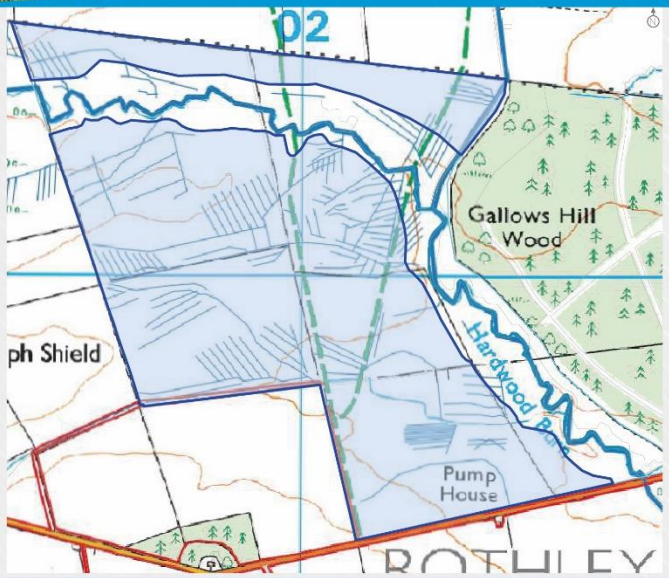
Gallows Hill Fell

Summary Report

INTERVENTIONS



Over 15,000m of grips or drains over 54ha moorland infilled to restore natural hydrology allowing re-wetting of vegetation to encourage wet heathland and bog, arresting and eventually restoring the loss of peat.

Several scrapes formed to help increase wader numbers, the number of species feeding and potentially breeding in the moorland.

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

Vegetation

Habitat	Abundance of flowers (no. of quadrats)	Abundance of grass (no. of quadrats)	Abundance of legumes (no. of quadrats)	Species diversity (total no. species)
Right Fell	23	23	1	25
Middle Fell	10	25	2	19

Soil Carbon

Habitat	Average soil organic carbon (%)	Average total carbon (%)	Average organic carbon stock (tonnes per hectare)
Deep Peat (upper: 0-15cm)	4.9	4.8	64.7
Deep Peat (lower: 15-30cm)	1.3	1.2	33
Shallow Peat (upper: 0-15cm)	4.5	4.5	61.5
Shallow Peat (lower: 15-30cm)	1.4	1.4	22.5

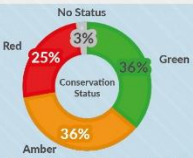
Birds

Total number of

351

birds spotted between

Nov 23 - Feb 24



36 different species spotted with 25% being in 'Red' conservation

Top 3 species of birds by amount spotted between Nov 23 - Feb 24

This is a summary of the winter bird surveys and were conducted over a single site visit per month.

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**

SITE PLAN

PROJECT SUMMARY

This project aims to enhance moorland with pockets of peat by restoring the natural drainage pattern.

Recent survey work has identified less peat than previously found in Gallows Hill moorland fields (survey in 2010).

The land was 'improved' during the mid-late 19th C by straightening and deepening watercourses and creating an extensive network of drainage channels / grips.

Blocking grips will rewet the vegetation and encourage blanket bog formation, create wet flushes and reduce erosion downstream.

Benefits include increase in invertebrate numbers, food source for wading birds such as curlews, lapwings, golden plover and grouse. Raised water level encourages development of sphagnum moss, mire and bog vegetation and formation of peat.

Reprofiling grips to reduce flow of water within a ditch system will restore natural hydrology, reduce soil erosion and reduce sediment inputs into the Harwood Burn.

KEY FACTS:

Location: Gallows Hill Fell, Wallington Estate Grid ref NZ 020900

Outputs: Over 15,000m grips or drains over 54ha moorland infilled and several shallow scrapes formed

Consents: Land Drainage Consent obtained for the grip-blocking work

Method: Completed December 2023

Management: Controlled grazing by livestock for 2-3 months later summer. Grazing and poaching scrape margins by cattle will retain valuable muddy margins

Benefits: Restoration of natural hydrology will rewet the vegetation and encourage wet heathland and bog, arresting and eventually restoring the loss of peat.
Scrapes will increase wader numbers and species feeding and potentially breeding in the moorland.

