BUTTERFLY CONSERVATION UPPER THAMES BRANCH

Green Hairstreak Report 2015-2024

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Introduction

The Green Hairstreak is a more enigmatic species than it might at first appear. For example, as Nick Bowles told me, when he was advising me to think carefully about whether or not I wanted to take on Green Hairstreak as a species to champion, it can be found flourishing in one location, and yet is completely absent from a nearby location that appears to be equally suitable. This report digs a little deeper into how the data illustrates this apparently capricious choice of which locations to embrace and which to shun, as well as attempting to grapple with standard questions that a species champion report should concern itself with.

Like the Small Blue report, this report uses the term "wonk" as shorthand for "1km square" and "1km x 1km square".

Data basis and validation

This report is based on a data set of 4,243 Green Hairstreak records exported from Levana and covering the years 2000-2024. The data set was imported into SCRIPT, and summarised and validated using the various functionalities offered by SCRIPT. SCRIPT retains for potential analysis only adult insect records, to 1k precision or better, with a complete date. This left a total of 4,167 records before duplicates were removed and validation was carried out, with the following results:

- 15 records were excluded because they had a duplicate
- 32 false positive records were excluded because (for historical reasons) they were not from UTB territory
- 2 false negative records (in the Levana export but apparently not in UTB territory) were corrected and included because a UTB site name indicated a "twisted digit" grid reference error
- 7 records were edited to correct the grid reference and make it consistent with the site name:
    - 3 were instances of Eastings/Northings confusion, with uncorrected and corrected versions both in UTB territory
    - 4 had inherited a systematic UKBMS error for the Grangelands transect, now corrected by UKBMS
- 1 record was edited to correct the site name and make it consistent with the site grid reference
- 10 records were excluded because the grid reference and site name were inconsistent, with no apparent correction possible
- 15 records were flagged as suspicious:
    - 13 were one of four or fewer records for the enclosing 10k square

- 2 apparently had a duplicate record, except for the cosmetic difference of “A” rather than “1” for the adult count

For analysis purposes, the data set was restricted to the period 2015-2024, on the basis that in order to assess how a species is faring, too long a time horizon is liable to confuse matters by including data that may no longer be relevant.

Analysis of record count and visit count

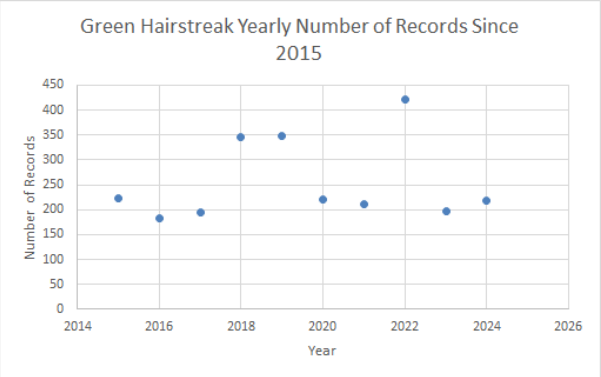

Figure 1: Green Hairstreak record count for 2015-2024

As noted in the report for 2023, and illustrated in Figure 1, the record count for Green Hairstreak in recent years appears to flip between two characteristic values, either low (and remarkably constant at an average of around 200), or high (at an average of around 400, approximately twice as high as the low values). This appears in principle to indicate something rather unusual about the Green Hairstreak’s reproductive success from year to year, but before we get too excited about that possibility, we should also consider how many visits were made to the territory where Green Hairstreak has been recorded, during its flight period.

The 2023 report was written using a more primitive version of SCRIPT, before visit counting was introduced, so it did not include a version of Figure 2. Figure 2 indicates that the visit count just described has not been subject to similarly dramatic ups and downs; the trend, if any, is a slow increase, but it has changed little in the last 10 years. In particular, the visit counts for 2018 and 2019 are not anomalously large like the record counts for those years, and whilst the visit count for 2022 was the highest ever, like the record count for 2022, it was not dramatically higher than the prevailing values (around one third larger, compared to the 2022 record count which was twice as large as the prevailing values).

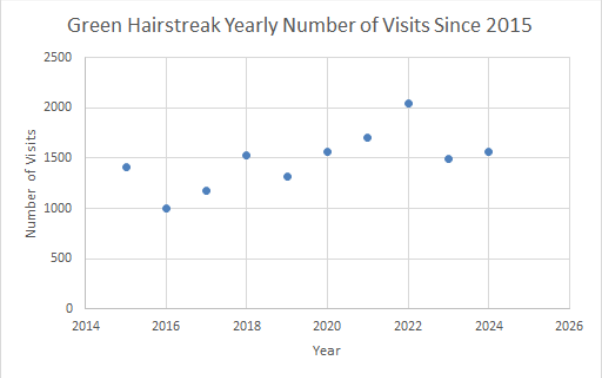

Figure 2:Green Hairstreak visit count for 2015-2024

Clustering the data

SCRIPT was used to identify clusters of wonks, isolated wonks and random wonks, as described in the SCRIPT user guide.

