,000.00	0			30	20	120	0	10	0	6	0				
N4N8	M5 Clean Rivers Project															1	0		
N4N10	Nene Valley Wetland Restoration Project	m	600	£ 13,000.00	1758.82		8184						4						
N4N11	East Winch Common SSSI															2	0		
N4N13	Wyomondham Green Bridge Conversion																	1	0
N4N14	Sillfield Newt Reserve	2100	0																
N4N15	Blows Down	664	0	£ 5,500.00	£ 800.64									Schools tbc	0	2	0		
N4N16	River Lea Habitat Restoration							tbc	0	tbc	0	10	0						
N4N17	The Woodland Wonders of Moor Copse	3000	0		0	£ 1,500.00	0				0								
N4N18	Dormouse Reconnected			£ tbc	0			20	0	500	0					1	0		
N4N19	Langford Lakes Wetland Project	1000	0	100000	0	34000	12051.6	15	0	tbc	0			6	0				
N4N19(b)	Smallbrook Meadows							10		50									
N4N20	J10 Chalk Grassland Restoration	m	0	£ tbc	0		0	tbc	0	tbc	0							1	1
N4N21	Shap Fells Peatland Restoration							tbc	0	tbc	0								
N4N22	Bringing Biodiversity Back to the Broads								0		0			Landowner enga	0				0
N4N23	South Elmham Hall wildlife pond network								0		0	monitor	0	1	0	university studies	0		0
N4N24	Bamfield-Blythburgh Farm Cluster													21					
N4N25	Suffolk Wool Towns													tbc					
N4N26	Reconnecting Fillongley						200	tbc	4	tbc	42			2	9				0
N4N27	Riddy Connectivity Restoration	31																	
N4N28	Cumbria Wildflower Meadow Restoration							48	0			12							
N4N29	Badley Habitat Mosaic Creation	1300						tbc	0	tbc				monitor					
	Total Sum	8095	913	123500	2559.46	35500	20435.6	133	0	820	0	40	1	63	34	7	1	3	0
	Total Count	10	9	6	7	2	5	12	14	11	12	5	5	10	7	6	6	3	6



Appendix 4: Technical notes net change in CO2 emissions

Emission factors

Emission factors in the model are from Natural England. Table shows the different values for each habitat. Negative numbers represent carbon sequestration and positive numbers represent carbon emitted.

Table A4.1: Emission factors

Habitat	tCO ₂ -eq per ha per year
Woodland and other	
Newly planted native broadleaf woodland	-5.77
Newly planted conifer woodland	-7.5
Scrubland	1.99
Heathland	0.05
Grassland	0
Arable / cultivated land	0.29
Peatland	
Near Natural Fen (undrained)	-0.93
Near Natural Bog (undrained)"	-0.02
Rewetted Bog	3.87
Rewetted Fen	8.05
Rewetted Modified (semi-natural) Bog	-0.02
Modified Bog (semi-natural) Heather + Grass dominated - Drained	3.48
Modified Bog (semi- natural Heather + Grass dominated - Undrained	2.25
Eroding Modified Bog (bare peat) - Drained	13.14
Eroding Modified Bog (bare peat) - Undrained	12.03
Extracted Domestic (drained)	13.23
Extracted Industrial (drained)	13.14
Cropland	32.89
Intensive Grassland	24.87
Extensive Grassland (combined bog/fen)	11.02

Mapping

Table A4.2 below shows the mapping between the Biodiversity assessment classification and habitats available from National Highway's (NH) model. Woodland habitats that are an 'enhancement' and not included in the model have an N/A in their respective cell.

