

# A baseline breeding bird and larger mammal survey of the Ken Hill Estate

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February 2020



**Fig. 1.** The Black Redstart recorded on the barn in October.

## 0 - Summary

The Ken Hill Estate plan to rewild a large area of some 400 ha of their Estate during 2019 and 2020. The summer of 2019 was the last crop for much of this area and as such, the 2019 survey season was an exciting opportunity to collect baseline data before any changes were made to the site.

The author was commissioned to carry out a wide range of surveys in 2019, including this baseline bird survey.

The site was too big to carry out a Common Birds Census and too small to fit Breeding Bird Survey 1 km squares into. Additionally, there was a desire to compare open areas with wooded areas and to also make a comparison to a control area elsewhere on the Estate.

Therefore, the BBS methodology was used but using the individual transect sections as monitoring units. Forty of these were split between the three treatments of Control Arable (outside of the rewilding area to the East of the Estate), Rewilded Arable and Rewilded Woodland. The surveys were conducted over two mornings in April and two in May. Large mammals were also recorded using the same methodology.

A total of 2446 birds and 248 mammals were counted and recorded during the four survey mornings. Of the 71 species of bird recorded during the standardised surveys, at least 52 are thought to be breeding. Of these, 19 can be considered Birds of Conservation Concern. The site is particularly good for ground-nesting farm birds and has good numbers of Lapwing, Grey Partridge and Skylark. Perhaps the most surprising find was a Short-eared Owl hunting on the grazing marsh on the Estate but just off the rewilding area on the 21<sup>st</sup> May.

The most frequent bird was Wood Pigeon, being the only bird to be picked up in all 40 transect sections. It was also the most abundant species across all three treatments.

The average number of species per transect section was  $15.3 \pm 0.5$  and there was very little difference between the three treatments.

Overall, the total number of species and particularly Species of Conservation Concern varied considerably between the three treatments, with the Rewilded Arable sections having the greatest diversity but the Control Arable having the largest number of individual scarce species present. Chiefly rare farmland birds are more abundant in this area due to its open nature and more simplified structure. The Rewilded Woodland area had the least number of birds, species and Species of Conservation Status which is to be expected from mainly closed canopy woodland.

Additional casual recording included many of the more interesting species such as Osprey, Hobby, Great White Egret, Hen Harrier, Spoonbill, Waxwing, Brambling, Black Redstart and Tree Pipit. Additionally, breeding Woodlark, Marsh Harrier & Turtle Dove, that were not picked up during the standardised surveys, were also noted. At least 106 species of bird were recorded across the Estate in 2019.

Six species of larger mammal were recorded, with Brown Hare being by far the most abundant species. Brown Hare followed a similar trend to the Birds of Conservation Concern with the largest number on the Control Arable but with the Rewilded Arable having significant populations too.

Management and monitoring recommendations are also provided.

## 1 - Introduction

The Ken Hill Estate plan to rewild a large area of some 400 ha of their Estate from 2019 and 2020. The summer of 2019 was the last crop for much of this area and as such the 2019 survey season was an exciting opportunity to collect baseline data before any changes were made to the site.

The author was commissioned to carry out a wide range of surveys in 2019, including this bird survey.

This survey is designed to monitor breeding bird assemblages on the Estate but also how they vary over time after the site is rewilded. The use of a control is employed to help this as is the division of transects as either 'arable' or 'woodland'.

By using a modified version of a standardised and tried and tested methodology, it will also be possible to compare the data to national and regional trends at some point in the future.

## 2 - Methodologies

The survey follows in part the standardised methodology known as the Breeding Bird Survey (BBS); a national programme of survey managed by the British Trust for Ornithology (BTO). The survey is comprised of 1 km squares, these themselves made up of 10 200 m long transect sections. In this survey, although the rewilding area is large, it is not large enough to place entire 1 km squares so the individual monitoring unit, the 200 m long transects, were used instead.

A total of 40 transect sections were selected (to be equivalent to four BBS squares). The transect sections were split evenly between arable land on the area to be rewilded, woodland on the area to be rewilded and comparable arable land to the east of the Estate that is not to be rewilded, as a control. See figure 2 below for a map of the transect sections and their labelling. All transect sections were given an alphanumeric depending on if they were in Rewilded Arable (RA), Control Arable (CA) or Rewilded Woodland (RW).