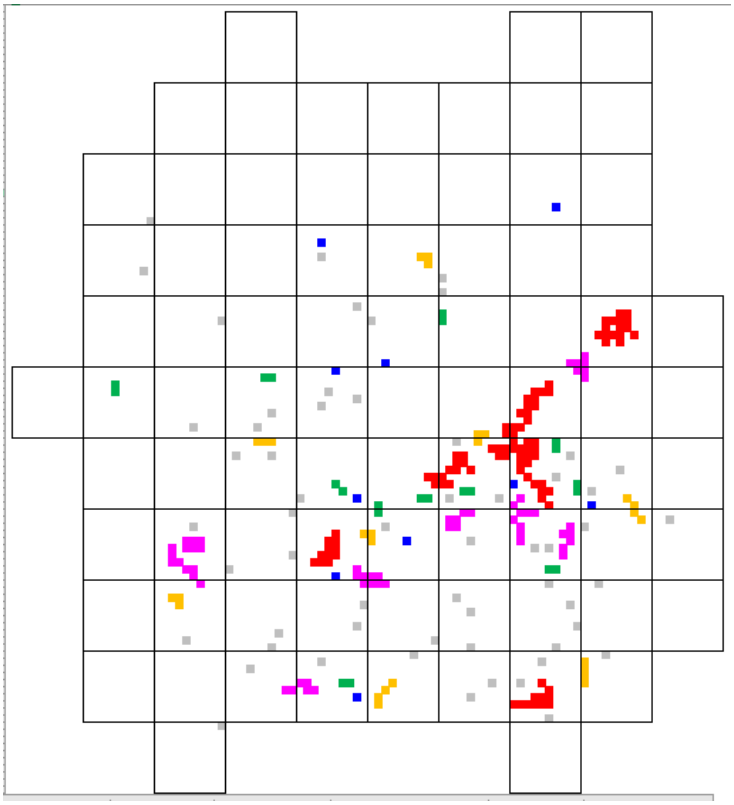

Figure 3: Map of Green Hairstreak distribution in UTB territory 2015-2024

Figure 3 shows the resulting map of Green Hairstreak distribution in UTB territory, divided into 10km squares, according to the key in Table 1. Five primary clusters consisting of more than 10 wonks can be seen in red, along with eight secondary clusters in magenta, consisting of 5-10 wonks.

Smaller clusters in yellow and green, and isolated wonks in blue, are all apparent, but are not as prevalent as the large number of random wonks, in light grey, suggests they perhaps ought to be. To be precise, there are 19 smaller clusters, 10 isolated wonks and 58 random wonks. The Green Hairstreak has nearly as many random wonks as the Small Blue, and that number is twice as many as the numbers of small clusters and isolated wonks put together!

Number of wonks	*More than 10*	*5-10*	*3-4*	*2*	*1 (isolated)*	*1 (random)*
Colour						

Table 1: Cluster map colour key

What is curious about this demography is that the Green Hairstreak ought in principle to be the butterfly species that is least prone to misidentification. It is our only species that is clearly and simply green when seen at rest. Not only that, but its name and superficial characteristics do not lend it to mistaken logic like the Small Blue ("It's small and it's blue, it must be a Small Blue"). On this basis, we ought to be taking most if not all of the random wonks seriously as genuine Green Hairstreak sightings. If so, why are many more of them not attaining the status at least of an isolated wonk, with records from more than one year? I will return to this question when digging deeper into the data in the rest of the report!

An overview of UTB Green Hairstreak territory

Appendices 1-3 summarize, in table form, the data for the 32 clusters, 10 isolated wonks, and 58 random wonks identified by the analysis. Appendices 1 and 2 are sorted by record count from highest to lowest. In Appendix 3, the random wonks have instead been sorted

by scarcity count from lowest to highest, in an attempt to rank them in some sort of order of decreasing plausibility.

Cluster highlights

As Figure 3 illustrated, one cluster stands head and shoulders above all others, and that is what I have (rather arbitrarily) called Bradenham & environs, which covers a total of 41 wonks, comfortably more than twice as extensive as Ivinghoe Beacon & environs in second place with 16 wonks. Bradenham & environs also has the highest record count, not surprisingly, although the difference from Ivinghoe Beacon & environs is much smaller than the difference in terms of wonks might lead us to suppose. A lot of the wonks that make up Bradenham & environs must have only a few records.

After Bradenham & environs and Ivinghoe Beacon & environs, three more clusters comprise more than 10 wonks: Aston Rowant NNR & environs, Aston Upthorpe & environs, and Wildmoor Heath & environs. All three have been visited roughly equally in proportion to the number of wonks they include, and the first two are comparable to Bradenham & environs and Ivinghoe Beacon & environs in scarcity terms, all four clusters having a scarcity in the range 2.9 to 4.2. Wildmoor Heath, on the other hand, as the same suggests, apparently hosts Green Hairstreak at much lower population densities. The scarcity of 16.3 indicates that four to five times as many visits are required there for every Green Hairstreak record, compared to the other four big clusters.

Two of the smaller clusters are worthy of note for not only having scarcity comparable to the big clusters (excluding Wildmoor Heath & environs), but also for their reliability; they both have Green Hairstreak records from every year from 2015 to 2024. They are Hartslock & environs, and Devils Punchbowl & environs. Although they are very similar in terms of scarcity, they are very different in terms of visit frequency, much more so than their different wonk extents would suggest.

Finally, if you want to maximise your chances of seeing a Green Hairstreak, the data suggest that Bradwell disused airfield is the place to go: just 12 visits between 2021 and 2024 have yielded 8 records! I have to declare a personal interest here; 5 of those records are mine. It's a great site and well worth a visit. It would be very popular indeed if I had managed to confirm the presence of the Duke on my repeated visits there (my primary motivation for visiting), but sadly the isolated report from 2021 seems probably to have been a misidentification.

Isolated wonk highlights

Five of the isolated wonks stand out as much more popular than the others; all five have been visited more than one hundred times from 2015-2024. However, only three of them have produced records for most or all of the period 2015-2024; the other two have only produced records in the last two or three years, and will be discussed in the section Any changes in distribution.

