Middleton North
Summary Report

INTERVENTIONS

Woodland and hedgerow planting schemes at Middleton North consisted of planting broadleaf tree saplings (total area 2.55ha) in order to provide shelter for livestock, ecological connectivity between adjacent woodland patches and hedges, and a riparian buffer along the River Wansbeck. All parcels on Figure 1 were implemented in February 2024, apart from 'Hitchycroft' which has been delayed until a subsequent year, for agri-environment reasons.

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)
Floodplain	7	1	75.7	15.1	31
Bells park north	11.2	0	45	44.5	19
Bells park south	7.1	0	84.7	5.7	17

Soil Carbon

Habitat	Average soil organic carbon (%)	Average total carbon (%)	Average organic carbon stock (tonnes per hectare)
Bells Park North (upper: 0-15cm)	3.82	3.82	53.5
Bells Park North (lower: 15-30cm)	2.02	2.02	32.6
Bells Park South (upper: 0-15cm)	3.7	3.7	52
Bells Park South (lower: 15-30cm)	1.9	1.9	31.5

Habitat	Average soil organic carbon (%)	Average total carbon (%)	Average organic carbon stock (tonnes per hectare)
Floodplain (upper: 0-15cm)	4.12	4.18	53.4
Floodplain (lower: 15 30cm)	3.32	3.32	47.6

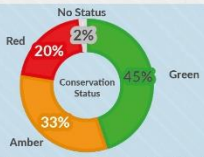
Birds

Total number of

938

birds spotted between

Nov 23 - Feb 24



49 different species spotted with 20% 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.

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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:

Woodland and hedgerow planting schemes at Middleton North consisted of planting broadleaf tree saplings (total area 2.55ha) in order to provide shelter for livestock, ecological connectivity between adjacent woodland patches and hedges, and a riparian buffer along the River Wansbeck. All parcels on Figure 1 were implemented in February 2024, apart from 'Hitchycroft' which has been delayed until a subsequent year, for agri-environment reasons.

The planting work required an Environmental Impact Assessment (EIA) by the Forestry Commission, a process that required a woodland creation and management plan. Following advice from the County Archaeologist, Bells Park wood pasture blocks were re-designed to respect the medieval field pattern of rigg and furrow, with blocks planted on every third ridge.

An England Woodland Creation Offer (EWCO) application was made which took several months to approve. The planting was also registered for the Woodland Carbon Code. Owing to the complexities of administering both schemes, neither of these two options were finally taken up by the landowner.

Figure 1. Map of planting interventions for Middleton North proposed by Groundwork.

Results: Vegetation

During the summer months of 2023 and 2024, Groundwork field staff carried out vegetation surveys at Middleton North to assess baseline conditions prior to, and after implementation of interventions. We did this through the use of a 2x2m quadrat and a 10x10m quadrat, with at least 5 samples of each in every field parcel. Within each quadrat, we measured the percentage cover of vegetative categories and species diversity (Table 1).

Habitat	Average herbaceous plants (%)	Average short grasses (%)	Average medium grasses (%)	Average long grasses (%)	Species diversity (total no. species)
Floodplain	7	1	75.7	15.1	31
Bells park north	11.2	0	45	44.5	19
Bells park south	7.1	0	84.7	5.7	17

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 habitat at Middleton North.

These results are indeed indicative of what we would expect, with floodplain habitats exhibiting a greater number of species due to the higher number of microhabitats available in damper, wetter conditions. Despite showing greater species diversity, the floodplain habitat was still dominated by medium grasses characteristic of unimproved grassland. These species included Smooth Meadow Grass, Yorkshire Fog, and Red Fescue. Herbaceous plants such as Yarrow, Common Mouse ear and Meadow Sweet were also present here.

Bells Park North and Bells Park South grazing pasture showed significantly less overall species diversity. They are dominated by long grasses and medium grasses, respectively. This may be because slightly taller grassland habitats are often composed of longer grasses when left ungrazed. These grasses included Cocksfoot, Common Bent and Meadow Fescue. Herbaceous plants such as Pignut, Common Sorrel and Meadow Buttercup were also present.

