



Nature in Harmony 2021



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A report on the Nature in Harmony project wildlife surveys undertaken throughout 2021 in the Diamond Wood and Harmony Woods, Andover, Hampshire.

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ABSTRACT

Until 2020, there has been little available wildlife data for Harmony Woods and the wider Diamond Wood in Andover, Hampshire. Since 2016, some data has been collected from a registered Butterfly Conservation transect in Harmony Woods, but little historic data has been available.

Having a baseline dataset is key in monitoring wildlife, as it allows you to identify trends in species populations and ecological communities over time. Monitoring wildlife will also allow the identification of any invasive or competitive species, as well as any priority and at-risk species - both of which may require special attention.

This report builds upon the Nature in Harmony 2020 report, adding to the first baseline dataset and species list of the plants and animals observed in the 44-acre site from April - October 2020 & 2021.

Bird, pollinator and plant data is grouped into the west and east sides of the wood to reflect the difference in land management style between each end. It is asked whether this difference in management style has led to any significant differences in biodiversity in birds, pollinators and plants between each end.

Birds and pollinators were more diverse in the west. Plant diversity was not significantly different across both ends, however, species composition was notably different between each end.

Butterfly diversity increased in 2021 despite a much lower sample size. There was the greatest increase in species identified in the Lepidopteran family, plus several new additions to the complete species list including species of bat, bird, spiders and other invertebrates.

Reasons for this year's findings and their wider implications are discussed, with a focus on the pros and cons of citizen science.

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INTRODUCTION

Until 2020, when the Nature in Harmony project began, there has been little available wildlife data for Harmony Woods and the wider Diamond Wood in Andover, Hampshire. Since 2016, some data has been collected from a registered Butterfly Conservation transect in Harmony Woods, but little historic data has been available.

Having a baseline dataset is key in monitoring wildlife, as it allows you to identify trends in species populations and ecological communities over time. Monitoring wildlife will also allow the identification of any invasive or competitive species, as well as any priority and at-risk species - both of which may require special attention.

The Nature in Harmony project provided the first baseline dataset of the site, set up methods for ongoing monitoring, and will allow the land managers (Andover Trees United) to make more informed decisions to better conserve their habitats and species.

The Nature in Harmony project also provides ongoing opportunities for citizen science and community engagement in environmental education. This meets Andover Trees United's constituted aims.

Before 2012, the 44-acre site was agricultural, growing kale and rape, although no historic data exists, it is assumed that the biodiversity of plants and animals would have been lower than it is today due to crop homogeneity.

The site was set aside by the Trinley Estate for the Andover Trees United (ATU) community planting project 'Harmony Woods' and for a Queen Elizabeth Diamond Jubilee woodland in 2012, supported by Hampshire County Council. Since 2012, the site has been owned and part-managed by Hampshire County Council. Harmony Woods, a 12-acre section of the site, has been managed by ATU. In 2020, Andover Trees United agreed to take on the management rights to the entire 44 acre site.

The Diamond Wood, and Harmony Woods, offer a unique opportunity to survey separate pockets of land that vary in their land management and land use.

The eastern end of the woods was planted with trees and sown with fescue grass in 2012/13, since then it has been left with very little land management input. It contains an area of mixed deciduous woodland, a hazel stand and chalk grassland. The east also contains a public right of way and is used frequently by walkers and local residents from an adjacent housing development who walk their dogs.

The western end contains Harmony Woods, which is surrounded by 2 main pathways. The 2 pathways are similarly managed and used as the pathways in the eastern end. However, the Harmony Woods section has been carefully managed since 2012 by Andover Trees United volunteers and the community of Andover.

It has been used by ATU for environmental education and nature connection. The wooded area has grown in succession with 1000 new native British trees planted every year since 2012, rather than all being planted at once as was done in the east. A conscious decision was made by ATU to involve all young people and all educational establishments within the Andover catchment area (Andover and surrounding villages) in this woodland creation.

A chalk wildflower meadow has also been created, which is cut and raked on a yearly basis to mimic grazing. A chalk scrape has been dug as well as a wildlife pond, and very recently some new pinch points to help reduce the size of the surrounding pathways and encourage more animals to migrate into the space.

Harmony Woods is a space where a team of volunteers come together to care for nature with environmental conservation in mind.

In 2020, with an agreement for ATU to take on the management rights to the entire 44 acre site, it will be interesting to see how the land management, land usage and, as a result, biodiversity and species composition of the west and the east changes over time.



The Diamond Wood site consists of priority habitats including lowland deciduous woodland, hedgerow and lowland calcareous grassland.

Chalk meadows are incredibly rare and important habitats. They are among the most species rich in the UK. However, they have declined immensely over the second half of the 20th century due to a variety of causes, including agricultural improvement, urban development and abandonment where management cannot be continued or is no longer economically viable (Natural England). Lowland calcareous grassland is still under threat and rare, covering around 3% of England's land area, with an estimated total area of lowland calcareous grassland in England of 38,687 ha. The greatest risk to lowland calcareous grasslands are fragmentation, under or over-grazing and nutrient enrichment from atmospheric nitrogen deposition (Natural England, 2020).

Priority species (UK Post-2010 Biodiversity Framework, 2012) identified from the Nature in Harmony wildlife surveys include: Skylark, Common Linnet, Corn Bunting, Yellowhammer, Grey Partridge, Swift, House Martin Common Starling, Brown Hare, Small Heath butterfly, Small Blue butterfly, Marsh Fritillary butterfly, Forester, Argent & Sable moth, Galium Carpet moth, Speckled Footman moth, Dingy Mocha moth, Should-striped Wainscot moth, Cinnabar moth, Garden Dart moth, White-line dart moth, White Ermine moth.

Harmony Woods forms the location for many community outreach activities such as green craft workshops, citizen science and volunteer work days. The site is used as a learning resource, community space and volunteer base and sits within 200m of Augusta Park, a large residential estate on the edge of Andover and just south of the village of Enham Alamein. This provides an interesting opportunity to consider how wild nature spaces may be impacted by being so close to the urban town, for example whether footfall from humans and their dogs may impact ground nesting bird populations.

Overall, it is clear to see how this community-planted woodland, Harmony Woods, is of high ecological value, as well as sentimental and educational value, and why it is important to monitor and carefully manage the wildlife that resides here, and the visitors who pass through.

This report presents the results of year 2 of the wildlife monitoring programme 'Nature in Harmony'.



Field Scabious amongst a yellow background
of Lady's Bedstraw in Harmony Woods.
Photo by Kym Welsh.

METHODS

Data Collection

The field site - Data was collected from the 44-acre Queen Elizabeth Diamond Wood in Andover, Hampshire UK. Within the Diamond Wood lies the 12-acre, community planted woodland called Harmony Woods. Harmony Woods was included in the surveys.

The Diamond Wood, and Harmony Woods offer a unique opportunity to investigate separate pockets of land that vary in their management and use. To gain an insight into the impact that this has had on the diversity of nature in Harmony, the site was divided into East and West sides. 8 100m transects were placed randomly across the site, however it was ensured that 4 transects remained to the west, and 4 to the east (**Figure.0**) - in order to allow comparison.

Every week, 2 transects (1 west and 1 east - pairs were kept the same throughout) were surveyed for wildflowers and grasses, birds and pollinators. As well as this, butterfly data was collected from the registered Butterfly Conservation transect in Harmony Woods, Moths were surveyed and herptiles were surveyed.



Figure.0 The locations of each transect across the Diamond Wood. T1, T2, T3, & T4 is in the West, and T4, T5, T6 & T8 is in the East.

Bird Surveys - A random number was generated between 0 - 100 and this number was used as the point (in metres) along the transect at which the bird survey would take place. At this point, the recorder stood for 15 minutes and noted down every bird they saw within 100m of them. When birds were overhead they were included, regardless of how high in the sky they were spotted. Binoculars were used. Abiotic data such as date, time, weather conditions and proximity of bird was also recorded. Bird species as well as number of individuals was recorded, and care was taken not to record the same individual twice (although this was an assumption).

Pollinators - Transects were walked at a very slow pace, at about 2 metres per minute. During the walk, recorders made a note of any pollinators seen within a 5m belt of the transect. This included Hymenoptera, Diptera, Lepidoptera and Coleoptera (if seen on a flower head).

Butterflies - Butterflies are recorded in a fixed width band (typically 5m wide) along the registered transect each week. Transect walks are undertaken between 10.45am and 3.45pm and only when weather conditions are suitable for butterfly activity: dry conditions, wind speed less than Beaufort

scale 5, and temperature 13°C or greater if there is at least 60% sunshine, or more than 17°C if overcast. Even when there was a count of 0 butterflies this was recorded.

Moths - A battery powered, LED heath moth trap was left in Harmony Woods from sunset and overnight until 8 or 9am the following morning. Moths were then removed, identified and released. Over the spring and summer the moth trap was set 3 times.

Wildflowers and grasses - A random number between 0 and 5 was generated. This number was used as the starting point (in metres) along the transect. Recorders then placed a 1m squared quadrat on the ground at the starting point. A coin was flipped to decide on whether the quadrat was placed to the right or left hand side of the transect. Then, the number of squares containing grass was noted and the dominant grass species present. The number of squares containing wildflowers and other grass species were also recorded, along with their identification. Any unsure observations were photographed or a sample taken for later analysis. Then the recorder took 5 big steps (about 5 metres), and the quadrat was placed on the ground again, on the same side of the transect, and the process was repeated.

All other observations - All other observations were collated into a complete list of species spotted in the Diamond Woods. This data comprised of off-transect observations and citizen science observations made during a citizen science events.

Statistical Analysis

Birds, pollinators, wildflowers and grasses - The number of different species recorded on each transect for each day of data collection was summed (diversity). Then an average was calculated from these values, giving the average number of different species recorded on each transect over the duration of the spring and summer.

The diversity values were allocated between 'west' and 'east' group. The 'west' group comprised of data collected from transect 1,2,3 & 4. The 'east' group comprised of data collected from transects 5,6,7 & 8 .

Microsoft Excel was used to produce all graphs and calculate descriptive statistics such as averages, standard deviation and standard error on all datasets.

RESULTS

Birds

24 species of bird were recorded in total, this does not include extra species that were spotted off-transect. The western end saw recordings of 23 of those species, whereas the eastern end only recorded 17 (**figure.1, table.1**)

Both the west and east ends of the Diamond Wood have large proportions of Skylark and Wood Pigeon. In 2020, Skylark numbers were more than double that of the east, however, in 2021 this trend was reversed, with the eastern end having more skylarks. Both groups also had greater numbers of crow compared to most other species, but this year the west had well over twice as many Jackdaw compared to the east (opposite of 2020), and the west had more than 3 times as many Linnets than the east (**figure. 2**).

The west had higher numbers of Blackbird, Blue Tit, Buzzard, Chaffinch, Collared Dove, Crow, Grey Partridge, Great Tit, House Martin, Jackdaw, Kestrel, Linnet, Magpie, Rook, Swift, Willow Warbler, Wood Pigeon and Yellowhammer compared to the east - 5 of these are priority species (Grey Partridge, House Martin, Linnet, Swift and Yellowhammer) (UK BAP)

The east had higher numbers of Goldfinch, Red Kite and Skylark than the west - 1 of these are priority species (Skylark)

Species which had no difference between east and west were the the Robin and Sparrow Hawk.

