ST EDMUND HALL BIODIVERSITY AUDIT RESULTS

June 2025

Sophie Mason, Abi Lovelock-Blair

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Background

Data collection for the 2025 St. Edmund Hall Biodiversity audit was completed in June of 2025. Data collection methods were replicated from the June 2023 audit except for the addition of a plant biodiversity survey. Outlines of our methods and any changes to previous years can be found throughout the document. This report details the data collected in 2025 compared with the 2023 and 2021 baseline data for insects, birds, and earthworms, representing datapoints for St Edmund Hall to establish biodiversity trends and assess progress towards biodiversity restoration goals. Land and Tree cover were not surveyed and details of the College's Land and Tree cover and carbon audits from 2021 are reported after the updated sections of the audit.

Acknowledgements

Thank you to Professor Henrike Lähnemann and Duncan Lyster for taking part in the bird audit at the Queen's Lane and Norham Gardens sites respectively. Thank you to Kieran E. Storer for guidance on how to conduct the audit. Abi Lovelock-Blair (JCR representative) and Sophie Mason (MCR representative) were responsible for the data collection of plants, insects and earthworms, overall analysis and reporting of audit results. Thank you to Dr Jonathan Green and Professor Tim Barraclough of the Department of Zoology for producing resources and developing methodologies of the original 2021 audit. Thank you to Joel Footring, Katey Fisher, Amelia Jeffery, Abigail Barker and Tom Badenhorst from NatCap Research Ltd for producing and analysing the land cover data in 2021.

Overview

Table 1 below shows the St. Edmund Hall biodiversity dashboard for the groups measured in 2021, 2023, and 2025; birds, earthworms, and insects, alongside the addition of plants biodiversity in 2025.

The overall trends in this data are a decline in the number of earthworms, an increase in the abundance of insects, and no major changes to the bird diversity. As plants were surveyed for the first time this year no conclusions can be drawn yet. Detailed accounts of these changes can be found in each group's dedicated section below.

Table 1: *St Edmund Hall Biodiversity Assets Dashboard: 2021, 2023 and 2025*

Birds	2021	2023	2025	Unit
Species Richness	17	25	21	No. of Species
RSPB Birds of Conservation Concern Red	4	3	3	No. of Species
RSPB Birds of Conservation Concern Amber	5	5	3	No. of Species
RSPB Birds of Conservation Concern Green	9	17	15	No. of Species
Earthworms	**2021**	**2023**	**2025**	**Unit**
Soil Feeding	1	7	1	No. of worms
Deep Living	0	4	0	No. of worms
Surface-Feeding	0	5	0	No. of worms
Insects	**2021**	**2023**	**2025**	**Unit**
Total Abundance	500	244	1570	Count
Flies – Diptera	332	108	673	Count
Beetles (including ladybirds and weevils) - Coleoptera	28	34	78	Count
Hymenoptera (including ants, bees and wasps)	126	102	808	Count
Plants	**2021**	**2023**	**2025**	**Unit**
Species Richness	N/A	N/A	15	No. of Species

Insects

Blue and yellow pan traps were deployed at three locations on the main site and two locations offsite, totalling 10 traps across the College properties (5 blue, 5 yellow). On the main site, the same what3words locations were used as previously in the 2023 and 2021 audits. Due to building works and difficulties with access, the offsite locations were changed for the 2025 audit to random what3words locations in the gardens of 26 Norham Gardens and 1 Crick Road. The changes in location between audits are reflected in table 2.

Table 2: *What3words locations of 2025 insect trapping*

Main site	Offsite
lawn.divisons.frozen	tells.fake.stacks (2025)
fairly.native.fend	estate.occurs.boost (2025)
yard.organ.double	pushy.dates.digit (2023, 2021)
	mile.cheese.mile (2023, 2021)

Results

The overall abundance of insects trapped was much greater in 2025 than in previous years, see figure 1A. In 2025, a total of 1570 insects were trapped, which is approximately 3 times as many as in 2021 and 6 times as many as in 2023.

Table 3: *Abundance of insects trapped in St Edmund Hall sites broken into categories.*

Phylogenetic Family	Phylogenetic Sub-Groups	Year		
		2021	2023	2025
Coleoptera (Beetles)	Ladybirds	6	0	2
	Weevils	5	0	0
	Other beetles	17	34	76
Diptera (Flies)	Hoverflies	3	2	12
	Other flies	329	106	661
Hymenoptera (Bees, Wasps)	Pollinating bees and wasps	14	7	46
	Parasitoid wasps	112	95	728
	Ants	10	0	46
Other	Moths and butterflies	0	0	1
	Earwigs	0	0	1
	True bugs	4	0	7
	Total	**500**	**244**	**1570**

The number of insects trapped at the two new offsite locations in 2025 was much greater than the number trapped at the previous offsite locations in 2023 and 2021, see figure 1B, whilst there was no major change to the main site locations. Therefore, the overall increase in abundance is mainly due to the change to the offsite sampling locations. The strip of meadow-like planting in the garden of 1 Crick Road is likely to be the cause of the increased insect abundance at tells.fake.stacks. It would be advisable to return to the previous offsite locations in future years because the 2025 offsite locations are skewing the data, and counting 1570 insects is much greater task than 200-500. However, specifically at the total insect abundance on the main site, see figure 1C, shows that there was also an increase there in 2025. There was an issue with the traps at yard.organ.double being emptied in 2023, which in part explains the lower abundance that year. Overall, there is a positive trend in insect abundance within the College grounds.

