Gallows Hill Grassland

Summary Report

INTERVENTIONS

Fields were heavily grazed over the summer and then scarified in two directions to open up pockets of bare ground providing good conditions for seed establishment. Wildflower seed was harvested from local farm in Northumberland and sown by wildflower expert Kevin Wharf. Stock were allowed back on the fields to help embed seed into the soil.

Establishing a flower rich grassland will take a number of years to achieve, as it is desirable for all areas to be kept as permanent grassland. Management will see a range of plant heights achieved suitable for invertebrates, birds or other priority species. All the grasslands will be managed by grazing, hay cutting, or a mixture of both maintain a continuous cover, particularly over historic features. No manure, fertiliser, pesticide or supplementary feed will be used in the establishment phase.

The benefits will include greater variety of grassland species including yellow rattle and eyebright.

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

Vegetation

Habitat	Average herbaceous plants (%)	Average short grasses (%)	Average medium grasses (%)	Average long grasses (%)	Species diversity (total no. species)
Gallows Hill Grassland	41.15	0	35	19.2	29

Soil Carbon

Habitat	Average soil organic carbon (%)	Average total carbon (%)	Average organic carbon stock (tonnes per hectare)
Gallows Hill Grassland (upper: 0-15cm)	3.24	3.24	45.07425
Gallows Hill Grassland (lower: 15-30cm)	1.8325	1.835	29.4545

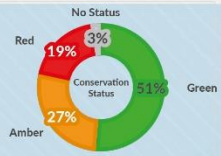
Birds

Total number of

1557

birds spotted between

Nov 23 - Feb 24



37 different species spotted with 19% being in 'Red' conservation

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

404 Woodpigeon

350 Brambling

121 Starling

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**

PROJECT SUMMARY

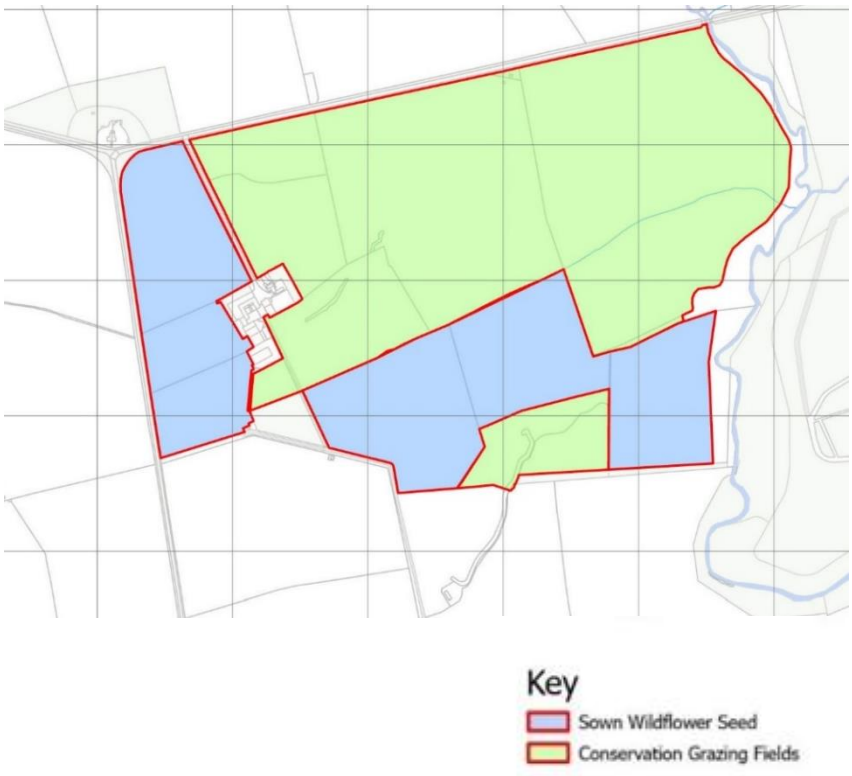
Walkover carried out in October 2023 to assess ground conditions by wildflower expert Kevin Wharf

Fields heavily grazed over the summer to create short grass

Local farmer contractor, Nick Scott (Catcherside farm) carried out spring tining in 2 diagonal directions to remove thatch and open up the ground

5 of the 6 fields were sufficiently grazed to permit sowing.