Comparison to other pilot sites:

It is also interesting to note that when considering results from all Nature Returns pilot sites nationwide, floodplain habitat had the greatest species richness (Figure 2). This suggests that the results from Middleton North are to consistent with that of other sites, with wetter conditions increasing the range of both grasses and herbaceous plants, benefitting ecosystem health and overall biodiversity.

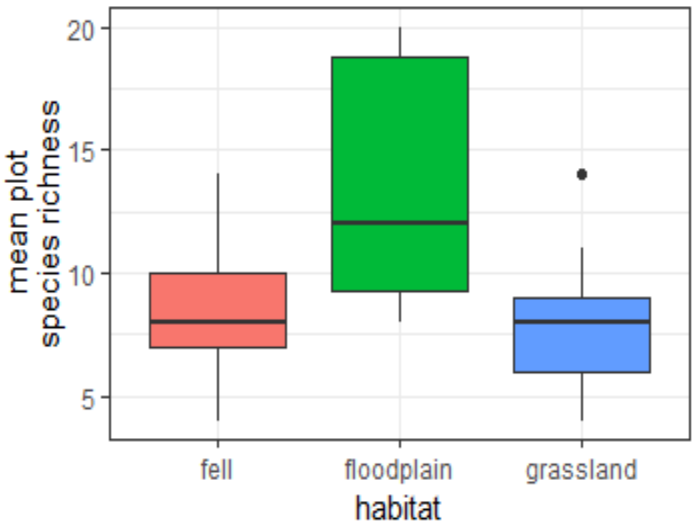

Figure 2. Average species richness of fell, floodplain and grassland habitat, from the six Nature Returns pilot sites across England.

Results: Soil Carbon

Groundwork's field team collected soil samples from the following sites throughout October 2023 and sent these samples to a laboratory to understand the amounts of carbon stored in the soil at Middleton North. The data below (Table 2) summaries these key findings.

Habitat	Average soil organic carbon (%)	Average total carbon (%)	Average organic carbon stock (tonnes per hectare)
Bells Park North (upper: 0-15cm)	3.82	3.82	53.5
Bells Park North (lower: 15-30cm)	2.02	2.02	32.6
Bells Park South (upper: 0-15cm)	3.7	3.7	52
Bells Park South (lower: 15-30cm)	1.9	1.9	31.5
Floodplain (upper: 0-15cm)	4.12	4.18	53.4
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Table 2. Average values of soil organic carbon (%), calculated organic carbon stock (t/ha), and total carbon (%) found in soil samples across Bells Park South, Bells Park North and Floodplain habitat. Samples were extracted from either the upper layer of soil (0-15cm) or lower level of soil (15-30cm) within these habitats at Middleton North.

Floodplain habitat generally exhibits greater amounts of organic carbon content, total carbon content and calculated organic carbon stock, especially in upper fractions of soil (0-15cm). This is likely due to the greater diversity of vegetation present, resulting in the breakdown of more organic matter and thus more carbon. Our results from Middleton support this explanation; our soil carbon results from sites which included floodplain habitat tended to demonstrate higher carbon percentages. These results also demonstrate that 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. This is due to the majority of organic matter breakdown by microbes occurring within the topsoil. 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.

Bells Park South and Bells Park North both exhibit lower amounts of carbon in soil, with Bells Park North exhibiting slightly higher values of all three variables, however this difference is not significant.