VEGETATION

During the summer months of 2023, Groundwork and Natural England field staff carried out vegetation surveys at Gallows Hill Fell to assess baseline conditions prior to 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

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 each fell habitat.

Habitat	Abundance of flowers (no. of quadrats)	Abundance of grass (no. of quadrats)	Abundance of legumes (no. of quadrats)	Species diversity (total no. species)
Right Fell	23	23	1	25
Middle Fell	10	25	2	19

Figure 1. Field names assigned to various parcels of habitat at Gallows Hill, to aid easier facilitation of surveying.

Both Gallows Hill Right Fell and Middle Fell habitats had a similar abundance of grasses. These species were characteristic of fell habitat and included species such as Common Bent, Meadow Foxtail, and Sweet Vernal Grass. The abundance of wildflowers was significantly greater in the Right Fell habitat than the Middle Fell, which may be due to a number of factors, such as previous grazing techniques, or competition from coarser, more dominant grasses and rushes.

Both habitats demonstrated common flowering species such as Common Mouse ear, Creeping Buttercup and Common Sorrel. However, the overall species diversity was greater in the Right Fell habitat, with species such as Sneezewort, Germander Speedwell, and Cuckooflower appearing here. Legumes present consisted of White Clover, Meadow Vetchling and Birdsfoot Trefoil, which are common and nutritious species due to their nitrogen-fixing nature, improving soil fertility.

Comparing Vegetation Data with Other Pilot Sites

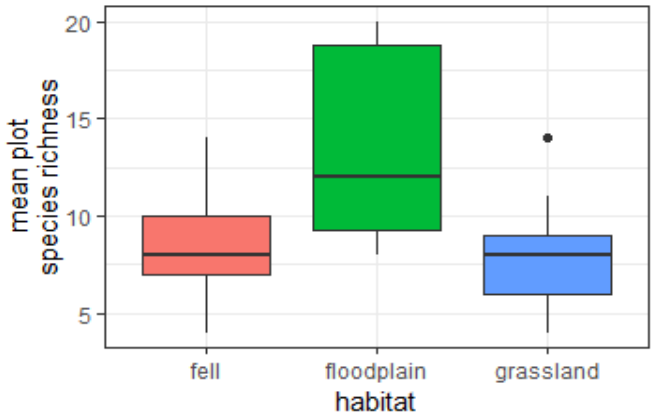


Figure 2. Average species richness of fell, floodplain and grassland habitat, from the six Nature Returns pilot sites across England

It is also interesting to note that when considering results from all Nature Returns pilot sites nationwide, our results from Gallows Hill Fell are consistent with that of other sites, with fell habitats generally possessing less plant species than floodplain, yet slightly more than grassland. This is due to damper, wetter floodplain conditions creating a higher number of available microhabitats for plant species to colonise when compared to drier grasslands and grazed fells.

SOIL CARBON

During autumn of 2023, Groundwork collected soil samples from the following sites and sent these samples to a laboratory to understand the amounts of carbon stored in the soil at Gallows Hill Fell.

Results

Habitat	Average soil organic carbon (%)	Average total carbon (%)	Average organic carbon stock (tonnes per hectare)

Deep Peat (upper: 0-15cm)	4.9	4.8	64.7
Deep Peat (lower: 15-30cm)	1.3	1.2	33
Shallow Peat (upper: 0-15cm)	4.5	4.5	61.5
Shallow Peat (lower: 15-30cm)	1.4	1.4	22.5

Table 2. Average values of soil organic carbon (%), calculated organic carbon stock (t/ha), and total carbon (%) found in soil across areas of deep peat and shallow peat, within cores extracted from the upper layer of soil (0-15cm) and lower level of soil (15-30cm).