The aim of the survey is not to catalogue all of the breeding birds across the Estate or the rewilding area, both are too large for such a thorough survey which would require large teams of people to survey using the Common Birds Census method. In addition to this, the analysis is also extremely lengthy and costly. Therefore, the idea is to ascertain an index for the site, a scientifically robust dataset that can be compared over time.

The full survey methodology and recording forms can be found here on the BTO website:

<https://www.bto.org/our-science/projects/bbs/research-conservation/methodology>

An example of the transect section is shown in figure 3 below. The methodology can be summarised as follows. All birds are placed along a 200 m transect into three sections; 0 to 25m, 25 to 100 m and 100+m. Standard BTO codes are used to note down birds in each section and these are then transferred to a spreadsheet where the maximum total number of birds per transect section over the two visits is used. The distance bands will not be used in this analysis but can be used in the future to look at trend data.

The 40 transect sections were completed on two consecutive days. These were:

Early visit: 13<sup>th</sup> and 14<sup>th</sup> April 2019.

Late visit: 20<sup>th</sup> and 21<sup>st</sup> May 2019.

The bulk of the work was completed on the first day (25 transects on the rewilding side) and 15 transects on the second day (the Control Arable sections and some Rewilded Arable close to the Estate Office).

Unfortunately, section RW6 was accidentally missed during the first visit, so the figures for this transect section are from the second visit alone.

In addition, as the author was carrying out many other surveys during the field season of 2019 for the Estate, any birds noted that were not picked up during the standardised surveys were also recorded and added to the site master list.

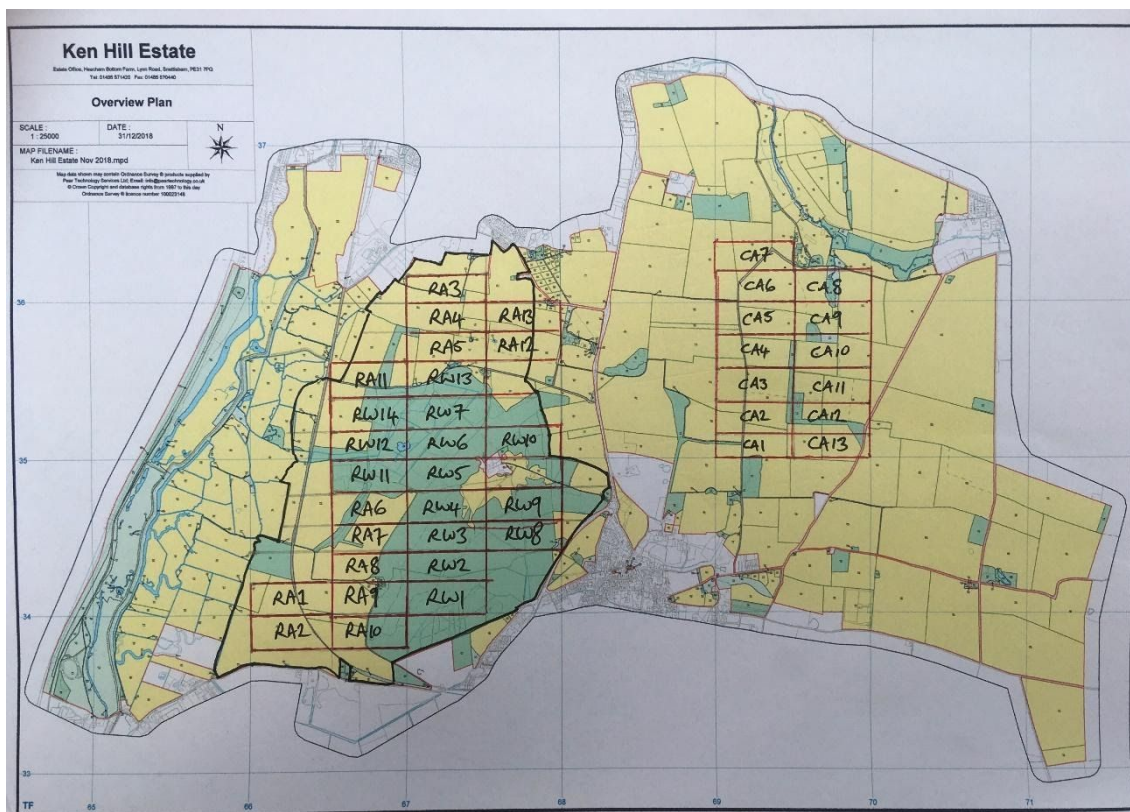


Fig. 2. Map of the forty transect sections.