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

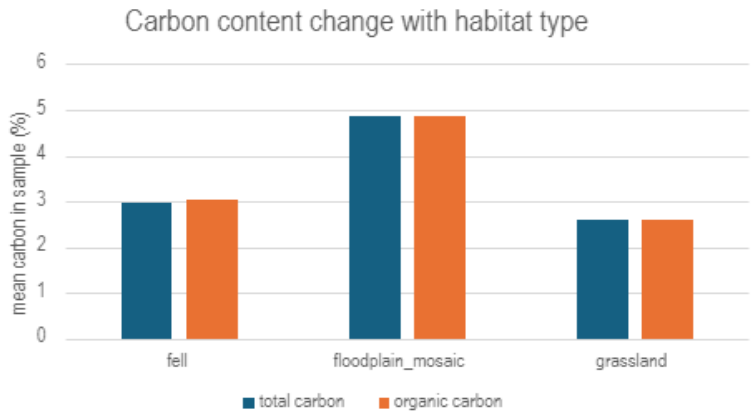


Figure 3. The change in the carbon content of average total carbon (%) and average organic carbon (%) in soil samples between fell, floodplain mosaic and grassland habitat

These results (Figure 3) which incorporate all farms from our Northumberland study sites, show that 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. These results are consistent with the lower vegetative diversity and thus carbon content within Bells Park North and Bells Park South.

Other surveys: 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.

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 can 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.

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

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.

At Middleton North, breeding bird surveys were conducted in June and July 2023 and wintering bird surveys were carried out during each month from November 2023 and February 2024. Some interesting species which were found at Middleton North include the Marsh Tit, Sedge Warbler, and Grasshopper Warbler.

Farm	Date	Total no of species of birds	Breeding	Non-breeding	Red	Amber	Green	Comments
Middleton North	June, July 2023 - April-July 2024	42	25	17	8	13	20	Blackcap, lesser redpoll, linnet, meadow pipit, redstart, reed bunting, sand martins, sedge warblers, willow warblers and yellow hammers all breeding. Grasshopper warbler, swallows, siskin, snipe and tree sparrows flying over or visiting the site. Plus a green sandpiper flying over. Good mix of habitat – hedgerow, woodland, meadow, riverbank.

For full details of all species recorded at Middleton North, please see Appendix

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:

- Floodplain habitats possess the greatest amounts of vegetative diversity and soil carbon, both at Middleton North and all other Northumberland study sites
- Bells Park North and Bells Park South possessed significantly less overall species diversity and were dominated by long and medium grasses, characteristic of less intensively grazed grassland
- At Middleton North, 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
- Soil carbon will continue to increase in floodplain habitats as the number of microhabitats and thus vegetative and invertebrate diversity continues to increase, which will increase soil fertility and ecosystem health
- The continuation of Greenhouse Gas Flux surveys will provide valuable data to show Middleton North's capacity to sequester carbon, and will provide us with a bigger picture to how differing land use practices are affecting these sequestration rates
- A variety of birds of conservation concern, such as the Barn Owl, Marsh Tit and Sparrowhawk, are using Middleton North and other Northumberland sites as either breeding or roosting grounds

Appendix

1a. Bells Park North Planting Plan

Site / Central Grid ref	Species	Species % of net area	No trees	Protection
Shelterbelt Bells Park	SBI Silver birch	25	100	1.2m Shelters
0.34 ha 3m spacings	CAR Common alder	10	30	1.2m Shelters
Cheviot Trees order - plugs	POK Pedunculate oak	15	50	1.2m Shelters
	BCH Bird cherry (sub Sorbus)	5	30	1.2m Shelters
375 shelters	HOL Holly	5	25	
	ASP Aspen	5	30	1.2m Shelters
	GWL sub Salix cinerea	10	25	1.2m Shelters
	WSH - Corylus avellana	10	30	1.2m Shelters
	SP Scots pine	15	100	Mesh guard
			420	

1b. Bells Park North Wood Pasture Blocks Planting Plan

Site / Central Grid ref	Species	Species % of net area	No trees	Protection
Wood Pasture blocks 7 x (9 X 3m) Bells Park - Trees Please order				**Protection**
Canopy trees 2m spacings, 5 per block	OAK		10	1.2m Shelters
	SCOTS PINE		25	Mesh guard
	BEECH		10	1.2m Shelters
Small trees & shrubs at 1m spacings, 24 per block	CRAB APPLE		25	Spirals
	ROWAN		50	Spirals
	HOLLY		40	
	DOG ROSE		40	Spirals
	HAZEL		50	Spirals
	ALDER		50	Spirals
			300	