Corn buntings , Herring Gulls and Starlings were not recorded on transect this year, but they are present in the 2020 data. The Willow Warbler is a new species present in the bird transect data this year.

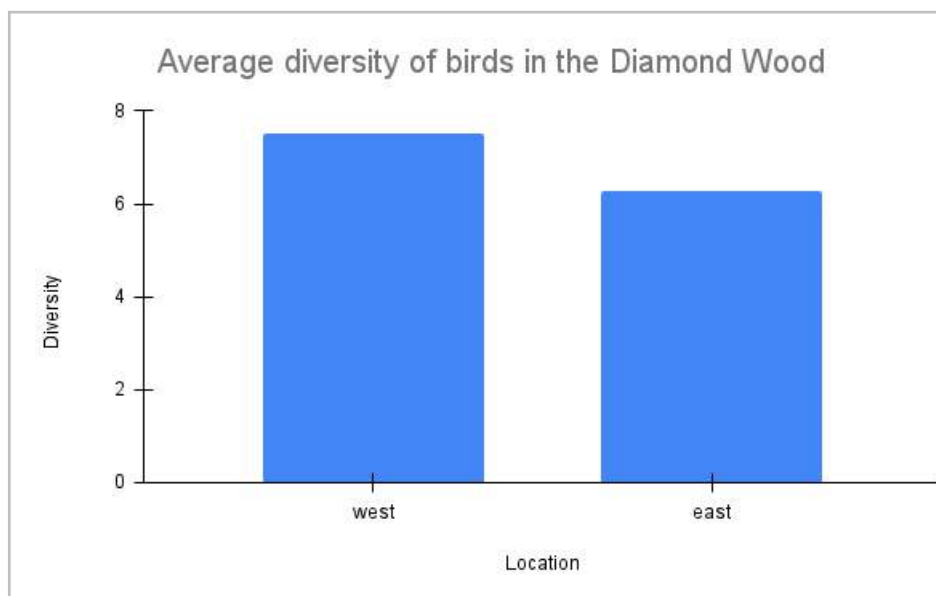


Figure.1. The number of different species recorded on each transect for each day of data collection was summed to give the diversity. The bird diversity values were allocated between 'west' and 'east' groups. Then an average was calculated from these values, giving the average number of different species recorded in each group.

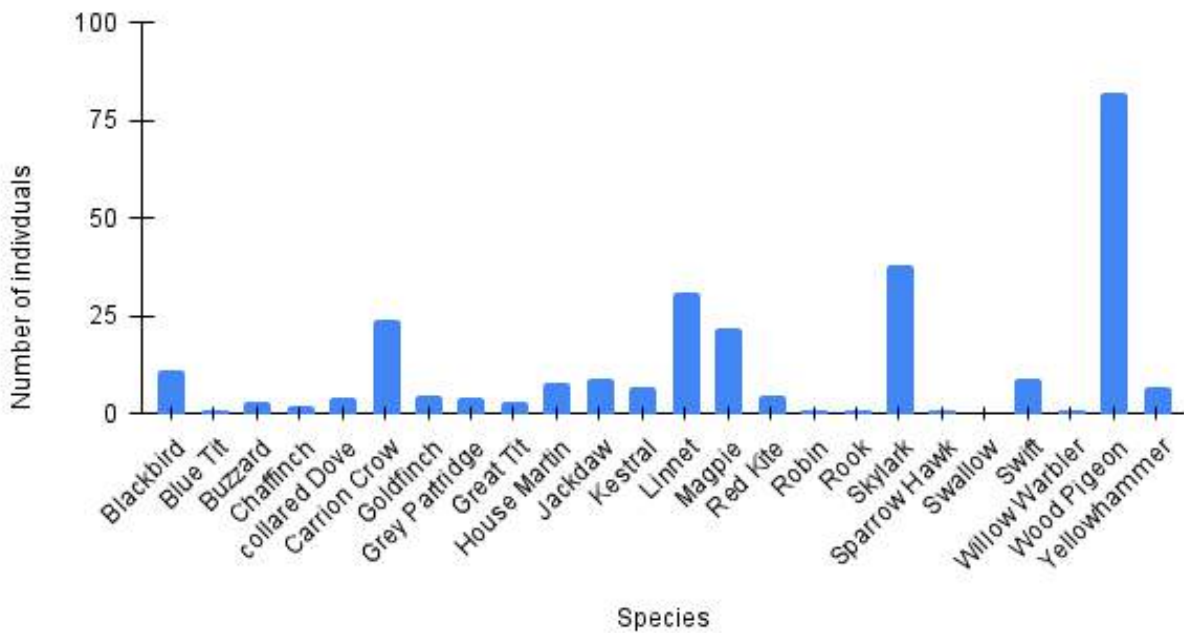
The 'west' average includes data from transects 1, 2, 3 & 4. The 'east' average includes data from transects 5, 6, 7 & 8. Descriptive statistics are as follows:

	West	East
Average	7.50	6.29
SD	1.58	2.56
SE	0.50	0.97
n	10	7

SPECIES	WEST	EAST
Blackbird	11	3
Blue Tit	1	0
Buzzard	3	2
Chaffinch	2	0
Collared Dove	4	2
Carrion Crow	24	14
Goldfinch	5	8
Grey Partridge	4	0
Great Tit	3	1
House Martin	8	0
Jackdaw	9	2
Kestral	7	2
Linnet	31	7
Magpie	22	6
Red Kite	5	6
Robin	1	1
Rook	1	0
Skylark	38	48
Sparrow Hawk	1	1
Swallow	0	1
Swift	9	2
Willow Warbler	1	0
Wood Pigeon	82	49
Yellowhammer	7	0
total	279	155

Table.1. The number of individuals of each species recorded on transects in the western and eastern ends of the Diamond Wood between May - October 2020.

WEST



EAST

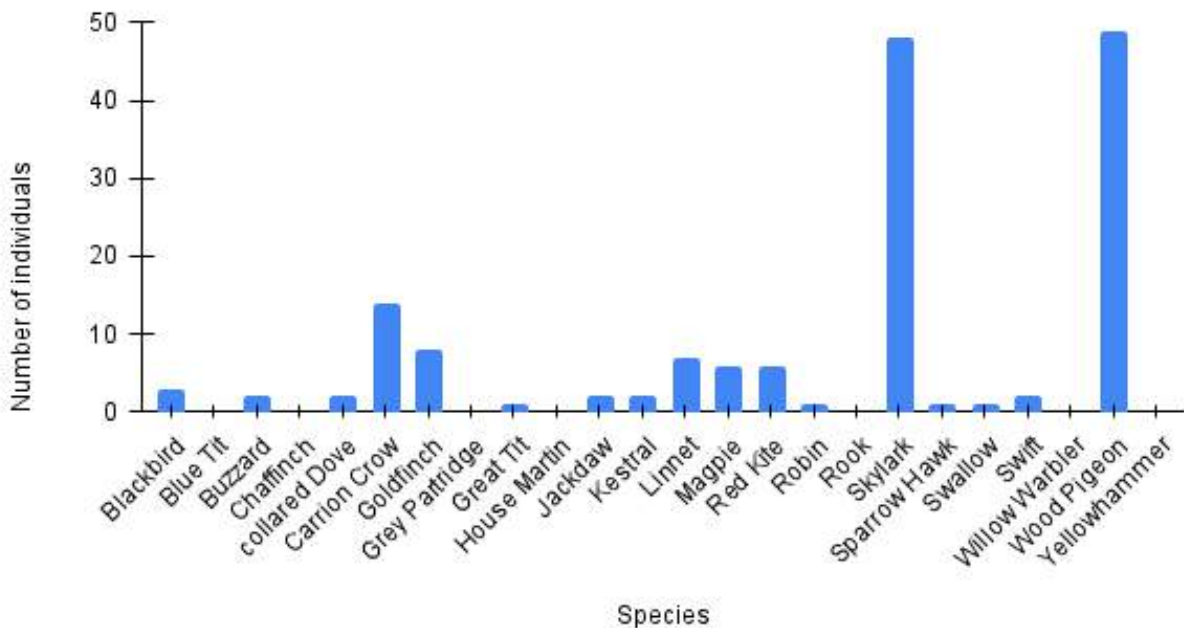


Figure.2. The number of individuals of each species of bird that was recorded on transect 1, 2, 3, and 4 was summed to give an overall frequency value per species in the western end of the Diamond Wood. The same was done for birds recorded on transects 5, 6, 7, and 8, giving the overall frequencies in the eastern end of the Diamond Wood.

24 species and 434 birds were recorded in total between April - October 2021. This can be compared to 2020's data of: 29 species, 660 birds between May - October 2020.

279 individuals were recorded in the western end (392 in 2020), and 155 individuals were recorded in the eastern end (268 in 2020). Other bird species spotted off-transect are not included in this analysis - they are however, included in the complete species list.

Finally, when comparing the average diversity of birds recorded between each transect (**Figure.3**), the data suggests that transects 1, 2, 3, 4, 5 & 8 have little difference in average, all being between 6 & 8. However, Transect 6 and 7 is shown to be the least diverse, with Transect 6 being much lower than the rest - this is a trend that was also saw in 2020, reasons for this are discussed.

Average diversity of birds recorded across 8 transects in the Diamond Woods between April - October 2021

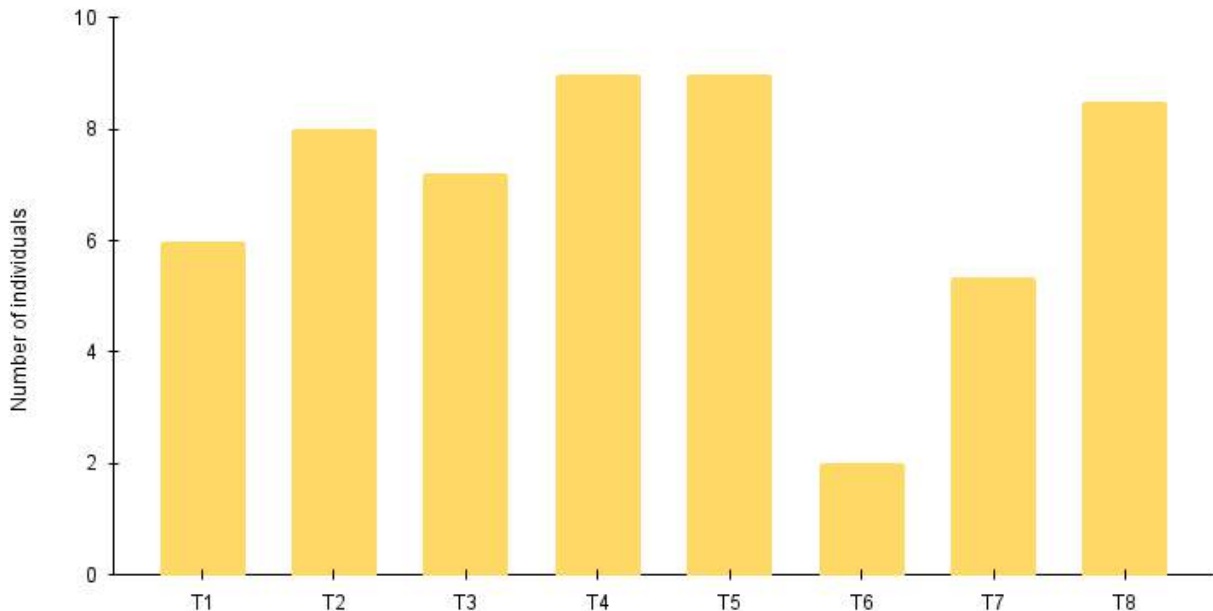


Figure. 3.