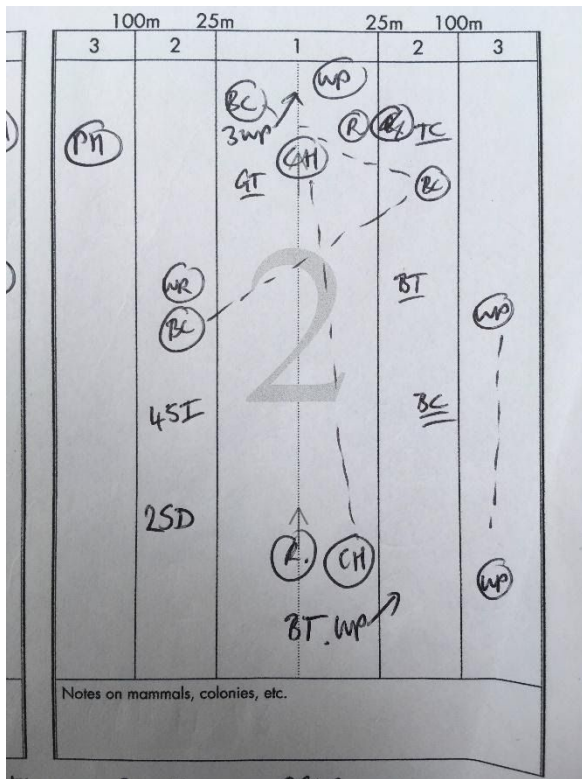


Fig. 3. An example of one of the transect survey forms.

### 3 - Results

#### 3.1 - Summary of findings

A total of 2446 birds and 248 mammals were counted and recorded during the four survey mornings. The actual figures provided from this point on however are calculated by taking the maximum figure from both surveys at each transect. This was comprised of 71 species of bird and six species of mammal.

#### 3.2 - Birds

Of the 71 species of bird recorded during the standardised surveys, at least 52 are thought to be breeding (species marked with a 'Y' in the relevant column in tables 1 to 3 below).

The BTO list of Birds of Conservation Concern (BoCC) is a valuable tool for assessing bird populations on a site based upon their rarity and threat status. In all tables the birds are listed as follows:

G for Green (not considered to be a Bird of Conservation Concern), A for Amber and R for Red. Therefore, only birds listed as A or R are considered as a Bird of Conservation Concern. Non-native species are listed as N/A (in this analysis, Greylag Goose is considered as a non-native along with Pheasant, Red-legged Partridge and Egyptian Goose).

