Harwood Forest
Summary Report

INTERVENTIONS

8ha of felled conifer forest undergone a combination of ground smoothing and linear deep trench bunding to increase the levels of the water table and reduce drainage to restore groundwater levels and return the land to bog.

Summary of vegetation, soil carbon & winter bird reports can be found below.

Vegetation

Habitat	Average herbaceous/ woody plants (%)	Average short grasses (%)	Average medium grasses (%)	Average long grasses (%)	Species diversity (total no. species)
Harwood Forest	0.9	0	0.9	0	15

Soil Carbon

Habitat	Average soil organic carbon (%)	Average total carbon (%)	Average organic carbon stock (tonnes per hectare)
Harwood Forest (upper: 0-15cm)	46.58	46.58	210
Harwood Forest (lower: 15-30cm)	47.18	47.18	205.2

Wansbeck Restoration for Climate Change (WRCC) is one of six pioneering nature projects across England to receive funding from Natural England to trial ways to capture carbon and mitigate the impacts of climate change. This nationwide project, 'Nature Returns', is funded by the Treasury's Shared Outcomes Fund, and co-sponsored by Defra and the Department for Energy Security and Net Zero. The project aims to provide the evidence for how nature-based solutions can tackle the environmental crisis. This project aims to restore mixed habitats, showcasing how land owners, environmental bodies such as the National Trust, and governing bodies such as Natural England, can come together to address climate change, increase biodiversity, reduce greenhouse gas emissions and promote carbon storage, in a way that benefits nature and society.

Contents

INTRODUCTION

Wansbeck Restoration for Climate Change (WRCC) is one of six pioneering nature projects studying how we can best use land across England to address climate change whilst producing food and promoting thriving nature.

Led by Natural England, 'Nature Returns' is funded by the Treasury's Shared Outcomes Fund, and co-sponsored by the Department for Farming and Rural Affairs (Defra) and Department for Energy Security and Net Zero (DESNZ).

WRCC is providing evidence through its trials as to how a range of nature-based solutions can help tackle the Climate and Biodiversity crises.

The project aims to restore mixed habitats and showcase how landowners, farmers, environmental bodies (such as the National Trust) and governing bodies (such as Natural England) can come together to:

- **address climate change**
- **increase biodiversity**
- **reduce greenhouse gas emissions**
- **promote carbon storage**
- **provide benefits for nature and society**

PROJECT SUMMARY

Site Plan

Location: Harwood Forest

Outputs: 8ha of felled conifer forest 'ground smoothed' to restore groundwater levels and return the land to blanket bog

Consents: Forestry Commission EIA

Method: combination of ground smoothing and linear deep trench bunding. This creates a more uniform surface to raise the water table, reduce sub-surface flow through degraded peat and contain surface water within the site

Management: carried out 'seeding' of sphagnum by collecting sphagnum moss from adjacent woodland boundary and planting into the restored area

Benefits: restore ground hydrology and reduce decomposition of peat

Background

In the 1950s, the area was cleared of all its native wildlife to create space for timber planting, a national priority. The Forestry Commission now reviews de-stocked forestry land in terms of peat and carbon conservation as well as timber productivity, and as a result this 8ha became available for peat restoration. Peat is one of nature's major weapons in the fight against climate change and this area of rewetted deep peat created in Harwood Forest will help store carbon, filter water and increase biodiversity.

Sphagnum mosses, bog rosemary and cranberry that grew in the area before the forest was planted in the 1950s will now grow and rot down in waterlogged conditions to create more peat. Forestry England's Peat Specialist, Richard Guy said: "This process will take some time to take full effect, but the development of deep peat takes millennia, so restoration of that peat can't be rushed."
The work and results will be closely monitored by Natural England and Forestry England for the next ten years. Depending on the results, the project could be replicated with pockets of land elsewhere. Groundwork's project manager Michele MacCallam said: "We are hoping for positive results that will act as a catalyst for other projects elsewhere."