Peatland habitat exhibits vast amounts of carbon when compared to drier habitats in areas with no peat. 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 Gallows Hill Fell, the greatest density of carbon is stored within the upper fractions of soil, closest to the surface (0-15cm), with lower fractions exhibiting less carbon. This is due to the majority of organic matter breakdown by microbes occurring within the topsoil. Areas of deep peat generally exhibit greater percentages of carbon when compared to shallower peat, however this difference is not large enough to be significant here.

The identical results of average soil organic carbon (%) and average total carbon (%) suggests a high level of readily available carbon for digestion by microbes, suggesting good overall soil health. Gallows Hill Fell exhibits relatively high levels of carbon due to the peat reserves here, which should be taken into account during the creation of future land 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

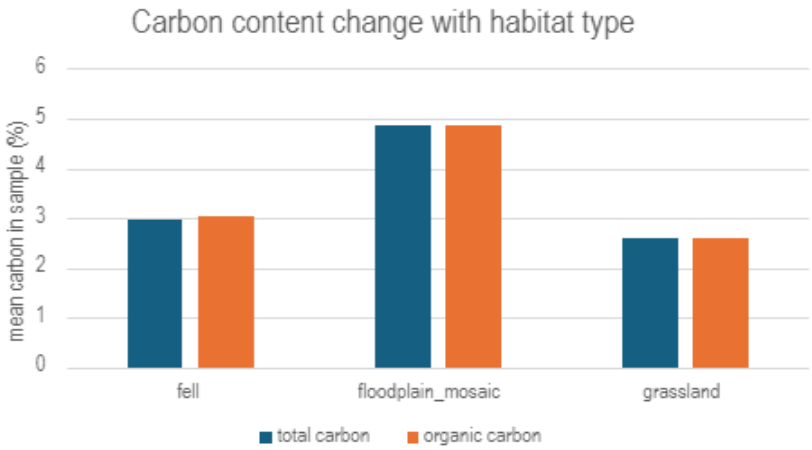


Figure 3. The change in the carbon content of average total carbon (%) and average organic carbon (%) in soil samples between fell, floodplain mosaic and grassland habitat types across all Northumberland pilot sites.

These results (Figure 3) which incorporate all farms from our Northumberland study sites, show that fell habitat generally stores less carbon when compared to floodplain and grassland habitat. However, this does not account for ground containing peat. Usually, fell and grassland habitats exhibit less vegetative diversity than floodplains, however Gallows Hill Fell demonstrates higher levels of carbon due to the presence of peatland here.

OTHER SURVEYS

Birds

Groundwork commissioned Birdwatch North East Ltd to carry out bird surveys on various Northumberland study sites. A total of 62 species were recorded within these sites. Many were birds of conservation concern, sitting on either the red or amber list.

Farm	Date	Total no of species	Breeding	Non-breeding	Red	Amber	Green	Comments
Gallows Hill North	June, July 2023; April-July 2024	40	20	20	9	13	16	Breeding - Nesting curlew; grasshopper warblers; linnets spread around the site with bias to eastern end and buffer. Skylarks on semi-improved grassland. 2 introduced species: Mandarin duck and Canada goose.

CONCLUSIONS

We are very grateful to landowners that we have been able to access these study sites across Northumberland. This has allowed us to collect valuable data, not only helping us to assess the effects of Groundwork's interventions, but also allowing us to understand how nature and various agricultural practices interact. It is clear from data collected that:

- Fell habitats such as Gallows Hill Fells tend to be dominated by grass species and usually possess less plant species than floodplain habitat, however 'Right Fell' exhibits a significantly greater number of herbaceous plants including wildflowers such as Sneezewort and Cuckooflower

- Gallows Hill Fell habitats contain peatland, which hold vast amounts of carbon when compared to drier habitats in areas with no peat. Peat therefore acts as a carbon store, providing very valuable habitat, which should be taken into account during the creation of future land management plans

- At Gallows Hill Fell, the greatest density of carbon is stored within the upper fractions of soil, closest to the surface (0-15cm), with lower fractions exhibiting less carbon

- Soil carbon will continue to increase in Gallows Hill Fell habitats as the partial breakdown of animals and plants continue, resulting in the sequestration of more carbon