1c. Former Railway Planting Plan

Site / Central Grid ref	Species	Species % of net area	No trees	Protection
Hedgerow Bells Park	HAWTHORN	60	2,600	Spirals
659m double row 300mm apart, 300mm spacings, 6.66 per m	BLACKTHORN	10	450	Spirals
	HAZEL	10	425	Spirals
Trees Please order	HOLLY	5	210	
	DOG ROSE	5	310	Spirals
	Ligustrum - privet	8	215	Spirals
Hedgerow trees at 16m intervals	OAK	60	40	1.2m Shelters
	BEECH	40	15	1.2m Shelters
			4,265	

1d. Riparian Woodland Planting Plan

Shelterbelt Bells Park	SBI Silver birch	25	100	1.2m Shelters
0.34 ha 3m spacings	CAR Common alder	10	30	1.2m Shelters
Woodland Trust - Railway and Floodplain	*The Scots pine would benefit from mesh guards rather than plastic. The downy birch would be best in the riparian area (wet but not too wet) and silver birch on the railway line. Scots pine – maybe spread between both areas but again not in too damp soils.*			**Protection**
	Downy Birch		160	Shelters
	Scots Pine		200	Mesh guard
	Silver Birch		240	Shelters
	Sycamore (in pots)		100	Shelters
			700	