Paices Wood is the most reliable popular destination. It has records from every year from 2015-2024, and its scarcity of 3.9 makes it comparable to the most reliable clusters. Next comes Ardley Quarry, also with records from every year from 2015-2024, but a scarcity of

7.1 indicating that records are nearly twice as hard to come by as they are at Paices Wood. Holtspur Bottom is next, although it only has records from 2017 onwards, so its high scarcity of 14.5 cannot be strictly compared with the values for Paices Wood and Ardley Quarry.

Random wonks

In the section Clustering the data, the surprisingly high prevalence of random wonks was discussed, and it was suggested that, unlike the random wonks for Small Blue, we should take most if not all of them seriously. The table of random wonks in Appendix 3 bears out this suggestion. In Appendix 3, 26 out of 58 wonks have a scarcity below 10, and only 6 have a scarcity above 100. In the corresponding table in the Small Blue report for 2024, nearly the same size (62 wonks), only 9 entries near the top had a scarcity below 10, and 12 had a scarcity above 100. In other words, on the basis that increasing scarcity indicates that a genuine record is increasingly unlikely, far fewer Green Hairstreak records fall into this category than do Small Blue records. In addition, 10 Green Hairstreak wonks have more than one record, compared to only 5 Small Blue wonks.

Flight period

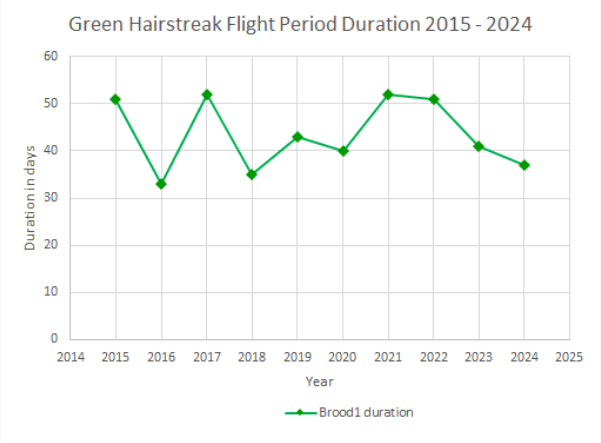

Figure 4: Green Hairstreak flight period 2015-2024

At least in UTB territory, the Green Hairstreak is a single-brooded species, one September record notwithstanding (although this is evidently not the case everywhere in the UK, and certainly not on Jersey). Figure 4 shows that the duration of the Green Hairstreak's flight period does not appear to have changed from 2015-2024, varying from 30 to 50 days in round terms, and with no discernible increasing or decreasing trend. It has decreased steadily year on year for the last four years, but it is too soon to attribute any ultimate significance to this. There is similarly no apparent yearly trend in the date of the first Green Hairstreak sighting, or of the 5th percentile date.

The overall population size (compared with recent years)

There are currently two ways by which this can be assessed using SCRIPT: abundance and scarcity, largely independent of each other. A third way, with the potential to reconcile those two ways and improve upon both of them, will be introduced in a future version of SCRIPT.

Abundance is calculated as the average number of adults per record i.e. total number of adults over all records, divided by the total number of records. Figure 5 shows that it appears to have been

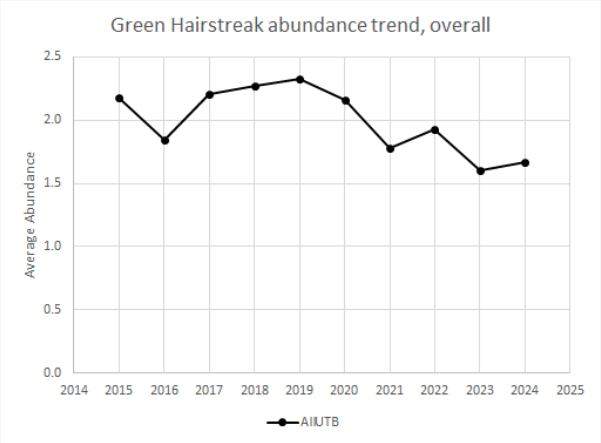

Figure 5: Green Hairstreak UTB abundance trend 2015-2024

dwindling steadily over several years. The difficulty with abundance as a reliable measure of trends in population size is that it depends on how recorders choose to "bucket" their sightings. Technically, the abundance value in a single record should be the largest number seen simultaneously at the specified location, and for Green Hairstreak this is seldom going to be bigger than 1. However, some recorders choose to amalgamate several sightings into a single record for a representative grid reference, giving a high value of abundance for one record, whilst others prefer to create separate records for each of several sightings at similar grid references, giving low values of abundance for several records.

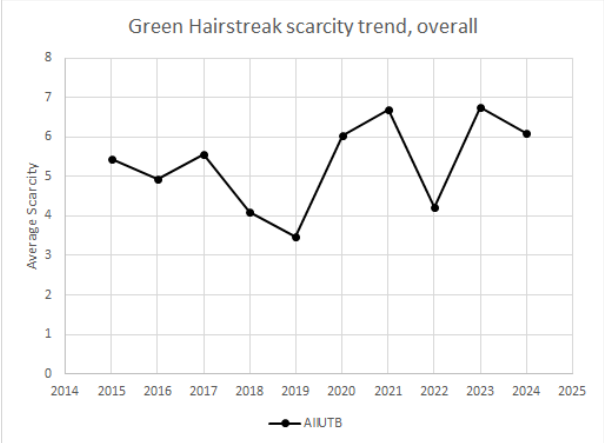

Figure 6: Green Hairstreak UTB scarcity trend 2015-2024

The alternative way of assessing population size is to examine the trend in scarcity. Scarcity for a species is calculated as the total number of visits during its flight period, divided by the total number of records. Figure 6 shows no clear pattern from year to year for 2015-2024, with large differences from year to year. However, it is apparent that when averaged over the traditional five-year recording periods, scarcity was higher for 2020-2024 than for 2015-2019, supporting the finding, suggested by average abundance, of slow decrease in Green Hairstreak population size. The use of scarcity as a measure of population size addresses one of the shortcomings of abundance, inasmuch as several records of one specimen on one visit are reckoned equally to a single record of several specimens on the same visit, for the visit half of the calculation, but it suffers from the same issue with counting records.