Tab. 1. Summary of birds recorded ranked by abundance

Rank	Species	BoCC	Breeding	Total	Mean	No. of plots
1	Wood Pigeon	G	Y	592	14.8	40
2	Black-headed Gull	A	N	352	8.8	19
3	Pheasant	N/A	Y	78	2.0	33
4	Wren	G	Y	75	1.9	34
5	Blue Tit	G	Y	64	1.6	27
6	Chaffinch	G	Y	58	1.5	31
7	Fieldfare	R	N	40	1.0	2
8	Blackcap	G	Y	39	1.0	25
9	Coal Tit	G	Y	39	1.0	19
10	Robin	G	Y	39	1.0	24
11	Curlew	R	N	34	0.9	6
12	Swift	A	N	34	0.9	4
13	Great Tit	G	Y	33	0.8	20
14	Chiffchaff	G	Y	31	0.8	19
15	Yellowhammer	R	Y	29	0.7	15
16	Shelduck	G	Y	28	0.7	6
17	Grey Partridge	R	Y	25	0.6	12
18	Jackdaw	G	Y	23	0.6	12
19	Lapwing	R	Y	23	0.6	8
20	Red-legged Partridge	N/A	Y	21	0.5	12
21	Common Gull	A	N	20	0.5	4
22	Greylag Goose	N/A	Y	20	0.5	5
23	Skylark	R	Y	20	0.5	14
24	Stock Dove	A	Y	20	0.5	12
25	Long-tailed Tit	G	Y	19	0.5	11
26	Linnet	R	Y	18	0.5	6
27	Goldcrest	G	Y	17	0.4	11
28	Whitethroat	G	Y	16	0.4	11
29	Dunnock	A	Y	14	0.4	13
30	Mistle Thrush	R	Y	14	0.4	5
31	Buzzard	G	Y	13	0.3	9
32	Jay	G	Y	13	0.3	9
33	Nuthatch	G	Y	13	0.3	10
34	Blackbird	G	Y	12	0.3	12
35	Goldfinch	G	Y	11	0.3	9
36	House Martin	A	N	11	0.3	1
37	Treecreeper	G	Y	11	0.3	10
38	Great Spotted Woodpecker	G	Y	10	0.3	10
39	Green Woodpecker	G	Y	10	0.3	9
40	Meadow Pipit	A	N	9	0.2	8
41	Song Thrush	R	Y	8	0.2	6
42	Red Kite	G	Y	7	0.2	5
43	Mallard	A	Y	6	0.2	3
44	Oystercatcher	A	Y	6	0.2	4
45	Cuckoo	R	Y	4	0.1	3
46	Grey Heron	G	N	4	0.1	2
47	Lesser Black-backed Gull	A	N	4	0.1	4
48	Redpoll	R	?	4	0.1	1
49	Bullfinch	A	Y	3	0.1	3
50	Carrion Crow	G	Y	3	0.1	3
51	Marsh Tit	R	Y	3	0.1	3
52	Pied Wagtail	G	Y	3	0.1	3
53	Swallow	G	Y	3	0.1	2
54	Egyptian Goose	N/A	Y	2	0.1	1
55	Greenfinch	G	Y	2	0.1	2
56	Kestrel	A	Y	2	0.1	2
57	Mute Swan	A	Y	2	0.1	1
58	Tawny Owl	A	Y	2	0.1	2
59	Barn Owl	G	Y	1	0.0	1
60	Crossbill	G	?	1	0.0	1
61	Cormorant	G	N	1	0.0	1
62	Gadwall	A	Y	1	0.0	1
63	Great Black-backed Gull	A	N	1	0.0	1
64	Herring Gull	R	N	1	0.0	1
65	Lesser Whitethroat	G	Y	1	0.0	1
66	Mediterranean Gull	G	N	1	0.0	1
67	Pink-footed Goose	A	N	1	0.0	1
68	Redwing	R	N	1	0.0	1
69	Short-eared Owl	A	Y	1	0.0	1
70	Starling	R	?	1	0.0	1
71	Whimbrel	R	N	1	0.0	1

### 3.2.1 - Overview of species recorded in order of abundance

Wood Pigeon was both the most abundant and the most frequent bird of the survey with a maxima of 592 individuals recorded.

The second most abundant was Black-headed Gull, skewed by a large flock of 250 birds to the south of the site during the early visit. These were not breeding on the site and represented a large feeding flock.

Pheasants were the third most abundant bird recorded, with a maxima of 78 animals reported.

With the exception of an outbound flock of wintering Fieldfare, the rest of the top ten commonest birds were common passerines more typical of woodland.