2. Bird Survey Results

2a. Breeding Bird Surveys

Figure 1A: Registrations at Middleton North (northern section) June 2023

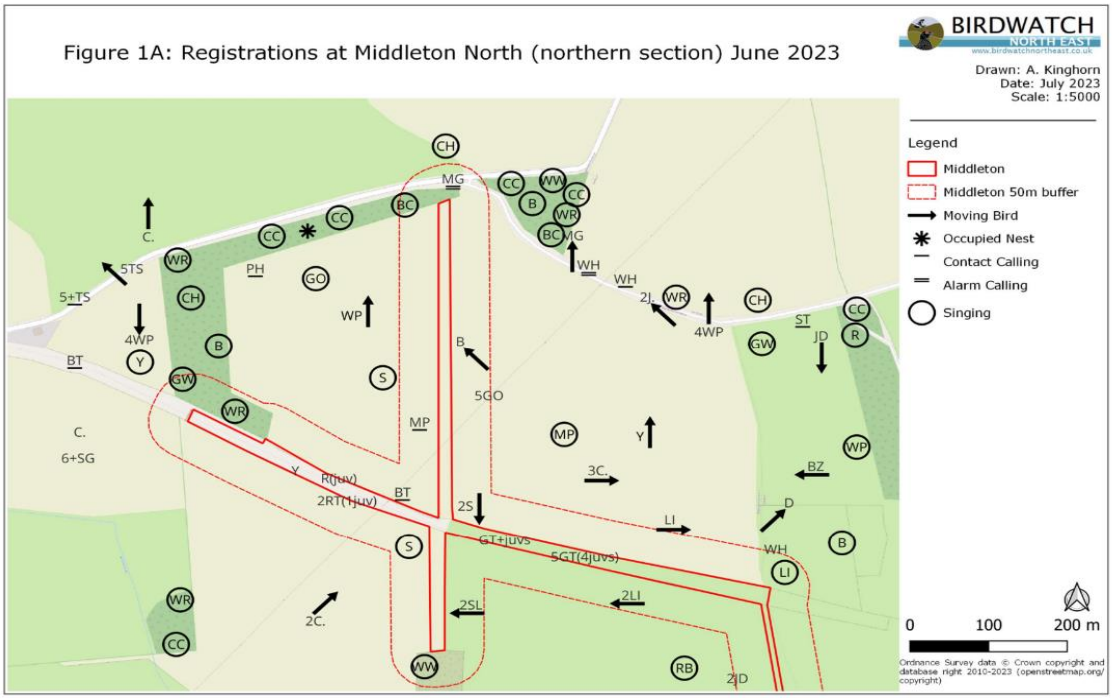
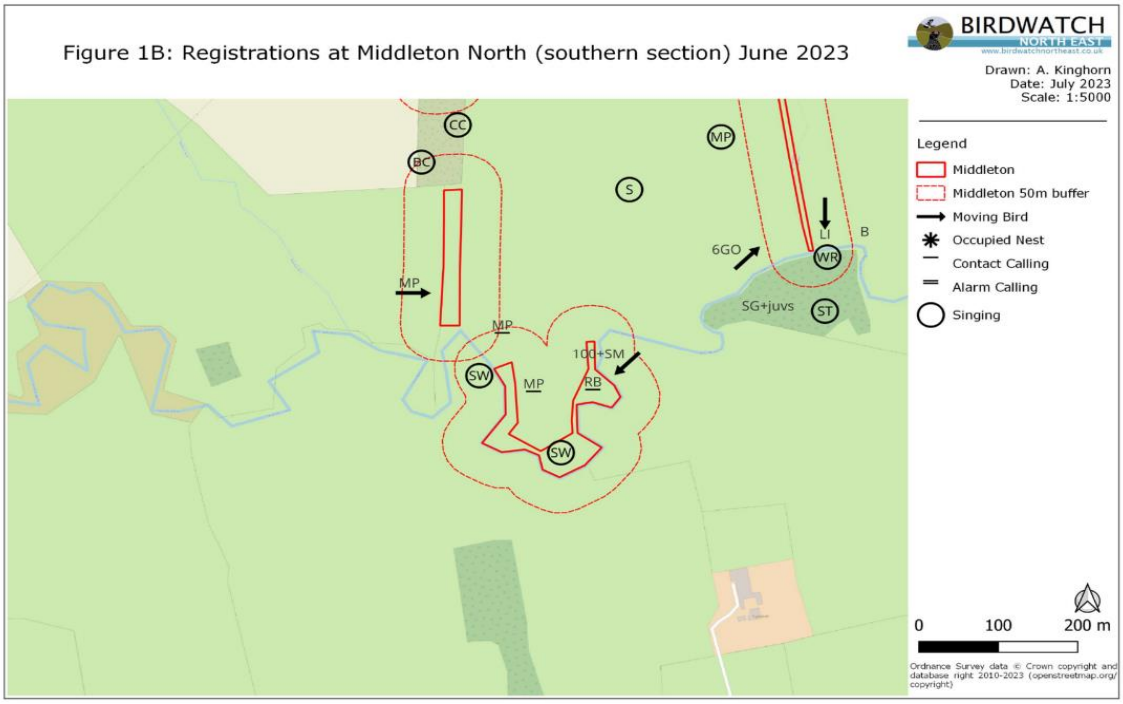