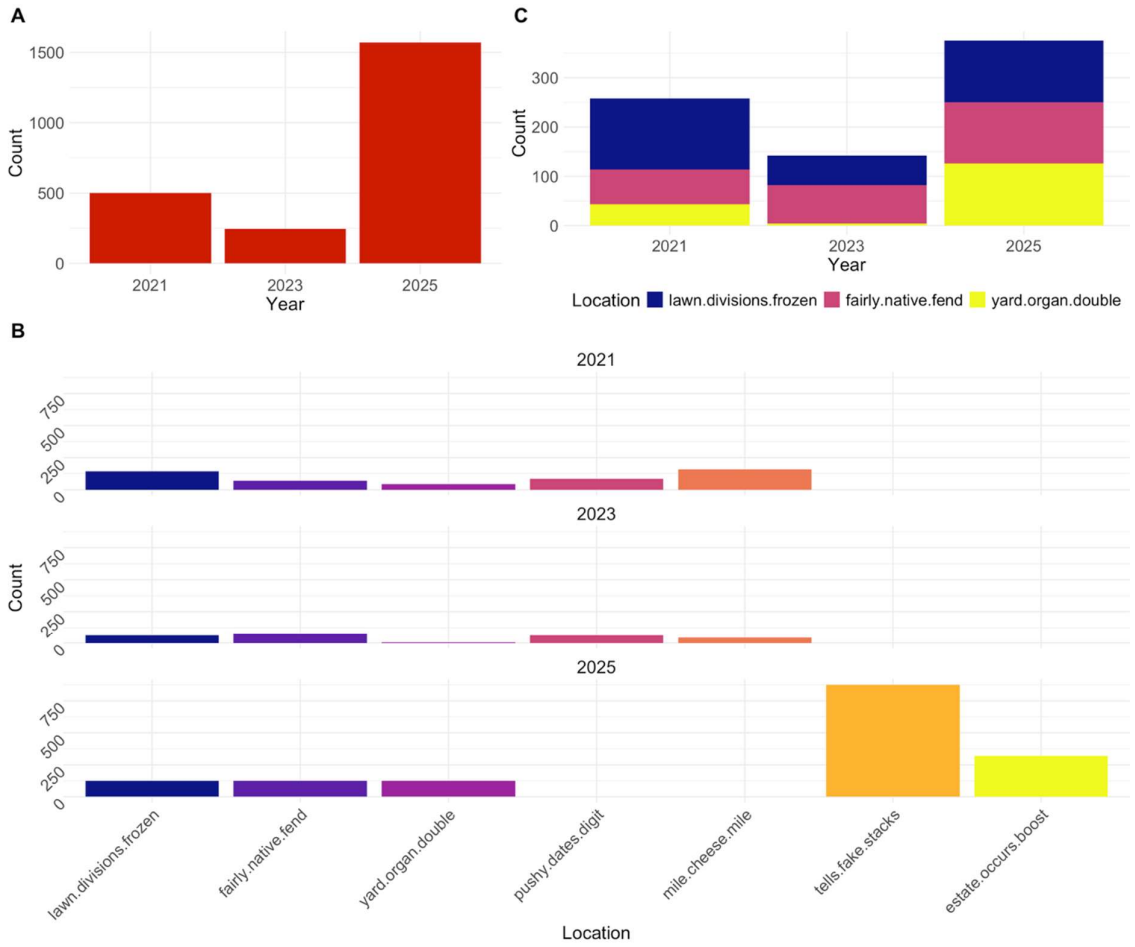


Figure 1: A) *The total insect abundance (count) over the three audits.* ***B)*** *Insect abundance split by year and sampling location.* ***C)*** *Total insect abundance at the main site locations split by year and divided by sampling locations.*

Similar to the previous years, the most prevalent insect groups in 2025 were the parasitoid wasps and the flies, followed by the beetles, see table 3. Figure 2A shows the

proportions of the three main phylogenetic families over the three audits. The piechart highlights the inflated numbers of Dipterans (flies) and Hymenopterans (Bees, Wasps and Ants) resulting from the high counts of other flies and parasitoid wasps. Fig. 2B examines the insect diversity outside of the most abundant groups by excluding the other flies and parasitoid wasp. This shows that 2025 and 2021 insect surveys collected the more diverse datasets than the 2023 survey. 2025 was the first time a butterfly/moth and an earwig were found in the samples.