Tab. 2. Summary of birds recorded ranked by frequency

Rank	Species	BoCC	Breeding	Total	Mean	No. of plots
1	Wood Pigeon	G	Y	592	14.8	40
2	Wren	G	Y	75	1.9	34
3	Pheasant	N/A	Y	78	2.0	33
4	Chaffinch	G	Y	58	1.5	31
5	Blue Tit	G	Y	64	1.6	27
6	Blackcap	G	Y	39	1.0	25
7	Robin	G	Y	39	1.0	24
8	Great Tit	G	Y	33	0.8	20
9	Black-headed Gull	A	N	352	8.8	19
10	Coal Tit	G	Y	39	1.0	19
11	Chiffchaff	G	Y	31	0.8	19
12	Yellowhammer	R	Y	29	0.7	15
13	Skylark	R	Y	20	0.5	14
14	Dunnock	A	Y	14	0.4	13
15	Grey Partridge	R	Y	25	0.6	12
16	Jackdaw	G	Y	23	0.6	12
17	Red-legged Partridge	N/A	Y	21	0.5	12
18	Stock Dove	A	Y	20	0.5	12
19	Blackbird	G	Y	12	0.3	12
20	Long-tailed Tit	G	Y	19	0.5	11
21	Goldcrest	G	Y	17	0.4	11
22	Whitethroat	G	Y	16	0.4	11
23	Nuthatch	G	Y	13	0.3	10
24	Treecreeper	G	Y	11	0.3	10
25	Great Spotted Woodpecker	G	Y	10	0.3	10
26	Buzzard	G	Y	13	0.3	9
27	Jay	G	Y	13	0.3	9
28	Goldfinch	G	Y	11	0.3	9
29	Green Woodpecker	G	Y	10	0.3	9
30	Lapwing	R	Y	23	0.6	8
31	Meadow Pipit	A	N	9	0.2	8
32	Curlew	R	N	34	0.9	6
33	Shelduck	G	Y	28	0.7	6
34	Linnet	R	Y	18	0.5	6
35	Song Thrush	R	Y	8	0.2	6
36	Greylag Goose	N/A	Y	20	0.5	5
37	Mistle Thrush	R	Y	14	0.4	5
38	Red Kite	G	Y	7	0.2	5
39	Swift	A	N	34	0.9	4
40	Common Gull	A	N	20	0.5	4
41	Oystercatcher	A	Y	6	0.2	4
42	Lesser Black-backed Gull	A	N	4	0.1	4
43	Mallard	A	Y	6	0.2	3
44	Cuckoo	R	Y	4	0.1	3
45	Bullfinch	A	Y	3	0.1	3
46	Carrion Crow	G	Y	3	0.1	3
47	Marsh Tit	R	Y	3	0.1	3
48	Pied Wagtail	G	Y	3	0.1	3
49	Fieldfare	R	N	40	1.0	2
50	Grey Heron	G	N	4	0.1	2
51	Swallow	G	Y	3	0.1	2
52	Greenfinch	G	Y	2	0.1	2
53	Kestrel	A	Y	2	0.1	2
54	Tawny Owl	A	Y	2	0.1	2
55	House Martin	A	N	11	0.3	1
56	Redpoll	R	?	4	0.1	1
57	Egyptian Goose	N/A	Y	2	0.1	1
58	Mute Swan	A	Y	2	0.1	1
59	Barn Owl	G	Y	1	0.0	1
60	Crossbill	G	?	1	0.0	1
61	Cormorant	G	N	1	0.0	1
62	Gadwall	A	Y	1	0.0	1
63	Great Black-backed Gull	A	N	1	0.0	1
64	Herring Gull	R	N	1	0.0	1
65	Lesser Whitethroat	G	Y	1	0.0	1
66	Mediterranean Gull	G	N	1	0.0	1
67	Pink-footed Goose	A	N	1	0.0	1
68	Redwing	R	N	1	0.0	1
69	Short-eared Owl	A	Y	1	0.0	1
70	Starling	R	?	1	0.0	1
71	Whimbrel	R	N	1	0.0	1