Table A4.2: Mapping between Biodiversity assessment and NH's model

Biodiversity assessment		NH's model	
Baseline habitat	Post-intervention habitat	Baseline habitat	Post-intervention habitat
Urban - Amenity grassland	Woodland and forest - Other woodland; broadleaved	Arable / cultivated land	Newly planted native broadleaf woodland
Heathland and shrub - Mixed scrub	Woodland and forest - Other woodland; broadleaved	Scrubland	Newly planted native broadleaf woodland
Woodland and forest - Other woodland; broadleaved	Woodland and forest - Other woodland; broadleaved	N/A	N/A
Woodland and forest - Other woodland; broadleaved	Woodland and forest - Other woodland; broadleaved	N/A	N/A
Woodland and forest - Other Scot's Pine woodland	Woodland and forest - Other Scot's Pine woodland	N/A	N/A
Wetland - Transition mires and quaking bogs (H7140)	Wetland - Transition mires and quaking bogs (H7140)	Eroding modified bog (drained)	Modified bog (undrained)



Woodland and forest - Other woodland; broadleaved	Woodland and forest - Other woodland; broadleaved	N/A	N/A
Wetland - Transition mires and quaking bogs (H7140)	Wetland - Transition mires and quaking bogs (H7140)	Eroding modified bog (drained)	Modified bog (undrained)
Heathland and shrub - Mixed scrub	Woodland and forest - Wet woodland	Scrubland	Newly planted native broadleaf woodland
Wetland - Transition mires and quaking bogs (H7140)	Wetland - Transition mires and quaking bogs (H7140)	Eroding modified bog (drained)	Modified bog (undrained)
Wetland - Lowland raised bog	Wetland - Lowland raised bog	Eroding modified bog (undrained)	Modified bog (undrained)
Woodland and forest - Other woodland; broadleaved	Woodland and forest - Other woodland; broadleaved	N/A	N/A
Grassland - Bracken	Wetland - Lowland raised bog	Intensive Grassland	Rewetted bog
Grassland - Bracken	Wetland - Transition mires and quaking bogs (H7140)	Intensive Grassland	Eroding modified bog (undrained)
Wetland - Depressions on Peat substrates (H7150)	Wetland - Transition mires and quaking bogs (H7140)	Rewetted modified bog	Eroding modified bog (undrained)
Woodland and forest - Wet woodland	Woodland and forest - Wet woodland	N/A	N/A
Woodland and forest - Lowland mixed deciduous woodland	Woodland and forest - Lowland mixed deciduous woodland	N/A	N/A
Woodland and forest - Other woodland; mixed	Woodland and forest - Other woodland; mixed	N/A	N/A
Woodland and forest - Lowland mixed deciduous woodland	Woodland and forest - Lowland mixed deciduous woodland	N/A	N/A
Woodland and forest - Other woodland; broadleaved	Woodland and forest - Other woodland; broadleaved	N/A	N/A
Woodland and forest - Other woodland; mixed	Woodland and forest - Other woodland; mixed	N/A	N/A
Woodland and forest - Other woodland; broadleaved	Woodland and forest - Other woodland; broadleaved	N/A	N/A
Woodland and forest - Other woodland; broadleaved	Woodland and forest - Other woodland; broadleaved	N/A	N/A
Wetland - Blanket bog	Wetland - Blanket bog	Eroding modified bog (undrained)	Near Natural Bog (undrained)
Baseline habitat	Proposed habitat	Baseline	Post intervention
Urban - Amenity grassland	Woodland and forest - Other woodland; broadleaved	Arable / cultivated land	Newly planted native broadleaf woodland
Heathland and shrub - Mixed scrub	Woodland and forest - Other woodland; broadleaved	Scrubland	Newly planted native broadleaf woodland

Transformation and maintenance cost

The transformation and maintenance cost is included in the model to represent the emissions emitted during transformation to the new habitat and additional maintenance required since the intervention (those habitats classified as succession and creation).

The average transformation and maintenance cost used for this calculation was provided by the Royal Society of Wildlife Trusts (RSWT). It represents the average CO₂ emissions emitted per ha in 2019 (on a total landholding of a little over 101,000 ha) for all activities across RSWT, as well as all the individual Wildlife Trusts. The value is 0.6 t CO₂ eq per ha of land managed emitted.

For transformation, this value is then multiplied by the total ha (132) included in the model, divided by the total years of appraisal period (69 years) to get the average yearly value.

For maintenance, the same value is then multiplied by the total ha which are assumed to be under new maintenance. This is then added into every year of the model.