	T1	T2	T3	T4	T5	T6	T7	T8
AVG	6	8	7.2	9	9	2	5.33	8.5
N	1	3	5	1	1	1	3	2

The number of different species of bird recorded on each transect for each day of data collection was summed to give the value of diversity. An average was calculated from those values, giving the average diversity of bird species recorded on each transect between April - October 2021.

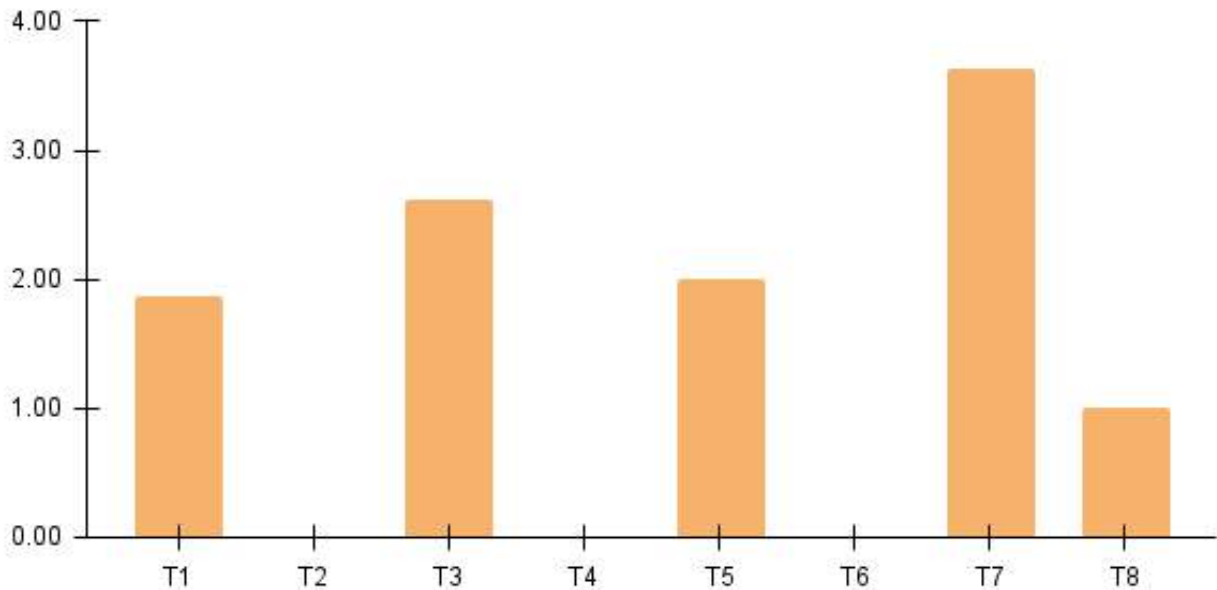
Pollinators

The west end of the woods recorded the highest number of pollinators, however the Standard Error values of 1.65 and 1.47 suggests the error bars would overlap, meaning this result would not be statistically significant (**Table .2**)

	West	East
Average	7.25	6.00
SD	3.30	2.94
SE	1.65	1.47
n	4	4

Table. 2. The number of different species of pollinator recorded on each transect or each day was summed to give the diversity. The diversity values were allocated between 'east' and 'west' groups. Then, an average was calculated from these values, for each group. The west includes data from transects 1, 2, 3 & 4. The east contains data from transects 5, 6, 7 & 8. Data was recorded on 4 days in the west and 4 days in the east, between April - October 2021, compared to 12 days from each in 2020 - reasons for this are discussed in the discussion.

Average diversity of pollinators recorded across 8 transects in the Diamond Woods



	T1	T2	T3	T4	T5	T6	T7	T8
Average	1.88	0.00	2.62	0.00	2.00	0.00	3.63	1.00
SD	0.83	0.00	2.48	0.00	1.73	0.00	3.40	0.00
SE	0.30	0.00	0.54	0.00	1.00	0.00	0.85	0.00
n	8.00	0.00	21.00	0.00	3.00	0.00	16.00	5.00

Figure. 4. The number of different species recorded on each transect for each day of data collection was summed to give the diversity. An average was then taken from those values, giving the average diversity of pollinator species recorded on each transect between April - October 2021. Transect 2, 4 & 6 were not surveyed for pollinators, reasons for this are discussed.

When comparing the average diversity of pollinators recorded between each transect (**Figure.4**), the data suggests that transect 7 was the most diverse, whereas transect 8 was the least. Diversity of transects 1, 2 and 5 are on average very similar.

In total, 139 pollinators were recorded, this a large reduction from 2020's data, where 603 pollinators were recorded. 251 Hymenoptera and 362 Diptera were recorded on transects across the Diamond Wood.

18 species of pollinators were recorded, 16 in the west and 13 in the east. This can be compared to the 2020 data where 14 species of Hymenoptera were identified in the west and 7 were identified in the east.,10 Diptera species were identified in the west and 5 in the east (Nature in Harmony 2020 report) . Greater numbers of individuals of pollinators were recorded in the west compared to the east, except for Honeybees, Common Wasps, Red-tailed Bumblebees, Hoverflies, Marbled Whites, Small Whites and Green-veined Whites (**Table.3**).

Group	Species	West	East
Hymenoptera	Solitary Bee spp	3	0
	Common Carder Bee	6	2
	White-tailed Bumblebee	7	2
	Honeybee	1	15
	Common Wasp	1	6
	Red-tailed Bumblebee	1	6
Diptera	Unidentified Hoverfly spp	1	3
Lepidoptera	Large White	7	2
	Common Blue	1	0
	Meadow Brown	17	6
	Small Skipper	11	0
	Brimstone	1	0
	Marbled White	5	8
	Gatekeeper	1	1
	Small Heath	3	3
	Small Blue	2	0
	Small White	0	6
	Green-veined White	0	1
TOTAL		68	61

Table 3. The number of individuals of each pollinator species counted across the west and east ends of the Diamond Woods between April - October 2021.



Lepidoptera

The overall number of butterflies recorded on the registered Butterfly Conservation transect was shown to have decreased in 2021 from 2020 (**Figure. 5**). Similarly to 2020, the butterflies whose populations are doing well (that is, who has the largest population sizes) appear to be the Meadow Brown, Marbled White and the Small Heath, as well as the Small Skipper and Small White.

In total 333 butterflies were recorded throughout 2021, this is a large reduction from the 1176 butterflies that were seen in 2020. These figures can be compared to historical data: 157 butterflies recorded in 2016, 298 in 2017, 248 in 2018 and 699 in 2019. (Previous butterfly results analysed by Graeme Davis).

It is important to note that the number of days surveyed in 2021 was 13, whereas in 2020 the butterfly transect was surveyed on 23 separate days; 10 days less. Therefore the numbers recorded in 2021 are not directly proportional to those in 2020, this suggests that any species decreases should be read carefully and any increases are quite significant.

Moreover, 13 is 56.5% of 23. 56.6% of 1176 (2020's total) is 664.4. This is still twice the amount than was recorded in 2021 (333).

24 different species were recorded from the Harmony Woods in 2021, compared to 21 in 2020, 17 in 2019 and 12 in 2018. Greater detail can be found in the Harmony Woods Butterfly Results report by Graeme Davis. The butterfly transect was walked on 13 days between April - October 2021.

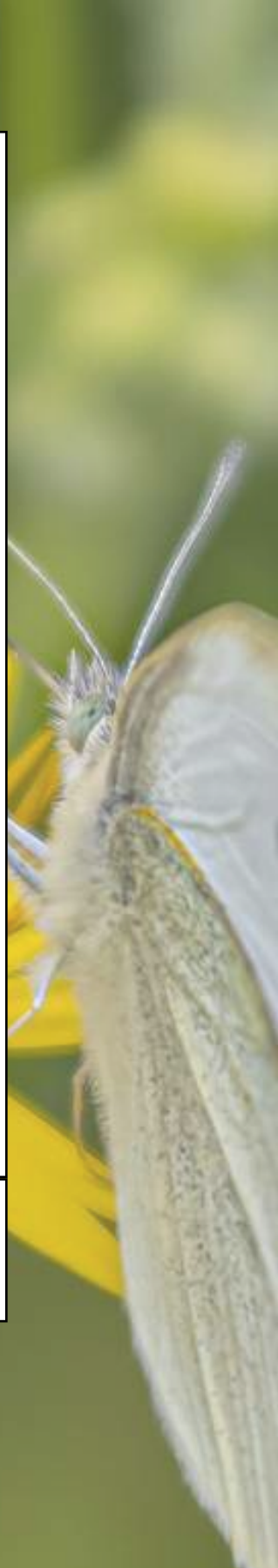


A Ringlet perching on the flowerhead of Ragwort in Harmony Woods. Photo by Kym Welsh.

2016		2017		2018	
Small/Essex Skipper	12	Small/Essex Skipper	4 Decrease	Small/Essex Skipper	7 Increase
Brimstone	3	Brimstone	3 Equal	Brimstone	1 Decrease
Large White	6	Large White	0 Decrease	Large White	12 Increase
Small White	13	Small White	1 Decrease	Small White	3 Increase
Green-veined White	1	Green-veined White	1 Equal	Green-veined White	5 Increase
Orange Tip	2	Orange Tip	0 Decrease	Orange Tip	0 Equal
Common Blue	0	Common Blue	12 Increase	Common Blue	26 Increase
Holly Blue	2	Holly Blue	9 Increase	Holly Blue	0 Decrease
Small Tortoiseshell	0	Small Tortoiseshell	0 Equal	Small Tortoiseshell	1 Increase
Red Admiral	4	Red Admiral	1 Decrease	Red Admiral	0 Decrease
Painted Lady	1	Painted Lady	0 Decrease	Painted Lady	0 Decrease
Peacock	0	Peacock	2 Increase	Peacock	1 Increase
Speckled Wood	2	Speckled Wood	1 Decrease	Speckled Wood	0 Decrease
Marbled White	16	Marbled White	67 Increase	Marbled White	36 Decrease
Gatekeeper	6	Gatekeeper	6 Equal	Gatekeeper	3 Decrease
Meadow Brown	78	Meadow Brown	118 Increase	Meadow Brown	102 Decrease
Small Heath	10	Small Heath	73 Increase	Small Heath	47 Decrease
Ringlet	1	Ringlet	0 Decrease	Ringlet	0 Equal

2019		2020		2021	
Small/Essex Skipper	1 Decrease	Small Skipper	95 Increase	Small Skipper	37 Decrease
Large Skipper	5 Increase (New)	Large Skipper	0 Decrease	Brimstone	4 Increase
Brimstone	9 Increase	Brimstone	3 Decrease	Large White	9 Decrease
Large White	24 Increase	Large White	45 Increase	Small White	43 Increase
Small White	30 Increase	Small White	16 Decrease	Green-veined White	19 Increase
Green-veined White	0 Decrease	Green-veined White	9 Increase	Orange-tip	1 Equal
Orange Tip	6 Increase	Orange-tip	1 Decrease	Green Hairstreak	1 Increase (New)
Small Copper	5 Increase (New)	Small Copper	5 Equal	Small Copper	1 Decrease
Small Blue	2 Increase (New)	Small blue	2 Equal	Small blue	3 Increase
Common Blue	43 Increase	Brown Argus	1 Increase (New)	Brown Argus	1 Equal
Holly Blue	2 Increase	Common Blue	45 increase	Common Blue	10 Decrease
Small Tortoiseshell	3 Increase	Holly Blue	4 Increase	Red Admiral	3 Equal
Red Admiral	4 Increase	Red Admiral	3 Decrease	Painted Lady	1 Equal
Painted Lady	0 Equal	Painted Lady	1 Increase	Small Tortoiseshell	6 Decrease
Peacock	6 Increase	Small Tortoiseshell	64 Increase	Peacock	8 Decrease
Speckled Wood	0 Equal	Peacock	56 Increase	Comma	3 Increase
Marbled White	98 Increase	Comma	1 Increase (New)	Speckled Wood	1 Equal
Gatekeeper	19 Increase	Speckled Wood	1 Increase (New)	Marbled White	27 Decrease
Meadow Brown	305 Increase	Marbled White	193 Increase	Gatekeeper	15 Decrease
Small Heath	137 Increase	Gatekeeper	106 Increase	Meadow Brown	55 Decrease
Ringlet	0 Equal	Meadow Brown	405 Increase	Ringlet	3 Increase (New)
		Small Heath	120 Decrease	Small Heath	82 Decrease
				Marsh Fritillary	1 Increase (New)

Figure.5 Historical data and the 2021 data that was collected from the Harmony Woods butterfly transect. Historical data is taken from the Harmony Woods Butterfly Reports 2016-19 by Graeme Davis. 2020 data is taken from the Nature in Harmony 2020 report.