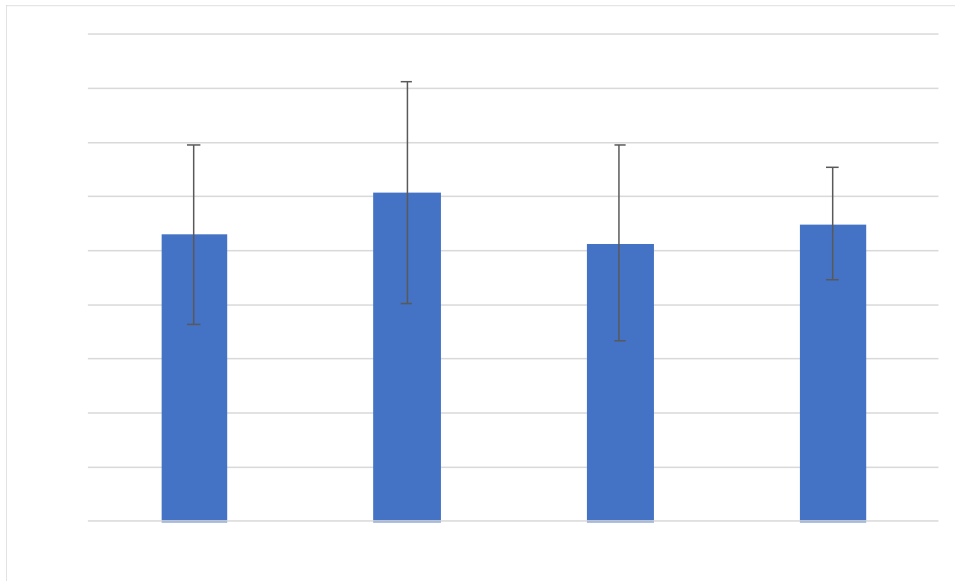
### 3.2.2 - overview of species recorded ranked by frequency

Wood Pigeon was the only species recorded in all 40 transect sections. After this Wren was in second place with 34 transects and Pheasant with 33. Typically, the rest of the top ten was populated with common woodland birds except Black-headed Gull which was an abundant 'fly over' during the survey.

The scarcer farmland birds occur much further down the list with the first Red Listed bird being Yellowhammer coming in at 12<sup>th</sup> place. Analysing the three treatments separately will help make more sense of this and is shown in table 3 below.

### 3.2.3 - Species-richness

Overall, the species-richness across the survey was  $15.3 \pm 0.5$  species per transect section. The three treatments all showed very little variation in this and therefore these subtle differences are unlikely to be significant.



**Fig. 4.** Mean species-richness across the three treatments, error bars represent  $\pm$  one standard error.

### 3.2.4 - Analysis by treatment

The overall number of species recorded was considerably higher in the Rewilded Arable treatment (61 species) than Control Arable (47 species) and the Rewilded Woodland (36 species). The total number of birds was also the lowest in this treatment. This is mainly due to the lack of large flocks of birds during the early visit.

The Rewilded Arable treatment contains some areas with woodland, more so than the Control Arable to the east of the Estate. The site is more open here and explains why in table 3 below, many of the scarcer farmland species are more abundant in this area.