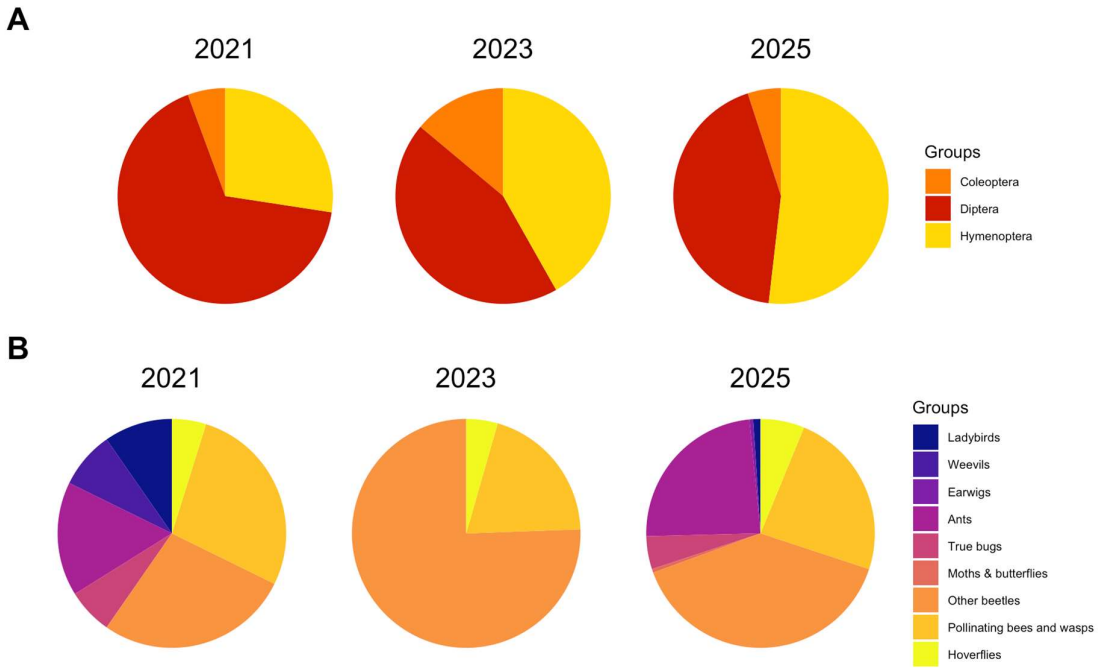


Figure 2: A) *Proportions of the main three insect phylogenetic families.* ***B)*** *Insect biodiversity, excluding the other flies and parasitoid wasps.*

Birds

Bird species were identified by sight and by sound using the Merlin phone application. Records were then compiled and categorised by RSPB Birds of Conservation Concern (BoCC) status; green, amber, red. The complete list of bird species found is also included and grouped by conservation concern status. Bird species were audited at two locations on the main site: the main Churchyard and Broadbent Gardens, and at three offsite locations in Norham Gardens.

Results

The bird species richness recorded in 2025 is in line with the previous audits and the distribution of species across the BoCC categories has not changed significantly, see figure 3. The specific set of species observed has changed each auditing year, see table 4. Some species were not recorded again this year, but other new species were observed instead.

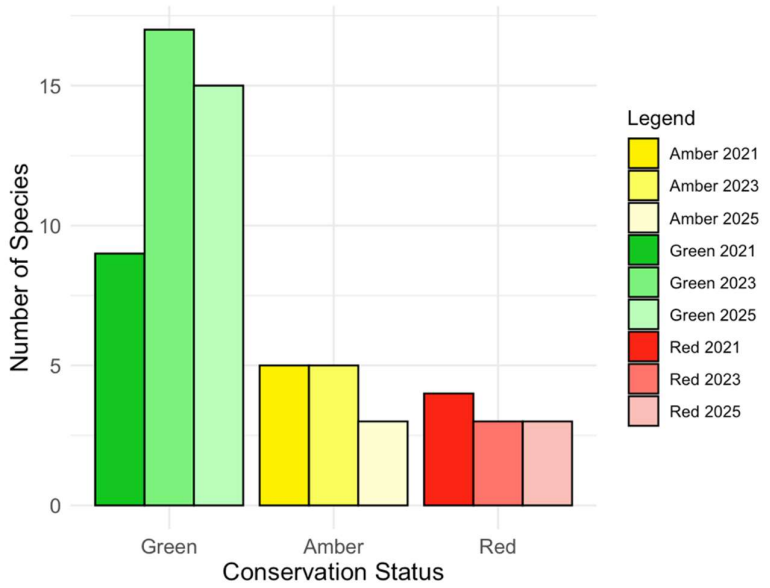


Figure 3: *The conservation status of birds recorded on St Edmund Hall sites according to the RSPB Birds of Conservation Concern list (green, amber, red). Audit year is distinguished by colour saturation.*

Table 3: *Bird species recorded at St Edmund Hall sites over the three audits.*

Green Listed Bird Species			
Species	2021	2023	2025
Blackbird	x	x	x
Blackcap			x
Blue Tit	x	x	x
Carrion Crow	x	x	x
Chaffinch		x	x
Chiff-chaff			x
Coal Tit		x	x
Collared Dove		x	
Eurasian Jay		x	
Goldcrest		x	x
Goldfinch		x	x
Great Spotted Woodpecker	x	x	
Great Tit	x	x	
Jackdaw	x	x	x
Long Tailed Tit		x	
Magpie		x	x
Nuthatch			x
Robin	x	x	x
Rock pigeon			x
Rook	x	x	
Swallow		x	
Tree Creeper	x		x
Total	9	17	15