Wildflowers and grasses

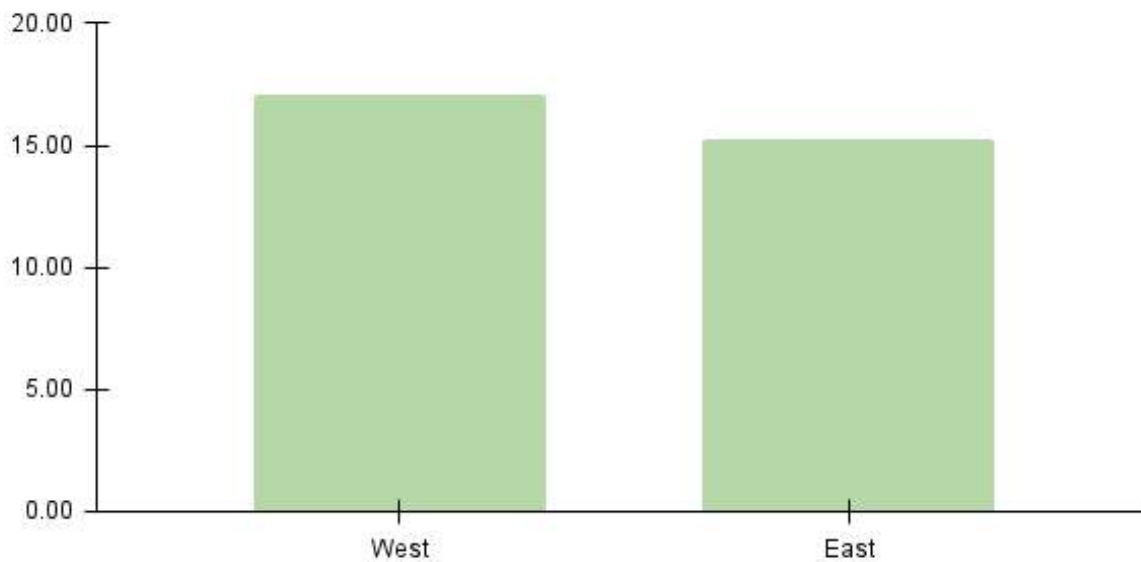
We do not have sufficient evidence to state whether the diversity of wildflowers and grasses is significantly different between the east and the west ends of the Diamond Wood between April and October 2021 (**Figure.6**).

Our small sample sizes of 9 & 8 means a lower statistical power and thus a reduced ability to detect a true difference in the data. Moreover our data did not meet the assumptions of a t-test, so instead a Wilcoxon Signed-Rank Test was performed. The W test statistic = 10 and the number of non-tied pairs (n) = 7

The critical value that corresponds to an alpha level of 0.05 and n = 7 is 2.

Since our test statistic (W = 10) is not less than or equal to 2, we fail to reject the null hypothesis, that is that there is no statistical difference in the average diversity of wildflowers and grasses between the east and the west.

Average diversity of wildflower and grass species recorded per day in the Diamond Wood.



	West	East
Average	17.11	15.25
SD	6.99	4.37
SE	2.33	1.54
n	9	8

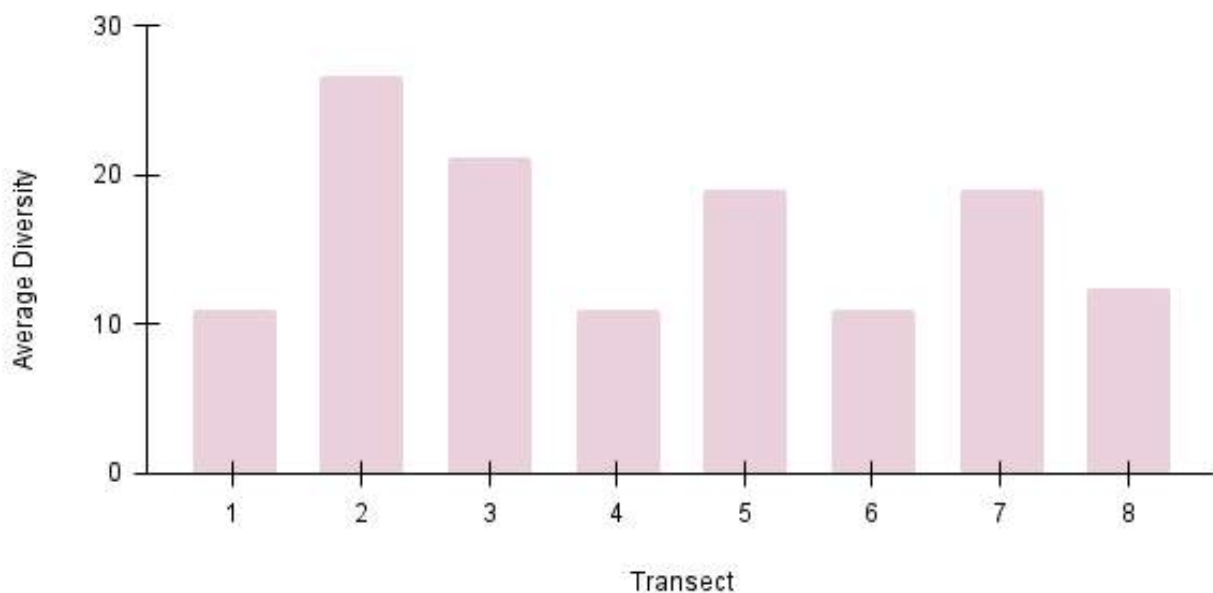
Figure.6 The number of different species was summed per day of data collection to give the diversity. An average was taken from the diversity values from each day of data collection. The 'west' average was taken from data collected from transect 1-4, and the 'east' average was taken from data collected from transect 5-8. Data was collected from western transects on 9 days, and from eastern transects on 8 days between April - October 2021.

Although diversity is not significantly different, the species present between the east and the west were notably different (**Figure. 8**) Transect 2 was the most diverse of all (**Figure. 7**).

Species that were recorded on transects in the western end and not in the eastern end of the woods include: Bird's-foot Trefoil, Common Broomrape, Common Knapweed, Common Mouse-ear, Crested Dog's-tail, Devil's-bit Scabious, Field Scabious, Hawkweed Oxtongue, Ladies Bedstraw, Lesser Knapweed, Little Mouse-ear, Meadow Grass (smooth & rough), Quaking Grass, Sainfoin, Salad Burnet, Small Scabious, Smooth Sow-thistle, Sorrel spp, Sweet Vernal Grass, Yarrow, Yellow Rattle, Yorkshire Fog, and Zigzag clover.

Species that were recorded on transects in the eastern end: and not in the western end of the woods include: Blue Fleabane, Bristly Oxtongue, Common Daisy, Common Vetch, Dove's-foot Cranesbill, Germanda Speedwell, Goatsbeard, Groundsel, Hawksbeard, Hoary Plantain, Hogweed, Nipplewort, Old Man's Beard, Perennial Rye Grass, Prickly Sow-thistle, Pyramidal Orchid, Smooth Hawksbeard, Soft Brome, Spear-leaved Willowherb, and Wood Avens.

Average diversity of wildflowers and grasses recorded across 8 transects in the Diamond Wood between April - October 2021



Transect	1	2	3	4	5	6	7	8
Average	11	26.67	21.25	11	19	11	19	12.5
n	1	3	4	1	2	1	3	2

Figure. 7 Bars represent the diversity of herbs and grasses recorded across each of the 8 transects. Data was collected from the Diamond Wood between April - October 2021. Transects in order of average diversity (number of different herbs and grass species recorded) are as follows: T2 - 26.67 / T3 - 21.25 / T5 - 19 / T7 - 19 / T8 - 12.5 / T1 - 11 / T4 - 11 / T6 - 11.