The third way envisaged for future introduction is another ratio, which steals the more reliable part of each of abundance and scarcity. It would be calculated as total number of visits during the flight period, divided by the total number of adults seen. It can thus be thought of as "specimen scarcity": the typical number of visits required to see one adult, rather than the typical number of visits required to secure one record.

Examination of measures of overall population size is undeniably worth doing, but it may obfuscate important messages that can only be discovered by looking at the data for individual clusters that contribute to the overall picture. The Small Blue report for 2024 documented some unexpected good news in what seemed to be a depressing overall message: one of the main clusters was found to be have a steadily-increasing population size (as measured by scarcity), clearly bucking the overall trend. Is there any similar evidence for Green Hairstreak?

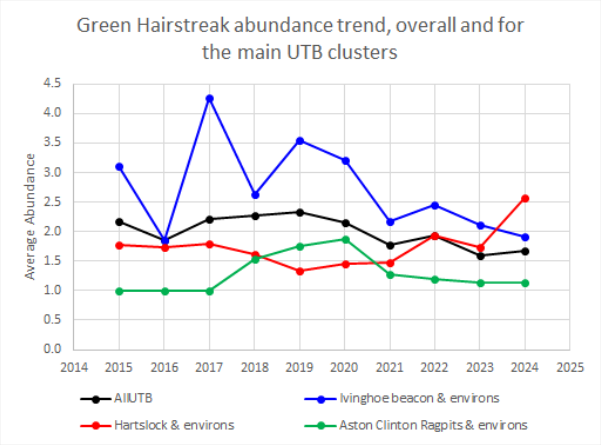

Figure 7: Green Hairstreak UTB abundance trend, overall and for three main clusters

Figure 7 compares the overall abundance trend with that for three of the main clusters, carefully chosen to try and illustrate contrasting fortunes. The abundance trends for the big three clusters more or less mirror the overall abundance trend, with only differences of scale, so that only Ivinghoe Beacon & environs, with a downward trend over several years, is shown in Figure 7. In contrast, abundance for Hartslock & environs has been increasing for the last six years, with a particularly noticeable increase in 2024. Aston Clinton Ragpits & environs is different again; for that cluster, abundance increased for three years in succession, starting from a low but steady baseline, before falling back, but to an apparently slightly higher steady baseline. So there is some provisional good news to be gleaned from at least some of the Green Hairstreak's territory, but with the caveat already expressed about the wisdom of investing too much faith in abundance as a reliable measure of population size.

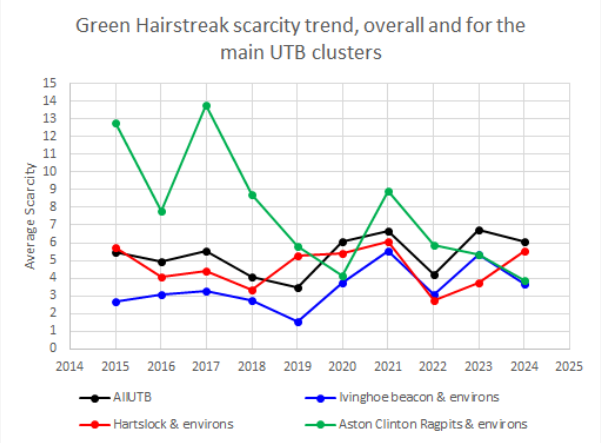

Figure 8: Green Hairstreak UTB scarcity trend, overall and for three main clusters

Figure 8 plots the scarcity trend for the same three clusters as shown in Figure 7. For Ivinghoe Beacon & environs and Hartslock & environs, the trend more or less mirrors the overall trend. For Aston Clinton Ragpits & environs, however, we see a different picture. Scarcity begins at high values initially, then decreases steadily year on year over four years, jumps up, and then decreases steadily for another four years. The overall picture is of a cluster that has been doing steadily better from 2015-2024, starting from a low population density, with two bad years each followed by three steadily better good ones.

Any changes in distribution

Appendix 1 appears to show that the Green Hairstreak did not have a terrible year in 2024. It was at least recorded in 24 out of 32 clusters in 2024. Appendix 2 tells a similar story; Green Hairstreak was recorded in 6 out of 10 of its isolated wonks (and all of the four where it was *not* recorded in 2024, only have records for two or three years from 2015-2024 anyway, and so represent no apparent new cause for concern).

Lost and struggling sites

Appendix 4 is the place to look for lost or struggling sites.

Of the clusters where Green Hairstreak was not recorded in 2024, the main cause for concern has to be Westcott disused railway. Green Hairstreak has been recorded there every other year from 2015-2024. This is a disappointing finding given the conservation effort that goes into those two wonks, but there is no evidence of prior gradual decrease in population size, so this may be no more than local factors playing a role in what was a most unusual year. It is probably premature to suggest that we might need a bit of a rethink of our conservation strategy at Westcott.

Dry Sandford pit & environs also appears to be struggling, with no record in either 2023 or 2024 after only one record-free year in the previous eight. It is also noticeable that the yearly scarcity values were higher after the record-free year than before it, so it appears that the rot may have set in at that site several years ago.