Amber Listed Bird Species			
Species	2021	2023	2025
Black Headed Gull	x		
Bullfinch		x	
Common Gull		x	
Common Whitethroat	x		
Song Thrush		x	x
Stock Dove	x		
Wood Pigeon	x	x	x
Wren	x	x	x
Total	5	5	3

Red Listed Bird Species			
Species	2021	2023	2025
Greenfinch			x
House Sparrow		x	
Marsh Tit	x		
Mistle Thrush		x	x
Spotted Flycatcher	x		
Swift	x	x	x
Yellow Wagtail	x		
Total	4	3	3

Earthworms

Earthworm surveys were conducted, following the methods of the Earthworm Watch, at expect.showed.plug and having.waddle.sketch; the latter differs from previous audits because defeat.limbs.shark was inaccessible.

Results

In 2021, there was only one earthworm found across the two sampling locations. In 2023, there were sixteen earthworms counted, with surface-feeding, soil-feeding, and deep-living worms all present. In 2025, again only one earthworm was found across the two sampling locations. The count data is shown in table 4. Weather conditions appear to have a severe impact on the earthworm abundance. Both 2021 and 2025 had warm dry weather prior to the survey, whereas 2023 had wetter weather. An improvement to the method could be to exploit wet weather within the sampling period and stipulate that earthworm sampling should be carried out after a rainy day. This would reduce the impact of differences in weather immediately prior to the sampling day. Or perhaps, it would be interesting to survey the earthworm population on the College's main site, particularly the new meadow in the Churchyard.

Table 4: *Annual earthworm counts broken into types.*

Earthworm Type	Year		
	2021	2023	2025
Surface feeding	0	5	0
Soil feeding	1	7	1
Deep Living	0	4	0

Earthworms are essential nutrient cyclers. Earthworms are important for maintaining soil quality and fertility and facilitating carbon storage by incorporating organic material into soils. The roles of each group of earthworms was described in the 2023 audit report and is repeated below:

- **"Soil feeding (endogeic) earthworms** – Live and feed in the top 20cm of soil, rarely coming to the surface. They make horizontal burrows as they feed on the soil, which help mix air into the soil and improve drainage. There are eight species in the UK.
- **Deep living (anecic) earthworms** – This type of earthworm makes deep vertical burrows into which they pull leaves to eat during the night, locking carbon into the soil. Their feeding activity modifies the soil structure through the creation of their vertical burrows and increases macro-porosities, aeration, and water

infiltration into the deeper soil. There are only three species of deep-living earthworms in the UK.

- **Surface feeding (epigeic) earthworms** – These do not make burrows but live on or near the surface of the soil and eat dead leaves, breaking them down into compost. This decomposition of organic material at the soil surface increases nutrient transformation and helps to stimulate activity of microorganisms. This is the largest group of earthworms in the UK, with 12 species."

Baseline surveys of all colleges in 2021 found that soil feeding worms were the most common (65% of worms), followed by surface feeding worms (21%) and deep living worms (14%). Soil-feeding earthworms have remained the most common over all three of the College's biodiversity audit surveys.

Plants

Plant species were surveyed within the Churchyard of the main site using 25" x 25" quadrats at three random what3words locations: bronze.soaks.much, earth.cards.issued, and punch.desks.cases. Plant species were identified using the Seek phone application and common names were recorded. Records were compiled and Royal Horticultural Society (RHS) website was used to research the importance of the plants to insect life.

Results

Plant species richness was found to be 15 species, see table 5. The Churchyard is not mown during May to June and therefore becomes a wildflower meadow during the early summer months. The majority of plants recorded were UK native species, typical of wild grass meadow areas and included many flowering plants listed on the RHS Plants for Pollinators 2025 list. The sampling was carried out in mid-June this year. It would be better to conduct the plant survey twice, in May and June, in order to capture a more representative picture of what grows in the meadow between spring and summer. This was the first year the plants were surveyed as part of the Biodiversity Audit, repeated surveys in future years will give insight into how wild plant diversity is changing in the College grounds. In reality, plant biodiversity within the College's main site is much greater than this survey indicates, because the planted species in the herbaceous borders and other areas of the site were not included.