WEST			EAST		
Species	Number	Present in west only or both sides?	Species	Number	Present in east only or both sides?
Bare Earth	21	BOTH	Bare Earth	80	BOTH
Bird's-foot Trefoil	22	WEST	Bird's-foot Trefoil	0	
Black Medic	10	BOTH	Black Medic	8	BOTH
Blue Fleabane	0		Blue Fleabane	10	EAST
Bristly Oxtongue	0		Bristly Oxtongue	11	EAST
Common Cat's Ear	116	BOTH	Common Cat's Ear	3	BOTH
Cock's-foot	65	BOTH	Cock's-foot	31	BOTH
Common Broomrape	30	WEST	Common Broomrape	0	
Common Daisy	0		Common Daisy	6	EAST
Common Knapweed	24	WEST	Common Knapweed	0	
Common Mouse-ear	51	WEST	Common Mouse-ear	0	
Common Ragwort	46	BOTH	Common Ragwort	42	BOTH
Common Vetch	0		Common Vetch	8	EAST
Creeping Buttercup	4	BOTH	Creeping Buttercup	4	BOTH
Creeping Thistle	18	BOTH	Creeping Thistle	244	BOTH
Crested Dog's-tail	20	WEST	Crested Dog's-tail	0	
Cut-leaved Cranesbill	18	BOTH	Cut-leaved Cranesbill	8	BOTH
Dandelion	111	BOTH	Dandelion	115	BOTH
Dove's-foot Cranesbill	0		Dove's-foot Cranesbill	1	EAST
Devil's-bit Scabious	7	WEST	Devil's-bit Scabious	0	
Red Fescue	44	BOTH	Red Fescue	5	BOTH
Field Scabious	2	WEST	Field Scabious	0	
Field Speedwell	1	BOTH	Field Speedwell	2	BOTH
Germanda Speedwell	0		Germanda Speedwell	2	EAST
Giant Fescue	6	BOTH	Giant Fescue	11	BOTH
Goatsbeard	0		Goatsbeard	8	EAST
Greater Plantain	2	BOTH	Greater Plantain	28	BOTH
Groundsel	0		Groundsel	5	EAST
Hawkbit spp	19	BOTH	Hawkbit spp	55	BOTH
Hawkweed Oxtongue	6	WEST	Hawkweed Oxtongue	0	
Hawksbeard	0		Hawksbeard	2	EAST
Hoary Plantain	0		Hoary Plantain	1	EAST
Hogweed	0		Hogweed	1	EAST
Ladies Bedstraw	3	WEST	Ladies Bedstraw	0	
Little Mouse-ear	31	WEST	Little Mouse-ear	0	
Meadow grass (smooth & rough)	52	WEST	Meadow grass (smooth & rough)	0	
Moss spp (lawn moss likely)	457	BOTH	Moss spp (lawn moss likely)	245	BOTH
Nipplewort	0		Nipplewort	3	EAST
Old Man's Beard	0		Old Man's Beard	22	EAST
Ox-Eye Daisy	336	BOTH	Ox-Eye Daisy	46	BOTH
Quaking Grass	27	WEST	Quaking Grass	0	
Perennial Rye Grass	0		Perennial Rye Grass	3	EAST
Prickly Sow-thistle	0		Prickly Sow-thistle	17	EAST
Pyramidal Orchid	0		Pyramidal Orchid	2	EAST
Red Clover	508	BOTH	Red Clover	22	BOTH
Ribwort Plantain	1278	BOTH	Ribwort Plantain	34	BOTH
Sainfoin	32	WEST	Sainfoin	0	
Salad Burnet	12	WEST	Salad Burnet	0	
Scarlet Pimpernel	2	BOTH	Scarlet Pimpernel	3	BOTH
Self-heal	39	BOTH	Self-heal	1	BOTH
Small Scabious	1	WEST	Small Scabious	0	
Smooth Sow-thistle	1	WEST	Smooth Sow-thistle	0	
Smooth Hawksbeard	0		Smooth Hawksbeard	15	EAST
Sorrel spp	4	WEST	Sorrel spp	0	
Soft Brome	0		Soft Brome	17	EAST
Sow-thistle spp	1	BOTH	Sow-thistle spp	5	BOTH
Spear-leaved Willowherb	0		Spear-leaved Willowherb	7	EAST
Sweet Vernal Grass	28	WEST	Sweet Vernal Grass	0	
White Clover	201	BOTH	White Clover	73	BOTH
Wild Carrot	21	BOTH	Wild Carrot	47	BOTH
Willowherb spp	1	BOTH	Willowherb spp	44	BOTH
Wood Avens	0		Wood Avens	1	EAST
Yarrow	10	WEST	Yarrow	0	
Yellow Rattle	161	WEST	Yellow Rattle	0	
Yorkshire Fog	97	WEST	Yorkshire Fog	0	
Zigzag Clover	9	WEST	Zigzag Clover	0	
GRASSES (8)			GRASSES (5)		
Cock's-foot	65	BOTH	Cock's-foot	31	BOTH
Crested Dog's-tail	20	WEST	Red Fescue	5	BOTH
Red Fescue	44	BOTH	Giant Fescue	11	BOTH
Giant Fescue	6	BOTH	Perennial Rye Grass	3	EAST
Meadow grass (smooth & rough)	52	WEST	Soft Brome	17	EAST
Quaking Grass	27	WEST			
Sweet Vernal Grass	28	WEST			
Yorkshire Fog	97	WEST			
Days surveyed	9		Days surveyed	8	
Diversity wildflowers & grasses	46		Diversity wildflowers & grasses	44	
Total number of species identified across all transects: 66					

Figure 8 Species of herbs and grasses that were recorded on transects throughout the Diamond Wood between April - October 2021. West data includes transects 1, 2, 3, & 4. East data includes transects 5, 6, 7 & 8. Species recorded across the Diamond Wood off transects can be found in the complete species list.



A male Emperor Dragonfly perches on vegetation by the Harmony Woods pond. Photo by Kym Welsh.

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COMPLETE LIST OF SPECIES OBSERVED ACROSS THE 44-ACRE DIAMOND WOOD IN 2020 & 2021.
These observations were made off-transect during walks, citizen science events and Bioblitz's.

** = new to 2021

^W = observed in the WEST only ^E = observed in the EAST only

AVES		AVES	
Species Name	Common name	Species Name	Common name
<i>Tito alba</i>	Barn Owl ^W	<i>Corvus frugilegus</i>	Rook
<i>Turdus merula</i>	Blackbird ^W	<i>Alauda arvensis</i>	Skylark
<i>Cyanistes caeruleus</i>	Blue Tit	<i>Accipiter nisus</i>	Sparrowhawk** ^W
<i>Buteo buteo</i>	Buzzard	<i>Sturnus vulgaris</i>	Starling
<i>Corvus corone</i>	Carrion Crow	<i>Saxicola torquatus</i>	Stonechat ^W
<i>Fringilla coelebs</i>	Chaffinch	<i>Hirundo rustica</i>	Swallow
<i>Streptopelia decaocto</i>	Collard Dove	<i>Apus apus</i>	Swift
<i>Emberiza calandra</i>	Corn Bunting	<i>Phylloscopus trochilus</i>	Willow Warbler ** ^W
<i>Carduelis carduelis</i>	Goldfinch	<i>Columba palumbus</i>	Wood pigeon
<i>Dendrocopos major</i>	Great Spotted Woodpecker ^W	<i>Emberiza citrinella</i>	Yellowhammer
<i>Parus major</i>	Great Tit ^W	HYMENOPTERA	
<i>Picus viridis</i>	Green Woodpecker ^W	Species Name	Common name
<i>Perdix perdix</i>	Grey Partridge ^W	<i>Bombus terrestris</i>	Buff-tailed Bumblebee
<i>Larus argentatus</i>	Herring Gull	<i>Bombus pascourum</i>	Common Carder Bee
<i>Delichon urbicum</i>	House Martin	<i>Vespula vulgaris</i>	Common Wasp
<i>Passer domesticus</i>	House Sparrow	<i>Bombus patorum</i>	Early Bumblebee ^W
<i>Corvus monedula</i>	Jackdaw	<i>Bombus campestris</i>	Field Cuckoo Bumblebee ^W
<i>Garrulous glandarius</i>	Jay ^W	<i>Bombus hortorum</i>	Garden Bumblebee
<i>Falco tinnunculus</i>	Kestrel	<i>Andrea cineraria</i>	Ashy Mining Bee
<i>Larus fuscus</i>	Lesser Black-backed Gull	<i>Apis mellifera</i>	Honey Bee
<i>Carduelis cannabina</i>	Linnet	<i>Megachile centuncularis</i>	Patchwork Leafcutter Bee
<i>Pica pica</i>	Magpie	<i>Nomada goodeniana</i>	Gooden's Nomad Bee
<i>Anas platyrhynchos</i>	Mallard ^W	<i>Bombus lapidarius</i>	Red-tailed Bumblebee
<i>Phasianus colchicus</i>	Pheasant (Ring-necked)		Solitary Bee spp
<i>Motacilla alba yarrellii</i>	Pied Wagtail ^W		Solitary Wasp spp
<i>Milvus milvus</i>	Red Kite	<i>Andrena fulva</i>	Tawny Mining Bee
<i>Erithacus rubecula</i>	Robin	<i>Bombus lucorum</i>	White-tailed Bumblebee
<i>Columba livia</i>	Rock Dove / Feral Pigeon		

COLEOPTERA

Species Name	Common name
<i>Agelastica alni</i>	Alder Leaf Beetle
<i>Carabus nemoralis</i>	Bronze Carabid** ^W
<i>Elateridae spp</i>	Click Beetle spp** ^W
<i>Rhagonycha fulva</i>	Common Red Soldier Beetle
<i>Coccinella septempunctata</i>	Lady Bird (7-spot)
<i>Oedemera lurida</i>	
<i>Cantharidae spp</i>	Soldier Beetle spp**
<i>Amara spp</i>	Sun Beetle spp**
<i>Oedemera nobilis</i>	Thick-legged Flower Beetle
<i>Clytus arietis</i>	Wasp Beetle

NEUROPTERA

Species Name	Common name
<i>Chrysoperla carnea</i>	Green Lacewing

ODONATA

Species Name	Common name
<i>Libellula depressa</i>	Broad-bodied Chaser ^W
<i>Enallagma cyathigerum</i>	Common Blue** ^W
<i>Sympetrum striolatum</i>	Common Darter** ^W
<i>Zygoptera</i>	Damselfly spp ^W
<i>Anax imperator</i>	Emperor Dragonfly** ^W
<i>Pyrhosoma nymphula</i>	Large Red Damselfly ^W

MAMMALIA

Species Name	Common name
<i>Myodes glareolus</i>	Bank Vole
<i>Pipistrellus pipistrellus</i>	Common Pipistrelle** ^W
<i>Myotis daubentonii</i>	Daubenton's Bat** ^W
<i>Lepus europaeus</i>	European Hare ^W
<i>Apodemus sylvaticus</i>	Field Mouse
<i>Nyctalus noctula</i>	Noctule Bat** ^W
<i>Vulpes vulpes</i>	Red Fox ^W

ORTHOPTERA

Species Name	Common name
<i>Chorthippus brunneus</i>	Common Field Grasshopper
<i>Omocestus viridulus</i>	Common Green Grasshopper
<i>Chorthippus parallelus</i>	Meadow Grasshopper

DIPTERA

Species Name	Common name
<i>Ferdinandea cuprea</i>	Common Copperback Hoverfly
<i>Eristalis tenax</i>	Common Drone Fly
<i>Eupeodes luniger</i>	Common Spotted Hovefly
<i>Bombylius major</i>	Dark-edged Bee-fly**
<i>Merodon equestris</i>	Greater Bulb-Fly
<i>Helophilus spp</i>	Hoverfly
<i>Syrphus spp</i>	Hoverfly
<i>Eristalis spp</i>	Hoverfly
<i>Eupeodes spp</i>	Hoverfly
<i>Brachypalpoides spp</i>	Hoverfly
<i>Episyrphus balteatus</i>	Marmalade Hoverfly
<i>Eupeodes corollae</i>	Migrant Hoverfly
<i>Scaeva pyrastris</i>	Pied Hoverfly
<i>Chrysotoxum bicinctum</i>	Two-banded Wasp Hoverfly

MOLLUSCA

Species Name	Common name
<i>Monacha cantiana</i>	Kentish Snail
<i>Cornu aspersum</i>	Garden Snail
<i>Arion hortensis</i>	Garden Slug

AMPHIBIA

Species Name	Common name
<i>Rana temporaria</i>	Common Frog ^W
<i>Bufo bufo</i>	Common Toad ^W
<i>Lissotriton vulgaris</i>	Smooth Newt ^W