Of those clusters where Green Hairstreak *was* recorded in 2024, there are nine where it was recorded every year from 2015-2024, and two more with only either one or two record-free year(s) from that period. These are the ones that give us the most reliable basis upon which to assess potential changes in distribution. Aston Upthorpe & environs had a terrible year, compared to what we would previously have judged to be a stable baseline. The same is true for Devil's Punchbowl & environs. For Warburg & environs, 2023-2024 were two terrible years in succession. Wildmoor Heath had three terrible years in succession from 2022-2024, but it was starting from an already very low baseline in 2015-2019; the population seems able to persist at very low levels there, without ever disappearing completely. There is no apparent cause for concern amongst any of the others.

Potential new sites

Consideration of Appendix 5, supplemented by inspection of visit count in SCRIPT, identifies two potential new sites from the isolated wonks where Green Hairstreak was recorded in 2024:

- Sydlings Copse has been visited between 7 and 25 times every year from 2015-2024, but Green Hairstreak remained unrecorded until 2022, when there were suddenly three records. After a year off in 2023, there was a single record again in 2024. One to watch!
- Bernwood M40 compensation area has a very similar story, visited between 6 and 18 times every year from 2015-2024, but Green Hairstreak remained unrecorded until 2023, when there were suddenly two records, and another record in 2024.

Two more isolated wonks where Green Hairstreak was *not* recorded in 2024 are also worthy of note. Both would seem to merit closer attention during the Green Hairstreak's flight period:

- After an apparently isolated single record in 2016, Warren Bank & Berins Hill had another record in each of 2021 and 2022. Although the record evidence is limited, it has been compiled based on very few visits: typically, only 1 in any given year, 2 or 3 at most, and none at all in two years (including 2023).
- Westridge Green to NW was first visited in 2020, and has had a single Green Hairstreak record in three of the five years 2020-2024. The enthusiasm for visiting this wonk seems to have faded quickly, unfortunately: the visit count of 18 in 2020 decreased every year down to just 1 in 2024.

A small number of random wonks should also be mentioned. It was noted earlier in the report that we should take the majority of random wonk records for Green Hairstreak seriously. Nonetheless,

we should still attempt to sift the evidence, in order not to spread our attention too thinly. First of all, we should confine attention to records from the last two or three years. The older a record is without the associated random wonk being converted to an isolated wonk by a follow-up record, the more likely it is to have been a genuine vagrant (unless the visit count is of a similarly sporadic nature). For the recent records, we should use the visit count history to try and distinguish between records that were apparently of genuine vagrants, and records that may well be indicative of healthy populations that were previously either unrecognised or unestablished.

Appendix 3 and Appendix 6 indicate four random wonks which all have two records from fewer than ten visits during the flight period: Pilot Hill, Ardley ERF, Woolley Down, and Greenfield. As a low record count must necessarily be concentrated in a small number of years, these random wonks have all had a high 'conversion rate' of visits into records and merit closer attention:

- Pilot Hill (which curiously is a named feature on the 1:50k OS map but not the 1:25k one) was visited during the Green Hairstreak's flight period for the first time in 2024, a visit that yielded two separate records. The wonk is actually split between Berks and Hants, substantially in favour of Hants, and the grid references for the two records are just across the county boundary into Hants. Frustratingly, much of Pilot Hill is indicated as an open access area, but the northern boundary of that area coincides with the county boundary.
- Ardley ERF has been visited during the Green Hairstreak's flight period either once or twice each year from 2022-2024, yielding two Green Hairstreak records for the first time in 2024.
- Woolley Down had a single visit in 2021 during the Green Hairstreak's flight period, and two more in 2023, each of which yielded a single record.
- Greenfield has been visited during the Green Hairstreak's flight period between one and three times every year from 2019-2024 except 2021, and yielded two records from one visit in 2022. Most if not all of those visits are likely to have been by the author, whose 10k square SU7191 belongs to, which is why I am able to anticipate next year's report and announce that Greenfield will be getting upgraded from a random wonk to an isolated wonk in 2025, because I recorded Green Hairstreak again there this year.

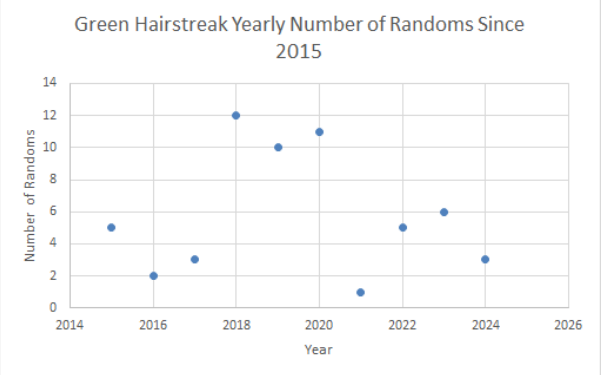

Figure 9: Green Hairstreak UTB random wonk count 2015-2024

One final feature of the data for random wonks will help to illustrate the enigmatic nature of the Green Hairstreak's distribution. Figure 9 shows the number of random wonks in the data each year from 2015-2024 i.e. the number of wonks with a record or records from that year and no records since to convert them into isolated wonks. There is a noisy but stable baseline at an average of about three random wonks per year (between one and six in any given year), *except* for the period 2018-2020, when, for some reason, the random wonk count jumped to values nearly four times as big as the underlying baseline. We can only speculate on what might have been responsible for such a large jump in one-off sightings, for three successive years. One explanation might be that those were unusually abundant years for the Green Hairstreak, which was thus driven to seek out pastures new. It is true that Figure 1 showed a similar jump in record count for 2018-2019, but 2020 was nothing unusual. On the other hand, the record count in 2022 was the highest ever, and yet the random wonk count for that year is firmly back at baseline.