Figure 1B: Registrations at Middleton North (southern section) June 2023



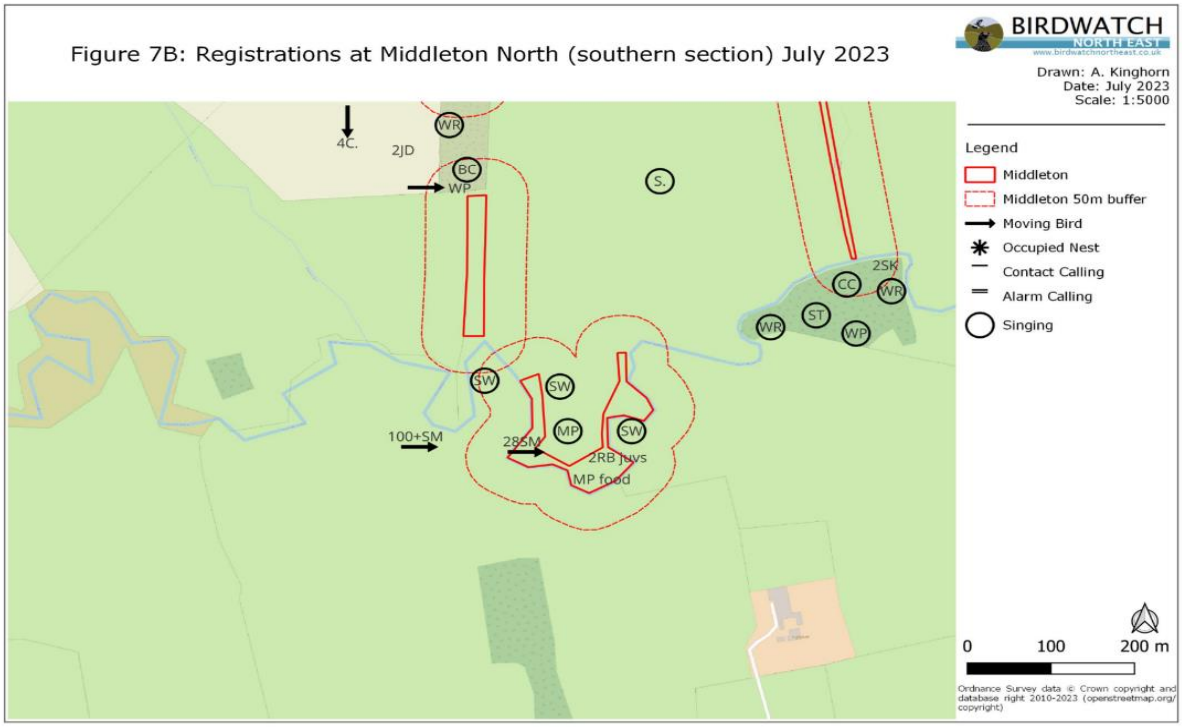


Figure 7B: Registrations at Middleton North (southern section) July 2023
BIRDWATCH NORTH EAST
Drawn: A. Kinghorn
Date: July 2023
Scale: 1:5000
Legend
Middleton
Middleton 50m buffer
Moving Bird
Occupied Nest
Contact Calling
Alarm Calling
Singing
4C.
2JD
WR
BC
WP
S.
2SK
CC
WR
ST
WR
WP
SW
SW
100+SM
28SM
MP
SW
2RB juvs
MP food
0
100
200 m
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2b.