MYRIAPODA		LEPIDOPTERA	
Species Name	Common name	Species Name	Common name
	Millipede Spp	<i>Euxoa</i>	Dart Moth spp ^W
	Centipede Spp	<i>Eilema griseola</i>	Dingy Footman Moth ^W
Ommatoiulus sabulosus	Striped Millipede** ^W	<i>Cyclophora pendularia</i>	Dingy Mocha Moth ^W
ARACHNIDA		<i>Pelosia muscerda</i>	Dotted Footman Moth ^W
Species Name	Common name	<i>Lateroligia ophiogramma</i>	Double Lobed Moth ^W
<i>Amaurobius species</i>	Lace Web Spider spp**	<i>Polymixis lichenea</i>	Feathered Ranunculus Moth ^W
<i>Scotophaeus blackwalli</i>	Mouse Spider**	<i>Adscita statures</i>	Forester Moth** ^W
<i>Argiope bruennichi</i>	Wasp Spider** ^W	<i>Cybosia mesomella</i>	Four-dotted Footman Moth** ^W
ISOPODA		<i>Epirrhoe galiata</i>	Galium Carpet Moth** ^W
Species Name	Common name	<i>Euxoa nigricans</i>	Garden Dart Moth ^W
<i>Armadillidium vulgare</i>	Pill Woodlouse**	<i>Pyromania tithonus</i>	Gatekeeper
<i>Oniscus asellus</i>	Common Woodlouse	<i>Pieris napi</i>	Green-veined White
DERMAPTERA		<i>Argotis exclamationis</i>	Heart and Dart** ^W
Species Name	Common name	<i>Crambidae</i>	Grass Moth spp
<i>Forficula auricularia</i>	European Earwig**	<i>Colostygia pectinataria</i>	Green Carpet Moth** ^W
REPTILIA		<i>Callophrys rubi</i>	Green Hairstreak ** ^W
Species Name	Common name	<i>Tholera cespitis</i>	Hedge Rustic Moth ^W
<i>Natrix natrix</i>	Grass Snake** ^W	<i>Celastrina argiolus</i>	Holly Blue ^W
LEPIDOPTERA		<i>Pieris brassicae</i>	Large White
Species Name	Common name	<i>Lacanobia w-latinum</i>	Light Brocade Moth ^W
<i>Rheumaptera hastata</i>	Argent & Sable moth ^W	<i>Campaea margaritaria</i>	Light Emerald Moth** ^W
<i>Gonepteryx rhamni</i>	Brimstone	<i>Eupithecia centaureata</i>	Lime Speck Pug Moth ^W
<i>Aricia agestis</i>	Brown Argus	<i>Abraxas grossulariata</i>	Magpie Moth ^W
<i>Mythimna conigera</i>	Brown Line Bright Eye Moth ^W	<i>Melanargia galathea</i>	Marbled White
<i>Phalera bucephala</i>	Buff-tip Moth ^W	<i>Euphydryas aurinia</i>	Marsh Fritillary** ^W
<i>Euclidia glyphica</i>	Burnet Companion Moth ^W	<i>Maniola jurtina</i>	Meadow Brown
<i>Tyria jacobaeae</i>	Cinnabar Moth ^W	<i>Acrionicta leporina</i>	Miller Moth** ^W
<i>Lomographa temerata</i>	Clouded Silver Moth ^W	<i>Callistege mi</i>	Mother Shipton Moth ^W
<i>Polygonia c-album</i>	Comma ^W	<i>Watsonalla binaria</i>	Oak Hook-tip Moth** ^W
<i>Polyommatus icarus</i>	Common Blue	<i>Anthocharis cardamines</i>	Orange-tip
<i>Cabera pusaria</i>	Common White Wave Moth** ^W	<i>Vanessa cardui</i>	Painted Lady

LEPIDOPTERA		GRASSES	
Species Name	Common name	Species Name	Common name
<i>Aglais io</i>	Peacock	<i>Hordeum vulgare</i>	Common Barley** ^W
<i>Eilema pygmaeola</i>	Pigmy Footman Moth ^W	<i>Cynosurus cristatus</i>	Crested Dog's-tail ^W
<i>Cerura vinula</i>	Puss Moth** ^W	<i>Festuca</i>	Fescue spp
<i>Vanessa atalanta</i>	Red Admiral	<i>Festuca gigantea</i>	Giant Fescue**
<i>Aphantopus hyperantus</i>	Ringlet** ^W	<i>Lolium multiflorum</i>	Italian Rye-grass** ^W
<i>Phragmatobia fuliginosa</i>	Ruby Tiger Moth ^W	<i>Poa pratensis</i>	Meadow-grass (smooth)**
<i>Eilema complana</i>	Scarce Footman Moth ^W	<i>Poa trivialis</i>	Meadow-grass (rough)**
<i>Leucania comma</i>	Shoulder-striped Wainscot** ^W	<i>Alopecurus pratensis</i>	Meadow Foxtail** ^W
<i>Autographa gamma</i> (f. <i>gammula</i>)	Silver Y Moth** ^W	<i>Lolium perenne</i>	Perennial Ryegrass
<i>Zygaena filipendulae</i>	Six-spot Burnet Moth ^W	<i>Briza media</i>	Quaking Grass ^W
<i>Cupido minimus</i>	Small Blue	<i>Festuca rubra</i>	Red Fescue**
<i>Lycaena phlaeas</i>	Small Copper ^W	<i>Bromus hordeaceus</i>	Soft brome**
<i>Coenonympha pamphilus</i>	Small Heath	<i>Anthoxanthum odoratum</i>	Sweet Vernal** ^W
<i>Thymelicus sylvestris</i>	Small Skipper	<i>Phleum pratense</i>	Timothy** ^W
<i>Aglais urticae</i>	Small Tortoiseshell	<i>Hordeum murinum</i>	Wall Barley** ^W
<i>Pieris rapae</i>	Small White	<i>Holcus lanatus</i>	Yorkshire Fog
<i>Aedia leucomelas</i>	Sorcerer Moth** ^W	TREES AND SHRUBS	
<i>Coscinia cribraria</i>	Speckled Footman ^W	Species Name	Common name
<i>Pararge aegeria</i>	Speckled Wood	<i>Rhamnus frangula</i>	Alder Buckthorn
<i>Thalpophila matura</i>	Straw Underwing Moth ^W	<i>Populus tremula</i>	Aspen
<i>Charanyca trigrammica</i>	Treble Lines Moth** ^W	<i>Fagus sylvatica</i>	Beech
<i>Hoplodrina octogenaria</i>	Uncertain Moth ^W	<i>Prunus padus</i>	Bird Cherry
<i>Spilosoma lubricipeda</i>	White Ermine Moth ^W	<i>Populus nigra betulifolia</i>	Black Poplar ^W
<i>Euxoa tritici</i>	White-line Dart Moth ^W	<i>Rubus fruticosus</i>	Bramble
<i>Orgyia antiqua</i>	Vapourer Moth** ^W	<i>Alnus glutinosa</i>	Common Alder
<i>Hoplodrina ambigua</i>	Vine's Rustic Moth** ^W	<i>Malus sylvestris</i>	Crab Apple
<i>Mythimna albipuncta</i>	White Point Moth** ^W	<i>Cornus alba</i>	Dogwood ^W
GRASSES		<i>Betula pubescens</i>	Downy Birch
Species Name	Common name	<i>Sambucus nigra</i>	Elder
<i>Bromus sterilis</i>	Barren Brome**	<i>Ulmus 'Wingham'</i>	Elm ^W
		correction: this is was incorrectly reported as <i>Ulmus minor</i> 'Ademuz' in the 2020 report	

Dactylis glomerata Cock's-foot

Acer campestre Field Maple

TREES AND SHRUBS

HERBS

Species Name **Common name**

Salix caprea Goat Willow

Salix cinerea Grey willow

Viburnum opulus Guelder Rose ^W

Crataegus monogyna Hawthorn

Corylus avellana Hazel

Ilex aquifolium Holly

Quercus ilex Holm oak ^W

Carpinus betulus Hornbeam

Aesculus hippocastanum Horse Chestnut ^W

Hedera Helix Ivy

Juniperus communis Juniper ^W

Quercus robur Pedunculate Oak

Sorbus aucuparia Rowan

Betula pendula Silver Birch

Tilia cordata Small-Leaved Lime

Euonymus europaeus Spindle ^W

Sorbus aria Whitebeam ^W

Prunus avium Wild Cherry

Sorbus torminalis Wild Service ^W

Taxus baccata Yew ^W

Species Name **Common name**

Ranunculus bulbosus **Buttercup (Bulbous)****

Ranunculus repens **Buttercup (Creeping)****

Ranunculus acris **Buttercup (Meadow)****

Trifolium Clover spp

Hypochaeris radicata Common Cat's-ear

Bellis perennis Common Daisy

Pulicaria dysenterica Common Fleabane ^E

Malva sylvestris Common Mallow

Cerastium fontanum Common Mouse-ear

Artemisia vulgaris Common Mugwort

Urtica dioica Common Nettle

Papaver rhoeas Common Poppy

Dactylorhiza fuchsii Common Spotted-orchid ^W

Linaria vulgaris Common Toadflax

Vicia sativa **Common Vetch****

Anthriscus sylvestris Cow Parsley

Primula veris Cowslip ^W

Geranium dissectum Cut-leaved Crane's-bill

Rumex crispus **Curled Dock****

Taraxacum Dandelion spp

Succisa pratensis **Devil's-bit Scabious** W**

Rumex Dock spp

Geranium molle Dove's-foot Crane's-bill

Convolvulus arvensis Field Bindweed

Myosotis arvensis Field Forget-me-not

Viola arvensis **Field Pansy** W**

Knautia arvensis Field Scabious ^W

Veronica persica **Field Speedwell****

Aethusa cynapium Fool's Parsley

Pilosella aurantiaca Fox-and-cubs

HERBS

Species Name **Common name**

Scorzonerooides autumnalis Autumn Hawkbit ^E

Lotus corniculatus Bird's-foot trefoil ^W

Solanum dulcamara Bittersweet

Fallopia convolvulus Black Bindweed

Medicago lupulina Black Medic

Erigeron acer Blue Fleabane ^E

Borago officinalis Borage

Helminthotheca echioides Bristly Oxtongue ^E

<i>Orobanche minor</i>	Broomrape ^W	<i>Veronica chamaedrys</i>	Germander Speedwell**
HERBS		HERBS	
Species Name	Common name	Species Name	Common name
<i>Tragopogon pratensis</i>	Goat's-beard	<i>Onobrychis viciifolia</i>	Sainfoin
<i>Centaurea scabiosa</i>	Greater Knapweed ^W	<i>Sanguisorba minor</i>	Salad Burnet ^W
<i>Rabelera holostea</i>	Greater Stitchwort** ^W	<i>Prunella vulgaris</i>	Selfheal ^W
<i>Plantago major</i>	Greater Plantain	<i>Scabiosa columbaria</i>	Small Scabious** ^W
<i>Senecio vulgaris</i>	Groundsel** ^E	<i>Hypochaeris glabra</i>	Smooth Cat's-ear ^W
<i>Leontodon</i>	Hawkbit spp	<i>Crepis capillaris</i>	Smooth Hawk's-beard ^E
<i>Picris hieracioides</i>	Hawkweed Oxtongue ^W	<i>Sonchus oleraceus</i>	Smooth Sow-thistle** ^E
<i>Hieracium</i>	Hawkweed spp	<i>Rumex</i>	Sorrel spp
<i>Galium mollugo</i>	Hedge Bedstraw ^W	<i>Sonchus</i>	Sow-thistle spp
<i>Geum urbanum</i>	Herb Bennet	<i>Epilobium lanceolatum</i>	Spear-leaved Willowherb**
<i>Geranium robertianum</i>	Herb Robert	<i>Veronica</i>	Speedwell spp
<i>Plantago media</i>	Hoary Plantain	<i>Anagallis arvensis</i>	Scarlet Pimpernel
<i>Heracleum sphondylium</i>	Hogweed	<i>Hypericum perforatum</i>	St. John's Wort
<i>Trifolium campestre</i>	Hop Trefoil	<i>Dianthus barbatus</i>	Sweet William ^W
<i>Anthyllis vulneraria</i>	Kidney Vetch ^W	<i>Dipsacus</i>	Teasel spp
<i>Galium verum</i>	Lady's Bedstraw ^W	<i>Cirsium</i>	Thistle spp
<i>Centaurea nigra</i>	Lesser Knapweed ^W	<i>Torilis japonica</i>	Upright Hedge-parsley
<i>Cerastium semidecandrum</i>	Little Mouse-ear**	<i>Trifolium repens</i>	White Clover
<i>Geranium pratense</i>	Meadow Cranesbill ^W	<i>Daucus carota</i>	Wild Carrot
<i>Malva moschata</i>	Musk Mallow**	<i>Clematis vitalba</i>	Wild Clematis
<i>Lapsana communis</i>	Nipplewort	<i>Narcissus pseudonarcissus</i>	Wild Daffodil ^W
<i>Leucanthemum vulgare</i>	Oxeye Daisy	<i>Reseda lutea</i>	Wild Mignonette
<i>Matricaria discoidea</i>	Pineappleweed ^E	<i>Epilobeum</i>	Willowherb spp
<i>Sonchus asper</i>	Prickly Sow-thistle**	<i>Geum urbanum</i>	Wood Avens** ^E
<i>Anacamptis pyramidalis</i>	Pyramidal orchid	<i>Achillea millefolium</i>	Yarrow
<i>Lychnis flos-cuculi</i>	Ragged-robin ^W	<i>Rhinanthus minor</i>	Yellow Rattle ^W
<i>Senecio jacobaea</i>	Ragwort	<i>Trifolium medium</i>	Zigzag Clover** ^W
<i>Silene dioica</i>	Red Campion ^W		
<i>Trifolium pratense</i>	Red Clover		
<i>Plantago lanceolata</i>	Ribwort Plantain		