Final food for thought

The Green Hairstreak is an enigmatic species, more so than typically given credit for, and I hope this report has helped to shed new light on some of the ways in which the data show this to be the case. Be that as it may, in terms of more pragmatic questions, probably the most important is whether 2024 was an uncommonly bad year for the Green Hairstreak, and the answer seems, fortunately, to be a resounding “No”, or at least a more considered “Probably not”.

One of the odd features of the data for Green Hairstreak is the way in which the annual record count appears to flip between two more or less constant values, one low and one high. The record count for 2024 was a low one, but so were seven out of the ten record counts for 2015-2024. The flight period visit count during the same period has changed little if at all, with at most a slow upward trend, and the 2024 value was similarly unremarkable. On both counts, there is nothing to suggest anything remarkable about 2024 for the Green Hairstreak.

The data for flight period is similarly unremarkable, with nothing to suggest either a trend over the last 10 years or a big difference between 2024 and previous years.

When we try and get a handle on population size, there is no compelling evidence of cause for concern. Measured by average abundance, there does appear to be a decreasing trend for UTB overall, but there are two question marks about the reliability of average abundance as a measure of population size, because abundance per record and records per visit are both influenced by the style of individual recorders. As measured by scarcity, the worst that can be said is that Green Hairstreak scarcity for UTB overall is higher for 2020-2024 than for 2015-2019, but the difference is not dramatic and was not actually calculated. Scarcity seems more reliable than average abundance as a measure of population size, but is still subject to the question mark about records per visit being influenced by the style of individual recorders. There is some evidence that the trend in population size measured either way is different for individual clusters, but it is not as dramatic an effect as it is for Small Blue. The way to resolve the equivocal nature of this aspect of the analysis seems to be a third measure of population size, a ratio that eliminates record count completely. It will be built into a future version of SCRIPT.

Two clusters – Westcott disused railway and Dry Sandford Pit & environs – have been identified as the primary candidates for potentially lost sites, and three more - Aston Upthorpe & environs, Devil’s Punchbowl & environs, and Warburg & environs - as sites that are struggling. On the other hand, four isolated wonks and four random wonks have all been identified as potential new sites.

One final thought needs to be tabled, although it relates to spring species generally, not just Green Hairstreak. The increasing use of iRecord as the recording platform of choice has led to a very onerous increase in workload for the small number of people who verify records (which is to say, to confirm as well as they are able, that the record is of the species, and at the location, claimed). This increase in workload in turn is leading to data sets being issued ever later to species champions. This year, preliminary data sets were issued in mid-March, for species champions to inspect and correct prior to an anticipated final version being issued in April. For the early-emerging spring species, this is much too late for a considered species champion report to be produced in time for anyone to do anything with any recommendations about sites to visit! Going forward, perhaps we should consider a phased approach to validation of the data issued to species champions, so that data for all species can be issued sufficiently far in advance of their flight period for production of a timely report, based on finalised data, to be feasible.

Appendix 1: Green Hairstreak clusters

Name	Wonks	Visits	Records	Scarcity	First In	Last In	Consistency
Bradenham & environs	41	2696	643	4.2	2015	2024	100%
Ivinghoe beacon & environs	16	1448	458	3.2	2015	2024	100%
Aston Rowant NNR & environs	13	865	295	2.9	2015	2024	100%
Hartslock & environs	9	1096	251	4.4	2015	2024	100%
Aston Upthorpe & Environs	11	561	158	3.6	2015	2024	100%
Aston Clinton Ragpits & environs	7	755	117	6.5	2015	2024	100%
Warburg & environs	6	299	50	6.0	2015	2024	90%
Homefield Wood & environs	9	407	37	11.0	2015	2024	100%
Devils Punchbowl & environs	6	173	37	4.7	2015	2024	100%
Calvert Jubilee NR	3	132	36	3.7	2015	2020	100%
Wildmoor Heath & environs	11	571	35	16.3	2015	2024	100%
Oakley Hill & environs	3	166	32	5.2	2015	2024	80%
Swyncombe Downs	2	104	23	4.5	2015	2022	88%
Seven Barrows & environs	8	310	21	14.8	2016	2024	67%
Wytham Woods	2	98	18	5.4	2018	2024	71%
Westcott disused railway	2	49	17	2.9	2015	2023	100%
Prestwood LNR	2	142	16	8.9	2016	2024	67%
Greenham Common	6	457	14	32.6	2015	2024	80%
Cock Marsh & environs	6	116	13	8.9	2017	2024	63%
Dry Sandford Pit & environs	3	192	13	14.8	2015	2022	88%
Swains Wood & environs	2	44	12	3.7	2015	2024	60%
Decoy Heath & environs	4	189	11	17.2	2015	2024	60%
Watts Bank	3	132	9	14.7	2016	2024	56%
Wasing	2	25	8	3.1	2018	2024	71%
Broadwell disused airfield	2	12	8	1.5	2021	2024	75%
Bulstrode & environs	4	88	7	12.6	2015	2021	71%
Gomm Valley	2	121	7	17.3	2015	2023	67%
Swinley brick pits	4	28	5	5.6	2015	2023	44%
Cholsey & environs	3	114	5	22.8	2015	2023	44%
Little Wittenham	2	73	4	18.3	2018	2024	57%
Preston Crowmarsh to E	2	366	3	122.0	2019	2024	33%
Pinkneys Green	2	197	2	98.5	2022	2024	67%