Table 5: *List of the plant species recorded within the St Edmund Hall graveyard.*

Common name	Scientific name	Information	Native to UK?
Cleavers	*Galium aparine*	Eaten by caterpillars	Yes
Common Cat's ear	*Hypochaeris radicata*	RHS Plant for Pollinators	Yes
Common Ivy	*Hedera helix*	RHS Plant for Pollinators	Yes
Common Vetch	*Vicia sativa*	RHS Plant for Pollinators	Yes
Cow Parsley	*Anthriscus sylvestris*	Provides early nectar	Yes
Dandelion	*Taraxacum*	RHS Plant for Pollinators	Yes
Hanging Sedge	*Carex pendula*	Grass	Yes
Iris (species unknown)	*Iris*	May provide nectar to pollinators	Depends on species
Meadow Buttercup	*Ranunculus acris*	RHS Plant for Pollinators	Yes
Mint (species unknown)	*Mentha*	May provide nectar to pollinators	Depends on species
Red Fescup	*Festuca rubra*	Grass	Yes
Ribwort Plantain	*Plantago lanceolata*	-	Yes
Smooth Meadowgrass	*Poa pratensis*	Grass	Yes
Thistle (species unknown)	*Cirsium*	RHS Plant for Pollinators	Yes
Wood violet	*Viola riviniana*	-	Yes

Land Cover, Carbon storage and sequestration

The following results are a reprint of the 2021 data collection and analysis by Nat Cap Research Ltd. It is recommended that this data is recollected within the next few years to note the recent changes to land cover in the main site, such as the new wildflower meadow in the Churchyard, and the increase of land cover at Norham Gardens.

Results

The majority of landcover on the St Edmund Hall sites is composed of mowed lawn and trees, with relatively few areas of meadow and uncut grass.

Table 6: *Asset register of estimated land cover types*

Landcover	Area (ha)
Trees	0.27
Mowed lawn	0.29
Wetlands and water meadows	0.00
Herbaceous borders and flower beds	0.14
Meadow and uncut grass	0.03
Water	<0.01
Other	0.98
Total	1.71

Figure 4: *Main Site Land Cover Map, Queens Lane*

Figure 5: *Offsite Land Cover Map, Crick Road*

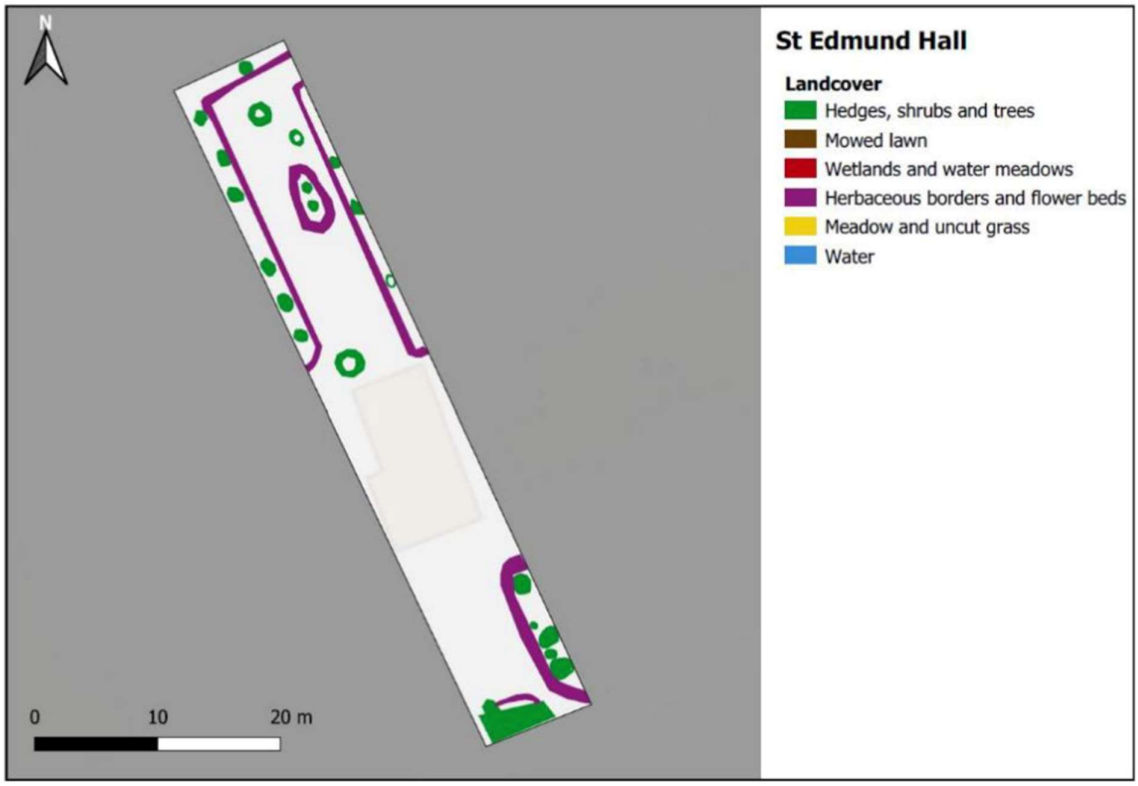


Figure 6: *Offsite Land Cover Map: 24-26 Norham Gardens*

Figure 7: *Offsite land cover: Norham Gardens*

The estimated amount of accumulated carbon (tonnes) that is stored in the different landcover types on the St Edmund Hall site is detailed in table 7. These results indicate that the trees on the site currently store the greatest amount of carbon (in trunk, branches, leaves, and roots).