Kevin Wharf distributed wild flower seed immediately following tining in later October 2023



KEY FACTS:

Location: Gallows Hill Farm, Wallington Estate. Grid ref NZ 02300 589300.

Outputs: Restoration of the 16ha of meadows by sowing locally sourced wildflower seed. 32ha of meadow will be enriched through conservation grazing.

Consents: None
Fields were heavily grazed over the summer and then scarified in two directions to open up pockets of bare ground providing good conditions for seed establishment. Wildflower seed was harvested from local farm in Northumberland and sown by wildflower expert Kevin Wharf. Stock were allowed back on the fields to help embed seed into the soil.

Establishing a flower rich grassland will take a number of years to achieve, as it is desirable for all areas to be kept as permanent grassland. Management will see a range of plant heights achieved suitable for invertebrates, birds or other priority species. All the grasslands will be managed by grazing, hay cutting, or a mixture of both maintain a continuous cover, particularly over historic features. No manure, fertiliser, pesticide or supplementary feed will be used in the establishment phase.

Benefits: Greater variety of grassland species including yellow rattle and eyebright; more nutritious hay crop

VEGETATION

Throughout the summer months of 2023 and 2024, Groundwork field staff carried out vegetation surveys at Gallows Hill Grassland 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.

Habitat	Average herbaceous plants (%)	Average short grasses (%)	Average medium grasses (%)	Average long grasses (%)	Species diversity (total no. species)
Gallows Hill Grassland	41.15	0	35	19.2	29

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 Gallows Hill Grassland habitat.

It was fantastic to see that the proportion of herbaceous plants, including wildflowers such as Yellow Rattle, Eyebright and Creeping Buttercup, was greater than that of both medium and long grass species here. This supports the value of spreading locally sourced wildflower seed and suggests that the same methodology in similar habitats would be successful in this area. Grass species such as Smooth Meadow Grass, Crested Dogstail and Yorkshire Fog were prominent, however did not seem to be outcompeting other flowers. Species diversity could be further improved by following specific grazing schedules and the application of wildflower seed in other field parcels.

Comparing Vegetation Data with Other Pilot Sites

It is also interesting to note that when considering results from all Nature Returns pilot sites nationwide, results are generally not consistent with that of other sites. This is due to the fact that many of today's grasslands are usually grazed in a way that prevents many herbaceous plants from flowering. However, due to the sowing of local seeds and the use of stock to embed seed into the soil, Gallows Hill Grassland exhibits higher species diversity (29) than even some of our measured floodplain habitat, which, as illustrated in Fig2, usually has the highest species diversity due to wetter conditions increasing the range of suitable microhabitats present.

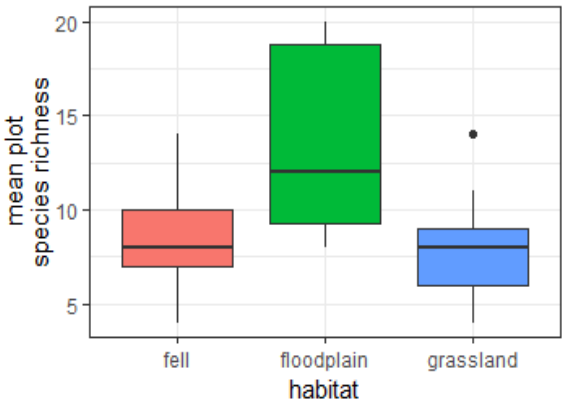


Figure 2. Average species richness of fell, floodplain and grassland habitat, from the six Nature Returns pilot sites across England

SOIL CARBON

Groundwork's field team collected soil samples during autumn of 2023 and sent these samples to a laboratory to understand the amounts of carbon stored in the soil at Gallows Hill grassland. 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)
Gallows Hill Grassland (upper: 0-15cm)	3.24	3.24	45.07425
Gallows Hill Grassland (lower: 15-30cm)	1.8325	1.835	29.4545

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).

The results show that soil carbon in grassland habitats is generally lower than that of floodplain and wetter riparian habitats due to the drier nature of the habitat. Our results from Gallows Hill Grassland support this finding: soil carbon levels are not particularly high here, however this is normal for this habitat type, and we expect the soil condition to improve over time as a result of the over-seeding and management practice.