Groundwork received a £10,000 grant from the Hexham-based Vattenfall Company, through donations to Ray Wind Funds. A further £41,000 was given by the government-sponsored Nature Returns programme, which also being used to fund Groundwork's wider Wansbeck Restoration for Climate Change project.

Tree stumps and deep drains in clear-felled area

Stump-flipping and infilling drains to restore bog conditions

VEGETATION

Throughout the summer months of 2023 and 2024, Groundwork field staff carried out vegetation surveys at Harwood Forest to assess baseline conditions prior to, and after implementation of interventions. Through the use of a 2x2m quadrat and a 10x10m quadrat, we took at least 5 samples in every field parcel. Within each quadrat, we measured the percentage cover of vegetative categories and species diversity.

Results

Habitat	Average herbaceous/ woody plants (%)	Average short grasses (%)	Average medium grasses (%)	Average long grasses (%)	Species diversity (total no. species)
Harwood Forest	0.9	0	0.9	0	15

Table 1. Average values of percentage cover of herbaceous plants, short grasses, medium grasses and long grasses, and the total number of species found within the sampled habitat at Harwood Forest in 2024

Harwood Forest showed very limited proportions of any herbaceous plants or grasses. There was a slight increase in measured vegetation when compared to last year, 2023, however due to the recent interventions that have taken place here, it is too early to expect much change in vegetative cover. The most prominent grass species present were Common Bent Grass, Purple Moor Grass and Wavy Hair Grass, however these were only present in very small abundances. Ling was by far the most commonly found woody species, with Common Sedge the most commonly found herbaceous plant.

Comparing Vegetation Data With Other Pilot Sites

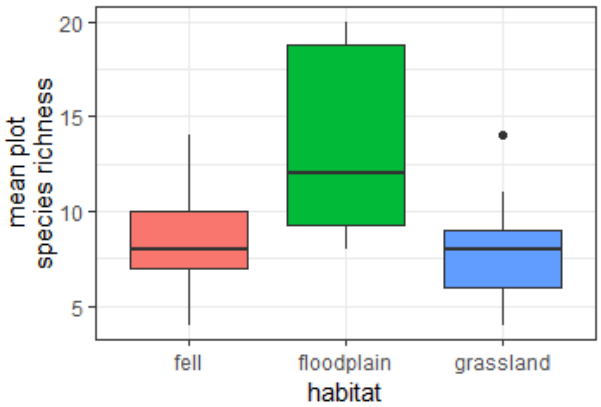

Figure 2. Average species richness of fell, floodplain and grassland habitat, from the six Nature Returns pilot sites across England

It is interesting to note that when considering results from all Nature Returns pilot sites nationwide, wetter floodplain conditions generally increase the range of both grasses and herbaceous plants, benefitting ecosystem health and overall biodiversity. Harwood Forest has potential for the accumulation of more peat and thus the distribution of mosses and other plant life, hopefully increasing the future vegetative diversity present here.

SOIL CARBON

Groundwork's field team collected soil samples during the winter of 2023 and sent these samples to a laboratory to understand the amounts of carbon stored in the soil at Harwood Forest. The data below (Table 2) summaries these key findings.

Results

Habitat	Average soil organic carbon (%)	Average total carbon (%)	Average organic carbon stock (tonnes per hectare)
Harwood Forest (upper: 0-15cm)	46.58	46.58	210
Harwood Forest (lower: 15-30cm)	47.18	47.18	205.2

Table 2. Average values of soil organic carbon (%), calculated organic carbon stock (t/ha), and total carbon (%) found within cores extracted from the upper layer of soil (0-15cm) and lower level of soil (15-30cm) at Harwood Forest.

The soil carbon content at Harwood Forest is extremely high compared to our other measured sites which do not contain peatland. This is due to waterlogged conditions resulting in the accumulation of partially decomposed remains of animal and plant material, acting as a carbon reserve. Peat therefore acts as a carbon store, providing very valuable habitat. At Harwood Forest, carbon content appears to be increasing within lower fractions of ground (15-30cm). The restored peat at Harwood Forest will continue to accumulate carbon as rewetting of peat improves and degradation is reduced, which should be strongly accounted for in future management plans.