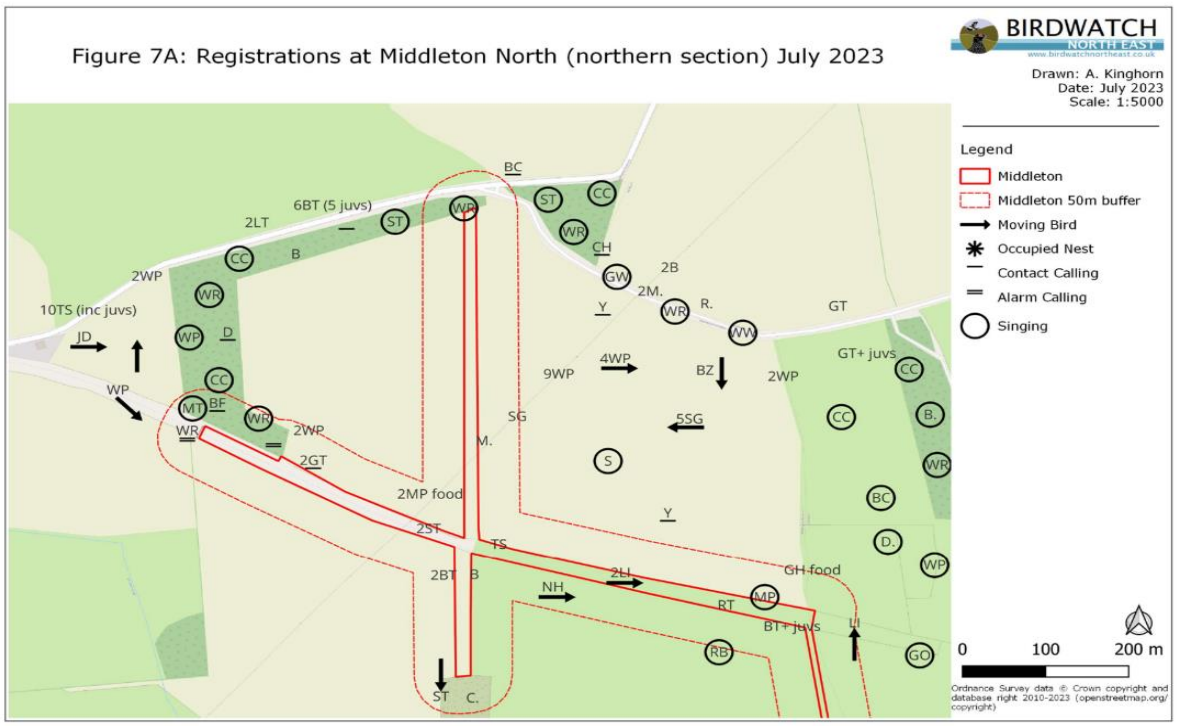
Figure 7A: Registrations at Middleton North (northern section) July 2023
BIRDWATCH NORTH EAST
Drawn: A. Kinghorn
Date: July 2023
Scale: 1:5000
Legend
Middleton
Middleton 50m buffer
Moving Bird
Occupied Nest
Contact Calling
Alarm Calling
Singing
BC
6BT (5 juvs)
2LT
ST
WR
ST
CC
WR
CH
2WP
CC
B
GW
2B
2M.
10TS (inc juvs)
WR
Y
WR
R.
GT
JD
WP
D
WW
GT+ juvs
9WP
4WP
BZ
2WP
CC
WP
CC
MT
BF
WR
WR
2WP
SG
5SG
CC
B.
2GT
M.
S
WR
2MP food
Y
BC
2ST
TS
D.
WP
2BT
B
NH
2LI
GH food
MP
RT
BT+ juvs
LI
RB
GO
ST
C.
0
100
200 m
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Table 3.2: Species recorded during surveys at Middleton.

English Name	Scientific Name	Conservation Status *(Stanbury et al. December 2021).*	Number noted during November Visit	Number noted during December Visit	Number noted during January Visit	Number noted during February Visit	Discussion
Blackbird	*Turdus merula*	Green	12	5	6	6	November's increase could be related to passage birds.
Bullfinch	*Pyrrhula pyrrhula*	Amber	4	13	3	1	A good population, benefitting from largely intact hedgerows.
Brambling	*Fringilla montifringilla*	Green		1			Single bird in December was heard calling.
Barn Owl	*Tyto alba*	Green				1	Roosting in ivy covered tree.
Blue Tit	*Cyanistes caeruleus*	Green	6	8	3	3	Common both on site and in immediate surroundings.
Buzzard	*Buteo buteo*	Green		1	1	1	At least one appeared to be using the site as part of a wintering territory.
Carrion Crow	*Corvus corone*	Green	6	5	3	1	Wintering on site in good numbers.
Chaffinch	*Fringilla coelebs*	Green	10	4	14	2	A common wintering bird around the site and surrounds.
Common Gull	*Larus canus*	Amber		2	1	1	Using the adjacent farmland for foraging opportunities.
Dunnock	*Prunella modularis*	Amber	1	1	5	1	There appeared to be an increase in January, other than that number appeared similar across the period.
Little Egret	*Egretta garzetta*	Green		3			Only seen on one visit, this could be as a result of water levels either in the immediate area or further afield, causing birds to utilise the Wansbeck.
Fieldfare	*Turdus pilaris*	Red	47	46	19	50	Similar numbers appeared to winter on the site, making use of berry laden bushes both on site and in the surrounding area.
Great Black-backed Gull	*Larus marinus*	Amber				3	Seen on one visit only, feeding on nearby pasture and then flew off.
Goldcrest	*Regulus regulus*	Green	1		2		Present in suitable habitat.
Greylag Goose	*Anser anser*	Amber	26				High flying birds over the northern edge of the site were the only registrations made over the period.
Goldfinch	*Carduelis carduelis*	Green	15	3	16	36	Common on site.
Greenfinch	*Chloris chloris*	Red	5		1	2	Scarce on site, with more in November.
Great Spotted Woodpecker	*Dendrocopos major*	Green	1			1	Present in wooded areas adjacent to main site boundary.
Great Tit	*Parus major*	Green	2				Fairly scarce in November then lacking the rest of the winter.
Grey Heron	*Ardea cinerea*	Green		1			A single registration, which seemed to coincide with an increase in presence of Little Egret on the Wansbeck.
Herring Gull	*Larus argentatus*	Red	7		17	2	Primarily flying over the site and using farmland in the vicinity for foraging opportunities.
Jay	*Garrulus glandarius*	Green	1			2	Using wooded areas and hedgerows adjacent to the site.
Jackdaw	*Corvus monedula*	Green		2	5	7	Present.
Kestrel	*Falco tinnunculus*	Amber	1			1	Using the site and surrounding area for foraging opportunities.
Kingfisher	*Alcedo atthis*	Green		1	1		Seen on two visits, utilising the Wansbeck.
Linnet	*Linaria cannabina*	Red	10	38	3	35	Small flocks throughout the winter.