The greatest density of carbon is stored within the upper fraction of soil, closest to the surface (0-15cm), with lower fractions exhibiting less carbon. 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.

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

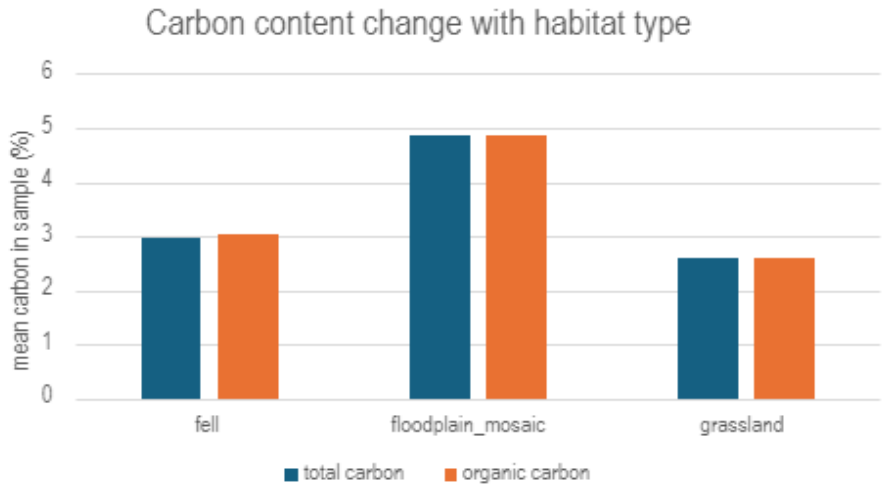


Figure 3. The change in the carbon content of average total carbon (%) and average organic carbon (%) in soil samples between fell, floodplain mosaic and grassland habitat types across all Northumberland pilot sites.

These results (Figure 3) which incorporate all farms from our Northumberland study sites, show that grassland and fell habitat generally demonstrate lower soil carbon percentages than that of floodplain habitat, consistent with our results from Gallows Hill Grasslands.

Greenhouse Gas Flux

One of the long-term aims of this project is to monitor a fundamental driver of climate change, the net emission and removal of greenhouse gases by terrestrial ecosystems. We are doing this on our project sites through the use of an EGM machine (Figure 4), which allows us to measure the rates of both soil respiration and plant photosynthesis. This gives us a method of quantifying the biosphere's capacity to sequester carbon in one particular area, and also allow us to understand how differing land management strategies are affecting these sequestration rates.

Figure 4. EGM machine (right) pictured with soil respiration chamber (left) used to measure the rates of respiration of soil microbes.

Due to the inter-annual variability of gas flux emissions, we are unable to provide immediate findings for this part of the project. However, carrying out these measurements seasonally over a number of years means we will be able to analyse long term carbon sequestration trends, helping us to understand how both habitat type, land use change and climatic effects are impacting the carbon sequestration of these landscapes.

Bird Surveys

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 of birds	Breeding	Non-breeding	R	A	G	Comments
Gallows Hill South	June, July 2023; April-July 2024	41	27	14	8	11	22	Linnet in quarry, mistle thrush holding territory south of farm house. Sky larks and tree sparrows breeding. Goldcrests, siskin, spotted flycatcher, tawny owl, whitethroat present.

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:

- Proportions of herbaceous plants within Gallows Hill Grassland was high, supporting the value of spreading locally sourced wildflower seed
- Grass species such as Smooth Meadow Grass, Crested Dogstail and Yorkshire Fog were prominent, however did not seem to be out-competing other flowers
- Species diversity could be further improved by following specific grazing schedules and the application of wildflower seed in other field parcels
- Soil carbon levels are not particularly high here, however this is normal for this habitat type, and the soil does not appear to be in poor condition
- The greatest density of carbon is stored within the upper fraction of soil, closest to the surface (0-15cm), this is due to the majority of organic matter breakdown by microbes occurring within the topsoil
- The continuation of Greenhouse Gas Flux surveys will provide valuable data to show Gallow Hill's capacity to sequester carbon, and will provide us with more evidence as to how differing land use practices are affecting these sequestration rates