Soil Carbon: Terms Explained

Table 2 presents the lab results as average soil organic carbon (%), average total carbon (%), and average organic carbon stock (t/ha). The key difference between these variables is that organic carbon (%) enters the soil through the decomposition of plant and animal residues, root exudates, and living and dead microorganisms. It therefore includes all the carbon-based compounds that were once found in living organisms and so acts as a relatively available form of carbon that can be absorbed by microbes and respired back into the environment as atmospheric carbon. Organic carbon (%) can thus act as a key indicator of overall soil health.

Average total carbon (%) includes both organic and inorganic carbon, where inorganic carbon refers to the inclusion of carbon compounds that do not contain carbon-hydrogen bonds, such as carbon dioxide and carbonates. Inorganic carbon is largely found in carbonate minerals (soils in Limestone areas) and does not act as a readily available source of carbon for digestion by microbes.

The metric tonnes per hectare (t/ha) is calculated using the following equation: (t/ha) = 10,000 x L x BD x (SOC/100) where:

10,000 m2 in one hectare
L = sample length (m)
BD = bulk density (kg/l)
SOC = soil organic carbon (%)

COMPARING SOIL CARBON TO OTHER NORTHUMBERLAND PILOT SITES

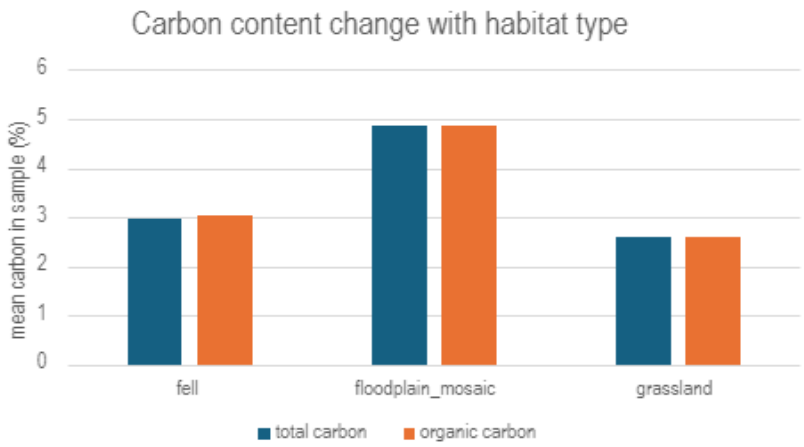

Figure 3. Comparison in the carbon content of average total carbon (%) and average organic carbon (%) in soil samples between fell, floodplain mosaic and grassland habitat types across all Northumberland pilot sites.

These results (Figure 3) which incorporate all farms from our Northumberland study sites, show that wetter floodplain habitat is indeed the habitat type which stores the most carbon in its soil. Fell and grassland, habitats which consistently have less vegetative diversity present, possess lower levels of carbon in soil. Peatland such as in Harwood Forest, however, does not strictly fall within these categories. Carbon content at Harwood Forest is significantly greater than any other site due to the deep peat (up to 6m) present here.

CONCLUSIONS

We are very grateful to be able to access these study sites across Northumberland. Access to your land is allowing us to collect valuable data which is not only helping us to assess the effects of Groundwork's interventions, but is also allowing us to understand how nature and various agricultural practices interact. It is clear from these results that:

- Harwood Forest showed very limited proportions of any herbaceous plants or grasses, and Ling was the most commonly found plant species here
- There were slightly increases in vegetative abundances when compared to the previous year (2023) however it should be noted that it is too early after interventions to expect significant changes in vegetative richness and diversity
- The soil carbon content at Harwood Forest is extremely high compared to our other measured sites due to the depth of peat present here
- At Harwood Forest, carbon content appears to be increasing within lower fractions of ground (15-30cm), when compared upper fractions (0-15cm)
- The restored peat at Harwood Forest will continue to accumulate carbon as rewetting of peat improves and degradation is reduced, which should be strongly accounted for in future management plans.