Table 7: *Accumulated carbon estimates*

	Carbon Stocks		
Landcover	Area (ha)	Total (tonnes of carbon)	% of total
Trees[2]	0.27	24.59	97.60
Mowed lawn	0.29	0.29	1.14
Wetlands and water meadows	0.00	-	-
Herbaceous borders and flower beds	0.14	0.29	1.14
Meadow and uncut grass	0.03	0.03	0.12
Water	<0.01	0.00	0.00
Total	0.73	25.20	

Figure 8: *Map indicating the spatial distribution of carbon stored by the different landcover types across the St Edmund Hall main site.*

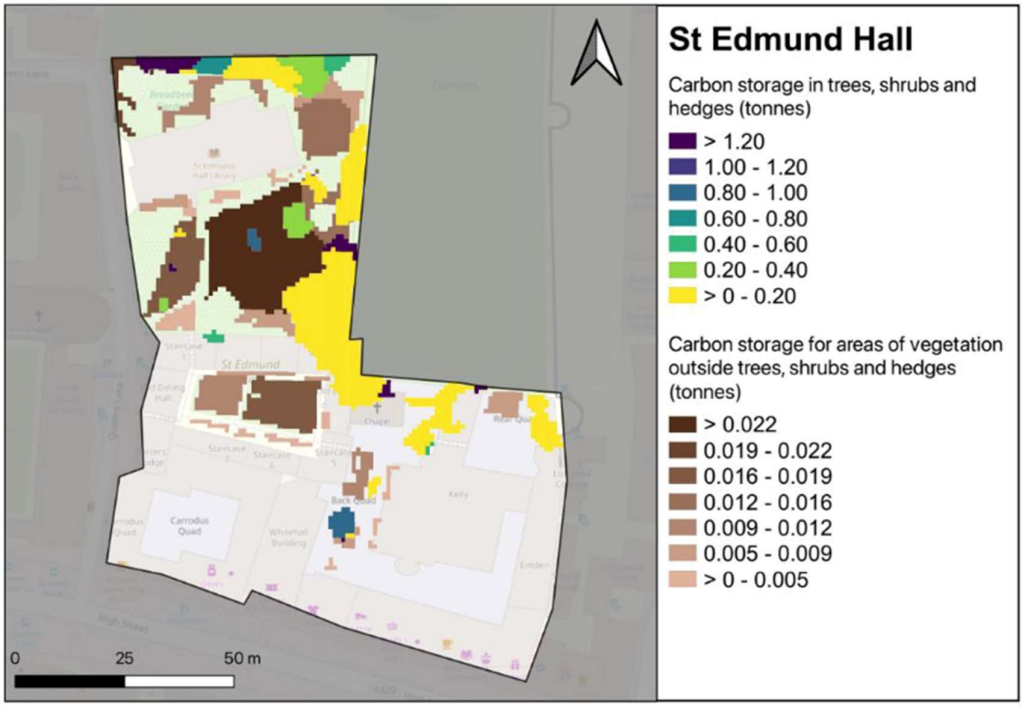
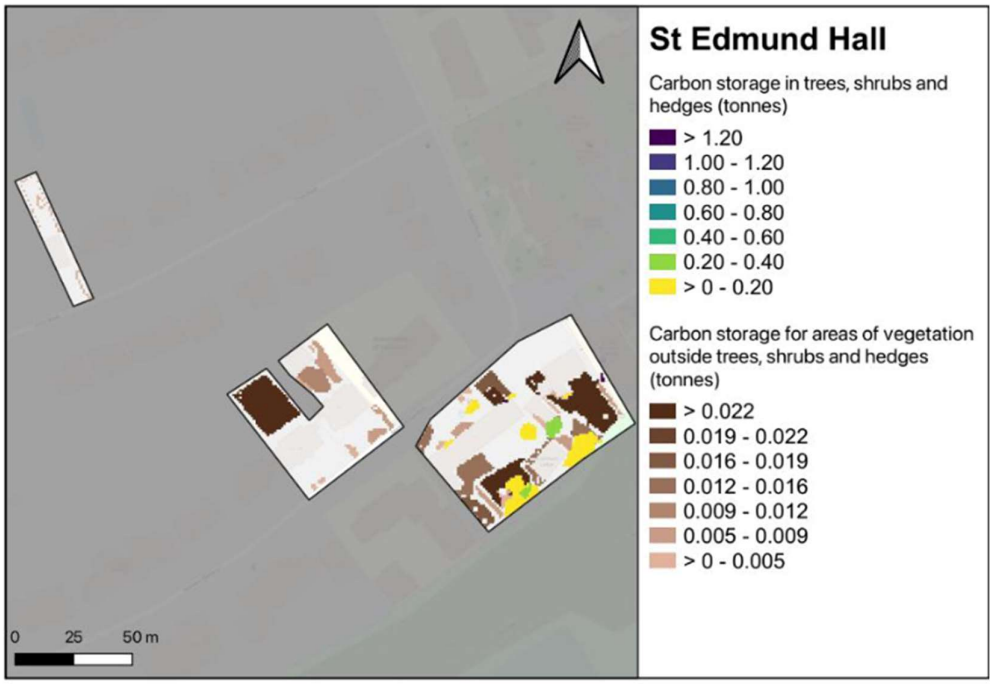


Figure 9: *Map indicating the spatial distribution of carbon stored by the different landcover types across the St Edmund Hall annex sites.*



The estimated amount of carbon (tC/yr) being drawn down from the atmosphere by the vegetation each year and stored as woody biomass at the St Edmund Hall site is detailed in figs. 10 and 11. As with carbon storage, the greatest drawn-down each year is from the trees on the College site.