Appendix 2: Green Hairstreak isolated wonks

Name	Wonk	Visits	Records	Scarcity	First In	Last In	Consistency
Paices Wood	SU5863	148	38	3.9	2015	2024	100%
Bushy Bank	SU5891	55	25	2.2	2017	2024	75%
Ardley Quarry	SP5327	135	19	7.1	2015	2024	60%
Holtspur Bottom	SU9190	189	13	14.5	2017	2024	75%
Sydlings Copse	SP5509	132	4	33.0	2022	2024	67%
Warren Bank & Berins Hill	SU6585	11	3	3.7	2016	2022	43%
Westridge Green to NW	SU5580	36	3	12.0	2020	2023	75%
Blue Lagoon NR, Bletchley	SP8632	32	3	10.7	2015	2018	75%
Bernwood M40 Compensation Area	SP6210	123	3	41.0	2023	2024	100%
Piddington west side	SU8093	34	2	17.0	2021	2023	67%

Appendix 3: Green Hairstreak random wonks

Name	Wonk	Visits	Records	Scarcity	From
Pilot Hill	SU3959	1	2	0.5	2024
Marsh Benham to E	SU4367	1	1	1.0	2020
Woolley Down	SU4081	3	2	1.5	2023
Snelsmore	SU4670	4	2	2.0	2018
Ardley ERF	SP5325	5	2	2.5	2024
Aston Rowant Five Ways	SU7299	3	1	3.0	2020
Stonesfield Common	SP3916	10	3	3.3	2020
Harts Hill Road	SU5368	7	2	3.5	2019
Rebellion Studios, Milton	SU5091	4	1	4.0	2020
Cumnor S	SP4603	4	1	4.0	2020
Higher Denham	TQ0288	4	1	4.0	2018
Caversham Lakes	SU7475	4	1	4.0	2018
Astley Bridge Farm	SP5818	4	1	4.0	2017
Greenfield	SU7191	9	2	4.5	2022
Middle Assendon to E	SU7485	5	1	5.0	2019
Bramshill Plantation NW edge	SU7463	5	1	5.0	2018
Silwood Park, Ascot	SU9369	12	2	6.0	2018
Chieveley Services embankment	SU4772	6	1	6.0	2016
Shepherd Meadows	SU8560	7	1	7.0	2021
Jubilee River	SU9279	7	1	7.0	2019
Rollright Stones	SP2930	7	1	7.0	2017
MOD Arncott	SP6016	29	4	7.3	2022
Green Hill Allotment Gardens	SU8694	8	1	8.0	2020
Arborfield	SU7765	8	1	8.0	2019
Touchen End	SU8876	8	1	8.0	2018

Gore Hill (North on map)	SU4983	8	1	8.0	2017
Fyfield Wick	SU4197	10	1	10.0	2023
Crowmarsh Gifford	SU6287	10	1	10.0	2020
Larks Hill (Fairclough Farm on map)	SU8670	10	1	10.0	2018
Burghfield	SU6669	10	1	10.0	2016
Gorrick Plantation	SU8165	10	1	10.0	2015
The Hockett nr Bigfrith	SU8584	11	1	11.0	2019
Chimney Meadows	SP3501	11	1	11.0	2018
Sandford Brook	SU4697	12	1	12.0	2023
Harleyford Lane	SU8384	13	1	13.0	2020
Chawridge	SU8973	13	1	13.0	2015
Nineacres	SU7891	16	1	16.0	2018
Little Hidden Farm	SU3471	18	1	18.0	2018
Bracknell, nr Peacock Farm	SU8468	21	1	21.0	2015
Penn Jubilee Wood	SU9192	24	1	24.0	2023
Greatmoor	SP7022	26	1	26.0	2019
SP2823 anonymous	SP2823	33	1	33.0	2022
Cores End	SU9087	33	1	33.0	2019
Appleton	SP4401	38	1	38.0	2020
Woolley Firs	SU8579	40	1	40.0	2019
Emmer Green to NE	SU7277	44	1	44.0	2020
Wheatley Paddock	SP5805	52	1	52.0	2024
Wantage	SU3587	55	1	55.0	2015
Owlpit Copse S2	SU5873	57	1	57.0	2023
Headington Quarry	SP5406	123	2	61.5	2022
Boundary Brook NR allotments	SP5304	68	1	68.0	2022
Fobney Island S4	SU6971	71	1	71.0	2019
Grendon & Doddershall Woods	SP7020	100	1	100.0	2018
Rushdown Farm	SU5976	118	1	118.0	2018
Harwell (village)	SU4989	135	1	135.0	2015
Widmer End	SU8897	171	1	171.0	2020
Maiden Erlegh Park	SU7470	177	1	177.0	2019
East Coleshill	SU9595	179	1	179.0	2023