Small Skipper on the seed head of a Ribwort Plantain in Harmony Woods. Photo taken by Kym Welsh.

DISCUSSION AND WIDER IMPLICATIONS

Firstly, and before I discuss each result in more detail I would like to address the fact that the 2021 data was not sufficient enough to carry out robust statistical analysis, and therefore in contrast to 2020's data, this year's analysis derives from mostly descriptive statistics.

Fewer data points were collected across all taxa compared to 2020. I was there for at least 90% of the surveys and I strongly suspect that this lack of data is due to a wider group of inexperienced recorders. Inexperience can lead to species identifications being missed, especially with difficult to 'see' species such as the pollinators. It can also lead to incorrect identification of species, and where I have seen species names that are unlikely to live in Harmony Woods (for example Marsh Thistles and Silver-studded Blues) in the raw data, I have chosen to omit them from this report rather than report false results, and thus this has reduced the sample size of our data. Furthermore, in 2020 during the COVID lockdown, it was myself and my colleague who carried out many of the transects as we were in a 'covid bubble' together. This meant we had weekly practice and so worked at a much faster pace. The survey assistants in 2021 changed every 2 weeks or more, which was good for community engagement however it meant that 50% or more of the recorders for any given day of data collection were inexperienced and had little identification knowledge. As a result, I was required to support and teach others much more than in 2020, and this produced a much slower work pace. Consequently, we often walked fewer transects and completed fewer surveys in the time frame compared to 2020.

Furthermore, the registered butterfly transect was carried out by one volunteer. In 2020 we had a butterfly survey rota team made up of half a dozen skilled surveyors, whereas in 2021 it was mostly the one person who was walking the butterfly transect. This lack of surveyors is most likely due to the fact that ATU volunteers who had previously committed time to survey butterflies were, in 2021, committed to other ATU activities that were occurring in the woodland throughout summer. Also, the intern ecologist was running 3 separate projects in 2021, whereas in 2020 they Nature in Harmony project was their main focus, this would have contributed to the fewer surveys completed.

The reason for more novice survey assistants in 2021 is because we designed the Nature In Harmony 2021 project to be much more citizen science based. Our aim was to engage as many people with ecology and with the natural world as possible, and whilst this brings with it huge environmental education benefits to the individuals involved, we can see the impact it had on the quantity and quality of the results we collected. On the other hand, citizen science can enable many data points to be collected at one time, especially when the methods are simple to follow, however more people leads to more human error.

This has taught us valuable lessons.

1. If we want to ensure that we have good quality wildlife data, we must keep this "scientific" wildlife surveying separate from "citizen science" wildlife surveying and events, and we must only use a handful of trained and skilled volunteers as we did in 2020.
2. When planning future events in the woods we must consider how the time commitment that our volunteers will give to them may impact on their ability to help with the data collection, as these have been the same pool of volunteers. Alternatively we may need a 'survey volunteers' team that is not called upon for other events during the field season.
3. There must be a skilled ecologist leading the project, as they need to be able to teach and train any volunteers who assist them, and they must be able to check the accuracy of their assistant's identifications. In 2020 it was the intern ecologist who had this role and it was their primary focus. In 2021, the intern ecologist had this role again but this time alongside other roles and responsibilities. As a result, 2020 was more streamlined and this probably accounts for the higher quantity of data collected.
4. Community engagement is incredibly important, but it can also reduce the accuracy of scientific methods.
5. Citizen science has many pros and cons and that is something that ATU will consider as it moves forward with the Nature in Harmony project.

For the remainder of the discussion, I would like to explain the results for each taxa and compare how they compare to 2020, as well as highlight any important results or trends from this year.

BIRDS

24 species of bird were recorded in total. The western end saw higher diversity of birds (23) than the eastern end (17). New species spotted this year include the Willow Warbler and the Sparrow Hawk, both of which were spotted in the western end.

The bird diversity of the western end of the Diamond Woods is significantly higher than the eastern end. This could be due to the fact that the western end of the woods contains a greater heterogeneity of habitats, including the wildlife pond, supporting a greater range of organisms and therefore a greater range of bird species. Alternatively, this could be because the western end may provide greater food resources than the eastern end, which could be a result of differences in vegetation composition (Tworek, S., 2007). The east and west ends were found to have no significant difference in vegetation diversity, however, the composition of plants between each end were notably different.

Both the west and east ends of the Diamond Wood have large proportions of Skylark and Wood Pigeon. In 2020, Skylark numbers were more than double that of the east, however, in 2021 this trend was reversed, with the eastern end having more skylarks.

Reasons for this could have been the high amount of activity that was present in the western end of Harmony Woods in 2021. There were volunteers and carpenters working up there almost every day for the whole of summer, and the previous Nature in Harmony report (Marshall, A.L., 2020) suggests that human presence is linked to reduced skylark numbers.

Alternatively, this could be due to the increased number of corvids in the western end in 2021 compared to 2020. This was a noticeable trend as someone who spent many days on site. This time, it appeared that the Magpies, Crows and Jackdaws were attracted to the human presence, as they are opportunistic feeders and were often seen scavenging around the kitchen tents. The increased corvid numbers could suggest a decrease in Skylark numbers, as corvids are natural predators of Skylarks (Praus, L. et al, 2014).

On the other hand, myself and my colleague camped out in Harmony Woods for the entire field season, from May to October 2021 - and our anecdotal evidence of Skylark numbers in the western end does not match that trend in the data. We witnessed Skylarks (and other bird species) almost every day during dawn and dusk, and this suggests that the time of day for bird surveys was an important factor in the number of species recorded. We did also notice a reduction in Skylark presence around the peak 'human activity' time of August, when the cabin build project was happening.

This conflict between the data and the anecdotal evidence strengthens the point made earlier, that a higher quantity of surveys would have increased data quality and increased it's reliability.

When comparing the average diversity of birds recorded between each transect the data suggests that transects 1, 2, 3, 4, 5 & 8 have little difference in average, all being between 6 & 8. However, Transect 6 and 7 is shown to be the least diverse, with Transect 6 being much lower than the rest - this is a trend that was also saw in 2020.

One reason for this is because transect 6 spans 1 busy footpath and within 10m of the busy public right of way. Being near footpaths means being near humans and dogs, a position that would be disadvantageous to a bird, particularly a nesting bird.

Words from the Nature in Harmony 2020 report:

Studies show that human presence and dog presence can evoke anti-predatory responses in birds (Banks, P.B. and Bryant, J.V., 2007); particularly ground-nesting birds.

Dogs, or their close ancestors, have also evolved as top predators in many ecosystems and hunt a wide range of fauna (Macdonald & Sillero-Zubiri 2004, in Banks, P.B. and Bryant, J.V., 2007), and thus it is no surprise that the sight of the dog will induce predator-avoidance and defence behaviours in birds. The skylark anti-predator response can include flocking, refuge-seeking and song. As well as an indication of an individual's quality, song is used as a pursuit-deterrent signal, and is used with respect to other anti-predation options such as flocking (Cresswell, W., 1994.).

For breeding birds there is clear evidence, both research-based and anecdotal, that disturbance and therefore anti-predatory responses such as flocking will expose the eggs or young to a greater risk of loss to opportunistic predators, especially corvids (Taylor, K. et al, 2005). The authors continue, stating that this appears to be the greatest risk arising from disturbance on sites where visitor and dog numbers are high and that this effect is greatest for ground nesting birds in a variety of habitats.

Banks and Bryant (2007) found that dog walking caused a 41% reduction in the numbers of bird individuals detected and a 35% reduction in species richness compared with controls. Humans walking alone also induced some disturbance but typically less than half that induced by dogs. Furthermore, ground dwelling birds appeared most affected. For birds which did not flee the site, there were 76% fewer individuals within 10 m of the trail when dog walking occurred compared with control sites, suggesting that birds were seeking refuge away from the immediate vicinity of the threat. This could further explain why transect 6 saw fewer bird species than any other.

Finally, notable trends from 2021 include:

- More yellowhammers were spotted in Harmony Woods this year; a pair (male and female) were often spotted right within the centre of the western end of the site, near the wildlife pond, whereas in 2020 we only spotted a lone male on the northern hedge line.
- We also saw the Green Woodpecker much more frequently this year
- We saw 2 adult Grey Partridge being followed by 2 chicks.
- We did not see any Corn Buntings, but this could be due to inexperience in bird identification (they look incredibly similar to Skylarks).

POLLINATORS

The west end of the woods recorded the highest number of pollinators, this is a result consistent with 2020's report. No new species were identified this year, but that is not to say that no new pollinators have moved into the woods, the reasons for a lack of identification are explained in the beginning of this discussion.

One difference in the data this year from last is the fact that we are now including Lepidoptera within our pollinator transects, whereas last year we only included Diptera, Hymenoptera and Coleoptera.

When comparing the average diversity of pollinators recorded between each transect the data suggests that transect 7 was the most diverse, whereas transect 8 was the least. Diversity of transects 1, 2 and 5 are on average very similar. Again, the sample size was very small, and the robustness of these results is not high. It could be that transect 7 was surveyed on a particularly warm and sunny day, or was surveyed by a recorder who was confident in their bee identification. I do not think we can infer anything else from these results due to the small sample size.

In total, 139 pollinators were recorded, this a large reduction from 2020's data, where 603 pollinators were recorded.

It is important to note that the number of days surveyed in 2021 was 8, whereas in 2020 the pollinators were surveyed on 24 separate days; 16 days more. Therefore, the numbers recorded in 2021 are not directly proportional to those in 2020.

Out of interest, 8 is 33.3% of 24. So, if we calculate 33.3% of 2020's total (603), we get 200.7 individuals. Now we can see that the 2021 total of 139 is not too far off what we would have expected, but it is nonetheless still less than in the 2020 data.