Figure 10: *Map indicating the spatial distribution of carbon sequestered (tC/yr) by the different landcover types across the St Edmund Hall main site*

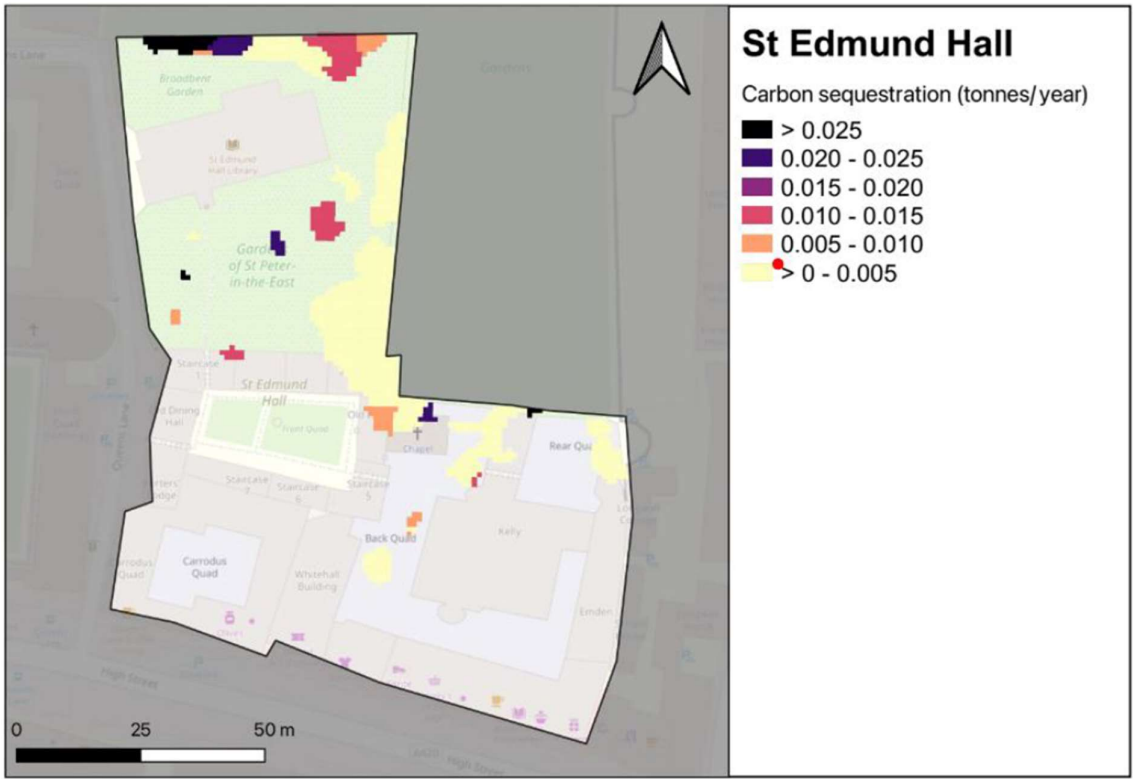
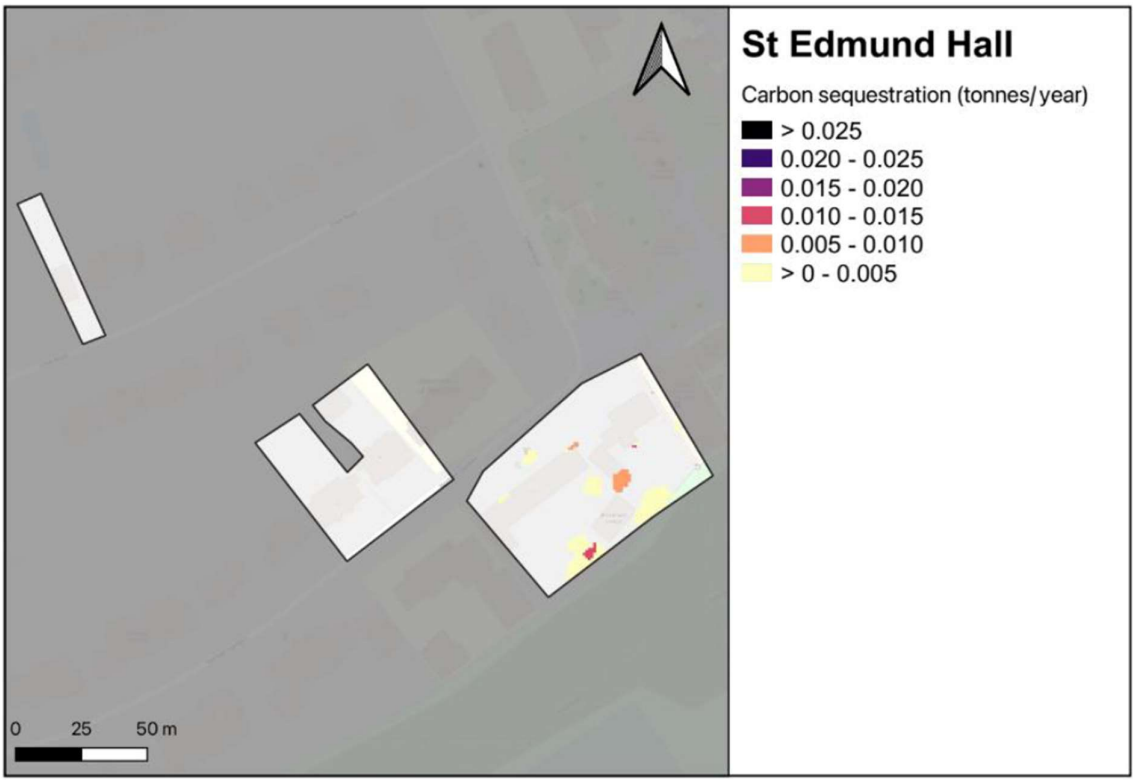