Appendix 4: Green Hairstreak cluster scarcity detail 2020-2024

Name	Scarcity	2024	2023	2022	2021	2020
Bradenham cluster	4.19	5.06	7.88	3.63	5.63	4.42
Ivinghoe beacon & environs	3.16	3.64	5.30	3.10	5.52	3.74
Aston Rowant NNR & environs	2.93	4.75	4.24	2.77	3.21	5.05
Hartslock & environs	4.37	5.56	3.74	2.76	6.05	5.42
Aston Upthorpe & Environs	3.55	10.83	3.56	1.84	5.80	4.81
Aston Clinton Ragpits & environs	6.45	3.86	5.33	5.87	8.91	4.13
Warburg & environs	5.98	10.00	29.00	2.74	7.20	9.00
Homefield Wood & environs	11.00	6.40	21.00	6.43	5.20	8.40
Devils Punchbowl & environs	4.68	10.50	4.86	4.00	8.00	6.67
Calvert Jubilee NR	3.67					10.00
Wildmoor Heath & environs	16.31	28.00	27.50	40.50	9.29	37.50
Oakley Hill & environs	5.19	5.00	5.50	4.00	1.75	14.00
Swyncombe Downs	4.52			5.00	4.00	5.67
Seven Barrows & environs	14.76	12.00	8.00	7.00		6.25
Wytham Woods	5.44	4.00		10.50		9.00
Westcott disused railway	2.88		2.00	7.00	5.00	2.50
Prestwood LNR	8.88	6.00		3.50		
Greenham Common	32.64	49.00	24.00	20.20		
Cock Marsh & environs	8.92	11.00		11.00		
Dry Sandford Pit & environs	14.77			12.50	15.00	19.00
Swains Wood & environs	3.67	3.33	2.25	14.00		2.00
Decoy Heath & environs	17.18	16.00	7.50			6.00
Watts Bank	14.67	6.00				1.67
Wasing	3.13	3.00		4.33		4.00
Broadwell disused airfield	1.50	2.00		0.40	1.00	
Bulstrode & environs	12.57				25.00	3.50
Gomm Valley	17.29		11.00		13.00	4.00
Swinley brick pits	5.60		4.00		4.00	3.50
Cholsey & environs	22.80		3.00			10.50
Little Wittenham	18.25	4.00			11.00	
Preston Crowmarsh to E	122.00	32.00				
Pinkneys Green	98.50	27.00		38.00		

Appendix 5: Green Hairstreak isolated wonk scarcity detail 2020-2024

Name	Scarcity	2024	2023	2022	2021	2020
Paices Wood	3.89	6.00	8.50	10.67	2.80	2.75
Bushy Bank	2.20	3.50	7.00	3.00		
Ardley Quarry	7.11	12.00		13.00		
Holtspur Bottom	14.54	8.33	14.00			7.50
Sydlings Copse	33.00	16.00		8.33		
Warren Bank & Berins Hill	3.67			3.00	1.00	

Westridge Green to NW	12.00		4.00	5.00		18.00
Blue Lagoon NR, Bletchley	10.67					
Bernwood M40 Compensation Area	41.00	16.00	5.50			
Piddington west side	17.00		9.00		3.00	

Appendix 6: Green Hairstreak random wonk visit detail 2020-2024

Name	Visits	2024	2023	2022	2021	2020
Pilot Hill	1	1	0	0	0	0
Marsh Benham to E	1	0	0	0	0	1
Woolley Down	3	0	2	0	1	0
Aston Rowant Five Ways	3	0	1	0	0	1
Snelsmore	4	0	0	0	0	1
Rebellion Studios, Milton	4	0	0	1	0	1
Cumnor S	4	1	0	0	0	2
Higher Denham	4	0	0	0	0	0
Caversham Lakes	4	1	0	0	0	0
Astley Bridge Farm	4	1	0	0	0	0
Ardley ERF	5	2	2	1	0	0
Middle Assendon to E	5	0	0	2	1	0
Bramshill Plantation NW edge	5	1	1	0	0	1
Chieveley Services embankment	6	1	1	0	0	1
Harts Hill Road	7	0	0	0	0	4
Shepherd Meadows	7	1	0	0	3	0
Jubilee River	7	1	0	2	1	1
Rollright Stones	7	0	1	1	2	0
Green Hill Allotment Gardens	8	1	1	1	0	4
Arborfield	8	0	0	0	2	2
Touchen End	8	0	0	0	1	5
Gore Hill (North on map)	8	0	0	0	0	1
Greenfield	9	1	2	3	0	1
Stonesfield Common	10	0	1	1	1	4
Fyfield Wick	10	2	1	1	6	0
Crowmarsh Gifford	10	1	0	0	1	7
Larks Hill (Fairclough Farm on map)	10	2	0	0	2	4
Burghfield	10	0	0	1	0	1
Gorrick Plantation	10	0	1	0	0	1
The Hockett nr Bigfrith	11	0	0	2	2	2
Chimney Meadows	11	1	0	4	1	0
Silwood Park, Ascot	12	3	0	1	1	2
Sandford Brook	12	0	1	6	1	3
Harleyford Lane	13	2	2	0	1	2
Chawridge	13	5	1	2	1	0

Nineacres	16	0	1	0	0	2
Little Hidden Farm	18	1	4	1	3	5
Bracknell, nr Peacock Farm	21	1	0	0	10	2
Penn Jubilee Wood	24	5	3	4	7	3
Greatmoor	26	3	1	0	0	7
MOD Arncott	29	2	3	8	1	1
SP2823 anonymous	33	6	3	4	6	4
Cores End	33	7	8	0	3	7
Appleton	38	15	1	1	2	8
Woolley Firs	40	2	0	3	7	8
Emmer Green to NE	44	6	1	3	0	12
Wheatley Paddock	52	8	4	10	11	8
Wantage	55	1	0	0	0	1
Owlpit Copse S2	57	12	13	14	14	1
Boundary Brook NR allotments	68	12	1	29	16	10
Fobney Island S4	71	11	9	11	9	5
Grendon & Doddershall Woods	100	9	10	15	11	3
Rushdown Farm	118	1	0	1	16	9
Headington Quarry	123	21	25	18	15	14
Harwell (village)	135	3	0	0	19	33
Widmer End	171	17	25	24	27	42
Maiden Erlegh Park	177	30	24	10	20	33
East Coleshill	179	30	27	23	34	31