Words from the Nature in Harmony 2020 report:

In 2020, the average diversity of Hymenoptera recorded on transects in the western end was significantly higher than in the eastern end. This could be due to differences in the habitat heterogeneity.

Increased landscape heterogeneity and the amount of high-quality (natural and semi-natural) habitat typically enhances species richness and abundance (Senapathi, D., et al, 2017). The western end has a greater habitat heterogeneity due to the presence of the chalk meadow, chalk

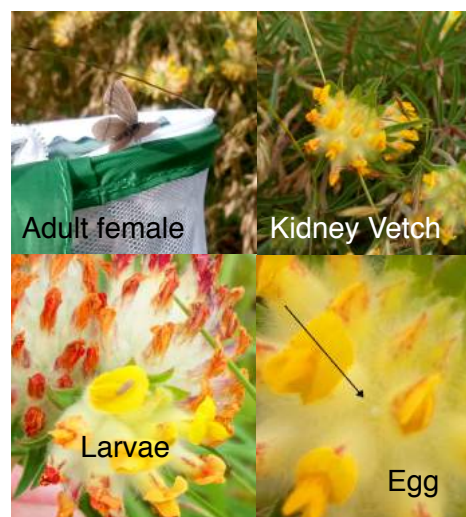
scrape and pond - 3 habitats that are absent in the eastern end. The presence of these habitats suggests an explanation for greater diversity of pollinators in the western end as they provide a greater variety of resources. In a study by Hanley, M.E., *et al* (2008), the nutrient content of pollen from wildflowers were analysed and pollinator preference was compared amongst flower species. They found a clear relationship between pollen protein content and pollinator attraction; bumblebees appear to fine-tune their foraging behaviour to select plants offering the most rewarding pollen. Hanley, M.E., *et al* (2008) found that the wildflowers with the highest protein content, and therefore the highest-quality food resource were as follows (in order of highest to lowest): *Trifolium pratense* (red clover); *Onobrychis viciifolia* (Sainfoin); *Lotus corniculatus* (bird's-foot trefoil); and *Trifolium repens* (white clover). The Asteraceae family was intermediate in pollen quality, and the lowest quality pollen was found in the Rosacea family. When looking at the plant composition of east and west, the west has greater numbers of the Fabacea family - namely, the red clover, Sainfoin, bird's-foot trefoil, black medic and white clover. Whereas the eastern end has white clover, black medic, hop trefoil and much greater densities of Thistle and Ragwort - which are from the Asteraceae family.

Another reason for differences in pollinator diversity between the east and west could be to do with that fact that as well as the abundance or diversity of floral food sources, wild pollinators depend on a range of other resources, for example, the majority of Hymenoptera requires nest sites, whilst Diptera and Lepidoptera require larval host habitat, which is often species-specific (Senapathi, D., *et al*, 2017). There could be lower nest site resources or larval host habitat resources in the eastern end of the woods. However, this would need to be studied further.

LEPIDOPTERA

2021 was a good year for Lepidopteran surveying in Harmony Woods. Many new moth species were identified by the ATU Youth team (under the project leader's guidance). Including a very rare species called the Sorcerer (*Aedia leucomelas*), which apparently has not been recorded before in Hampshire. Unfortunately, I do not have a photograph to confirm this sighting, but I am including it in these results as I am confident that we would have identified the individual correctly at the time of capture.

Another notable species in 2021 was the Small Blue. Efforts have been made by the ATU volunteers for the past 5 years to introduce the Small Blue into Harmony Woods through the growing and planting of Kidney Vetch. In 2021 an adult female was identified ovipositing on the flowerhead of a kidney vetch in the western end of Harmony Woods. Furthermore, the larvae of the Small Blue was then spotted on a different Kidney Vetch flowerhead. This confirms that Harmony Woods has a steadily growing colony of Small Blue. The photos to the right show the adult, the egg and the larvae that was spotted in Harmony Woods.



Other new butterfly species identified this year include the Green Hairstreak and the Marsh Fritillary. After sharing this sighting with scientists at Butterfly Conservation, it is thought that the Marsh Fritillary may have been an isolated individual that may have been raised in someone's home and released. This is because there are no known Marsh Fritillary colonies near Harmony Woods and they are a very rare species. Nonetheless it was indeed a Marsh Fritillary as the identification was confirmed by Butterfly Conservation. Having said that, the calcareous meadow habitat in Harmony Woods would be an ideal location for Marsh Fritillary - as it has all of the 3 main food plants: Devil's-bit-Scabious (*Succisa pratensis*), Field Scabious (*Knautia arvensis*) and Small Scabious (*Scabiosa columbaria*). I would recommend that ATU begin to grow and plant more Devil's-bit Scabious, too, to support the conservation of this Europe-wide threatened species.

The overall number of butterflies recorded on the registered Butterfly Conservation transect was shown to have decreased in 2021 from 2020. This could be due to reduced numbers of skilled recorders and survey days, as 13 days were surveyed compared to 23.

Similarly to 2020, the butterflies whose populations have the largest population sizes are the Meadow Brown, Marbled White and the Small Heath, as well as the Small Skipper and Small White.

In total 333 butterflies were recorded throughout 2021, this is a large reduction from the 1176 butterflies that were seen in 2020. Reasons for reduced data quantity have already been discussed. 24 different species were recorded in 2021, compared to 21 in 2020, so despite the reduction in data points (333 in 2021 compared to 1176 in 2020), the diversity of butterflies is still increasing.

WILDFLOWERS AND GRASSES

We do not have sufficient evidence to state whether the diversity of wildflowers and grasses is significantly different between the east and the west ends of the Diamond Wood between April and October 2021.

Our small sample sizes of 9 survey days in the west & 8 days in the east lead to lower statistical power and thus a reduced ability to detect a true difference in the data.

The results of a Wilcoxon Signed-Rank Test showed that there is no statistical difference in the average diversity of wildflowers and grasses between the east and the west.



Ox-Eye Daisies. Harmony Woods.

Although diversity is not statistically different, the species composition between the east and the west were notably different. Transect 2 was the most diverse of all, which is consistent with the 2020 data.

In 2021 a greater variety of grasses were identified, this is most likely due to increased skill level of the project leader, who had completed a grass course just before data collection started in 2021. As well as that, several new species of wildflower were identified, including: Common Vetch, Devil's-bit Scabious, Speedwells, Buttercups, Prickly Sow-thistle and more.

Besides the small sample size, reasons for no statistical difference in wildflower diversity between the east and west could be due to differences in land management. The east contains more competitive and generalist species of plants such as ragwort, thistle and bindweed. The west contains species that have been sown or planted by the ATU team such as sainfoin and kidney vetch, the thistle and ragwort is kept in check by volunteers and there is no use of chemicals. The west also contains a chalk meadow that is routinely cut and raked once a year - to reduce nutrient richness and enable chalk-loving species to thrive. The chalk meadow has also seen an introduction of yellow rattle in order to reduce the prevalence of competitive grasses. This reduction in nutrient level, the scraping back of top soil to reveal chalk, and the reduction in competitive species such as thistle and ragwort will have made way for the natural introduction of other less-competitive species as well as the establishment of those planted by the team.

Words from the Nature in Harmony 2020 report:

Shellswell, C.H., et al (2016) states that positive indicator species of lowland grasslands include: crested dog's-tail *Cynosurus cristatus*, meadow buttercup *Ranunculus acris*, red clover *Trifolium pratense*, and yellow rattle *Rhinanthus minor* - all of which can be found in the more managed areas of the western end of the woods. Early successional species of lowland grassland habitats can include cowslip *Primula veris*, common knapweed *Centaurea nigra*, oxeye daisy *Leucanthemum vulgare*, yellow rattle *Rhinanthus minor* and ribwort plantain *Plantago lanceolata*. Again, these are all present in the more managed areas of the western end of the woods.

Negative indicator species of lowland grassland habitats, that indicate soil nutrient enrichment include creeping thistle *Cirsium arvense*, ragwort *Senecio jacobaea* and cow parsley *Anthriscus sylvestris*. Creeping thistle and common ragwort was found across both ends of the woods - but in much greater numbers where the land had little to no human intervention (transect 4, 5, 6, 7, & 8), where they have been able to spread across large areas of the existing grassland and woodland.

This suggests that the management techniques used by Andover Trees United within the Harmony Woods boundary have been advantageous in the creation of a richly diverse chalk meadow, and the diverse community of invertebrates and bird species, too, and this informed management style should continue across the whole 44-acre site whilst still being ecologically considerate to other habitats such as the wooded areas, hedgerows and grasslands. For example, Fescues are an important food plant for the larvae of the Small Heath butterfly (a priority species and currently present in the Diamond Woods), so care should be taken not to lose areas of Fescue cover.

Moreover, it will be important to keep areas of varying intervention. We have seen that areas of very little input has developed a species composition that differs greatly to the chalk meadow, however, this environment is just as diverse and does contain important species, too, such as the thistle, ragwort, hawkbits and plantains, for example, which should not be completely eradicated.

Monitoring should be maintained in order to ensure that all management decisions of areas are informed, and that any competitive species (such as scrub) do encroach and do not compromise others. Priority species should be monitored and special care taken to ensure their populations are maintained.

Overall, the Nature in Harmony 2021 report provides a positive build onto last year's starting point. We continue to discover new species and, despite the drop in data quantity, trends of increased diversity are still shown (for example, with the Lepidoptera and birds).

As with 2020, the report highlights areas for improvement such as the unimproved grassland in the east. It highlights priority species for which care should be taken to conserve, such as the Skylark and Small Heath butterfly, as well as a possible direction for intervention such as the devil's-bit scabious and Marsh Fritillary. It provides an insight into consequences of different management strategies and provides a good baseline that can be added to and developed further in the years to come.

It also highlights how a summer of intense 'people' action (cabin build and citizen science events) in the western end, plus a more stretched workload of the project leader, has impacted the ability to collect high quality data at a faster pace, it also hints to how species have been impacted by our disturbance (the lower numbers of Skylark). It will be interesting to see how the Skylark numbers in 2022 compare to 2021, as the summer will be less 'people' intense next year.

These reports will allow the managers of the land to recognise trends and changes in species populations and compositions, and allow ATU to continue providing citizen science training opportunities to their volunteers with easy-to-replicate survey methods.

Finally, I would like to suggest that the Nature in Harmony report be updated yearly as it is here, with comments on new species or noticeable trends, however in order to report robust statistical analysis, I think that the data should also be combined each year and analysed together as one dataset every 5 years. This should enable us to have an even clearer view of the difference between the west and east sides of the Diamond Woods, which is a very unique and exciting research opportunity in the world of wildlife conservation and rewilding.



Spider amongst birch leaves. Harmony Woods

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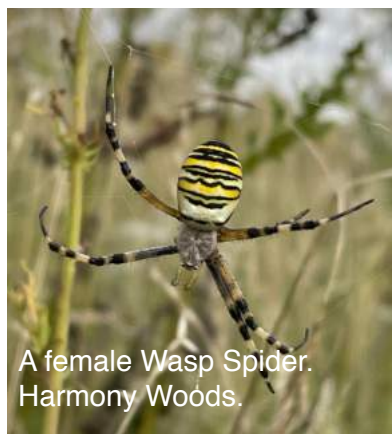
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A female Wasp Spider.
Harmony Woods.



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Small Blue on a Sainfoin flower in Harmony Woods. Photo taken by Alex Marshall.