Figure 11: *Map indicating the spatial distribution of carbon sequestered by the different landcover types across the St Edmund Hall annex sites*



Methods

Estimating carbon storage and sequestration

Colleges were provided with a set of landcover maps for their sites. Colleges identified six different categories of land cover (water; mowed lawn; meadow and uncut grass; wetlands and water meadows; herbaceous borders and flowerbeds; hedges, shrubs, and trees) which were recorded directly onto the maps using a simple colour code.

Trees

Tree species and circumference were measured as part of the survey conducted by members of the college community. Tree diameter was then calculated from tree circumference. Tree height was obtained for each measured tree using the National Tree Map. This data was then processed in i-Tree Eco, software that uses allometric equations from the scientific literature to predict carbon storage and sequestration. These values were then assigned to each respective tree to produce the final map outputs. Additional carbon stock values for non-woody vegetation were taken from 'Carbon Storage and Sequestration by Habitat 2021 (NERR094)'.

The landcovers retrieved were modified grassland for mowed lawn, wetlands, nursey and horticulture for herbaceous borders and flower beds, lowland meadows for meadows and uncut grass, and standing open water and canals. The tonnes of carbon per hectare and the landcover areas were used to calculate the tonnes of carbon for each landcover using QGIS.

Bird counts

The previous what3words locations were used, except for the front quad and back quad, as they were deemed too noisy and built up for any useful results. Bird surveys were completed early in the morning (4:30-5:30am) of early summer (June). Participants used the Merlin Bird ID app to identify birds from their song and by sight.

Insect counts

Sampling took place in June-July at multiple sites within the College grounds using coloured pan traps (yellow and blue to attract a diversity of insects). The selected sites encompassed a range of habitats, including flower beds, meadows, allotments, and sports grounds. The pan traps that were used specifically target insects that visit flowers: some may visit flowers for nectar, while others may eat other parts of the plant (e.g. leaves, pollen). Pan traps were left for two days half full with water plus dish soap, and checked daily to refill the soapy water. At the end the liquid was sieved to collect the trapped insects, and these were stored in 70% ethanol at 4ºC. The insects were then identified and counted over the long vacation.

Earthworm counts

Sampling took place in 2 locations offsite at 24-26 Norham Gardens. The what3word locations were expect.showed.plug and having.waddle.sketch. The Earthworm Watch Instruction booklet was followed (available online). The equipment used was: a tray, water, mustard powder, vinegar, a trowel.

Plant counts

Sampling took place in 3 locations within the Churchyard in June, specifically within the wildflower meadow area. Quadrats were 25x25inches and all plant species found within were recorded. Abundance was not counted. The app 'Seek' was used to identify any unknown plants.

References

Many of the methods that were followed have been used for academic research elsewhere. You can read further details in the following publications and websites:

BirdNET: A deep learning solution for avian diversity monitoring. Kahl et al., 2021
Drivers of avian species richness and community structure in urban courtyard gardens,

Biroli et al., 2020. This is existing data on birds in Oxford colleges from an undergraduate project.

Soil health pilot study in England: Outcomes from an on-farm earthworm survey, Stroud, 2019

Earthworm Watch is a collaboration between Earthwatch Institute (Europe) and the Natural History Museum in London. Further information about the research behind their survey is available on the Earthworm Watch website.

Optimising coloured pan traps to survey flower visiting insects. Vrdoljak & Samways, 2012.

Measuring bee diversity in different European habitats and biogeographical regions, Westphal et al.

i-Tree Tools for assessing and managing forests and community trees: Resources and Overview Camden i-Tree Inventory Report

RHS Plants for Pollinators 2025 list can be viewed on the RHS website.