Lesser Redpoll	*Acanthis cabaret*	Red			1	1	Heard calling.
Long-tailed Tit	*Aegithalos caudatus*	Green			1	4	Utilising hedgerows on site and in the immediate vicinity.
Mistle Thrush	*Turdus viscivorus*	Red		1	1		Birds present on two visits; this species can often range widely on a winter territory.
Mallard	*Anas platyrhynchos*	Amber		5			Present primarily around the Wansbeck.
Magpie	*Pica pica*	Green		1			Single bird seen on one visit.
Merlin	*Falco columbarius*	Red			1		A single bird appeared to be hunting passerines that were utilising a field.
Robin	*Erithacus rubecula*	Green	5	1	3	1	Present throughout the period.
Pheasant	*Phasianus colchicus*	No Status		1			Only one registration made.
Reed Bunting	*Emberiza schoeniclus*	Amber	2		11	2	Absence in December but present in other months with a slight increase in January.
Redwing	*Turdus iliacus*	Amber	14				In with Fieldfares.
Rook	*Corvus frugilegus*	Amber		18	13		Utilising the surrounding pasture for foraging and commuting over the site.
Skylark	*Alauda arvensis*	Red	13	2	3	4	Present in November in good numbers, this then dropped with fewer staying to winter on site before then starting to sing again during February's visit.
Stonechat	*Saxicola rubicola*	Green			1		Only a single bird noted during the period.
Sparrowhawk	*Accipiter nisus*	Amber		1		2	Likely using the site for hunting opportunities on account of good numbers of wintering passerines.
Starling	*Sturnus vulgaris*	Red			12	10	Mostly commuting over the site and surrounding area.
Siskin	*Spinus spinus*	Green		1			Heard calling.

Snipe	*Gallinago gallinago*	Amber	10	13	6		Present in good numbers through most of the period. A lack of presence in February could be related to birds moving back to breeding areas.
Song Thrush	*Turdus philomelos*	Amber	1	1	1	2	Present on site during every visit.
Teal	*Anas crecca*	Amber		130	17	5	Primarily around the Wansbeck where there was foraging opportunities available for the species.
Treecreeper	*Certhia familiaris*	Green			1	1	Present in surrounding areas, primarily wooded areas.
Woodpigeon	*Columba palumbus*	Amber		26	2		Present on site and commuting over.
Wren	*Troglodytes troglodytes*	Amber	6	6	6	4	Present in relatively stable numbers throughout the winter.
Yellowhammer	*Emberiza citrinella*	Red	3	5	3	8	Present in good numbers, seemingly to increase as the winter period went on.