**Tab. 3. Comparison of the avifauna of the three treatments**

Treatment	BoCC	Breeding	Control Arable			Rewilded Arable			Rewilded Woodland		
			Total	Mean	No. of plots	Total	Mean	No. of plots	Total	Mean	No. of plots
Barn Owl	G	Y	0	0.0	0	1	0.1	1	0	0.0	0
Blackbird	G	Y	3	0.2	3	4	0.3	4	5	0.4	5
Blackcap	G	Y	6	0.5	5	10	0.8	7	23	1.6	13
Black-headed Gull	A	N	30	2.3	8	320	24.6	10	2	0.1	1
Blue Tit	G	Y	9	0.7	6	18	1.4	8	37	2.6	13
Bullfinch	A	Y	1	0.1	1	1	0.1	1	1	0.1	1
Buzzard	G	Y	7	0.5	5	1	0.1	1	5	0.4	3
Carrion Crow	G	Y	2	0.2	2	0	0.0	0	1	0.1	1
Chaffinch	G	Y	22	1.7	12	16	1.2	7	20	1.4	12
Chiffchaff	G	Y	2	0.2	1	8	0.6	6	21	1.5	12
Coal Tit	G	Y	1	0.1	1	5	0.4	5	33	2.4	13
Common Gull	A	N	8	0.6	2	12	0.9	2	0	0.0	0
Cormorant	G	N	1	0.1	1	0	0.0	0	0	0.0	0
Crossbill	G	?	0	0.0	0	0	0.0	0	1	0.1	1
Cuckoo	R	Y	1	0.1	1	3	0.2	2	0	0.0	0
Curlew	R	N	31	2.4	4	3	0.2	2	0	0.0	0
Dunnock	A	Y	10	0.8	9	2	0.2	2	2	0.1	2
Egyptian Goose	N/A	Y	0	0.0	0	0	0.0	0	2	0.1	1
Fieldfare	R	N	39	3.0	1	1	0.1	1	0	0.0	0
Gadwall	A	Y	0	0.0	0	1	0.1	1	0	0.0	0
Goldcrest	G	Y	2	0.2	1	2	0.2	1	13	0.9	9
Goldfinch	G	Y	4	0.3	4	5	0.4	3	2	0.1	2
Great Black-backed Gull	A	N	0	0.0	0	1	0.1	1	0	0.0	0
Great Spotted Woodpecker	G	Y	0	0.0	0	3	0.2	3	7	0.5	7
Great Tit	G	Y	6	0.5	4	11	0.8	5	16	1.1	11
Green Woodpecker	G	Y	0	0.0	0	3	0.2	2	7	0.5	7
Greenfinch	G	Y	1	0.1	1	0	0.0	0	1	0.1	1
Grey Heron	G	N	0	0.0	0	3	0.2	1	1	0.1	1
Grey Partridge	R	Y	16	1.2	7	9	0.7	5	0	0.0	0
Greylag Goose	N/A	Y	2	0.2	1	18	1.4	4	0	0.0	0
Herring Gull	R	N	0	0.0	0	1	0.1	1	0	0.0	0
House Martin	A	N	0	0.0	0	11	0.8	1	0	0.0	0
Jackdaw	G	Y	5	0.4	3	12	0.9	5	6	0.4	4
Jay	G	Y	1	0.1	1	5	0.4	2	7	0.5	6
Kestrel	A	Y	0	0.0	0	2	0.2	2	0	0.0	0
Lapwing	R	Y	14	1.1	6	9	0.7	2	0	0.0	0
Lesser Black-backed Gull	A	N	3	0.2	3	1	0.1	1	0	0.0	0
Lesser Whitethroat	G	Y	1	0.1	1	0	0.0	0	0	0.0	0
Linnet	R	Y	15	1.2	4	3	0.2	2	0	0.0	0
Long-tailed Tit	G	Y	6	0.5	3	4	0.3	3	9	0.6	5
Mallard	A	Y	0	0.0	0	3	0.2	2	3	0.2	1
Marsh Tit	R	Y	0	0.0	0	1	0.1	1	2	0.1	2
Meadow Pipit	A	N	5	0.4	5	4	0.3	3	0	0.0	0
Mediterranean Gull	G	N	0	0.0	0	1	0.1	1	0	0.0	0
Mistle Thrush	R	Y	10	0.8	1	2	0.2	2	2	0.1	2
Mute Swan	A	Y	0	0.0	0	2	0.2	1	0	0.0	0
Nuthatch	G	Y	0	0.0	0	3	0.2	3	10	0.7	7
Oystercatcher	A	Y	2	0.2	2	4	0.3	2	0	0.0	0

Treatment			Control Arable			Rewilded Arable			Rewilded Woodland		
Species	BoCC	Breeding	Total	Mean	No. of plots	Total	Mean	No. of plots	Total	Mean	No. of plots
Pheasant	N/A	Y	37	2.8	13	29	2.2	12	12	0.9	8
Pied Wagtail	G	Y	1	0.1	1	2	0.2	2	0	0.0	0
Pink-footed Goose	A	N	0	0.0	0	1	0.1	1	0	0.0	0
Red Kite	G	Y	0	0.0	0	3	0.2	3	4	0.3	2
Red-legged Partridge	N/A	Y	17	1.3	8	4	0.3	4	0	0.0	0
Redpoll	R	?	0	0.0	0	4	0.3	1	0	0.0	0
Redwing	R	N	1	0.1	1	0	0.0	0	0	0.0	0
Robin	G	Y	7	0.5	5	8	0.6	6	24	1.7	13
Shelduck	G	Y	1	0.1	1	27	2.1	5	0	0.0	0
Short-eared Owl	A	Y	0	0.0	0	1	0.1	1	0	0.0	0
Skylark	R	Y	15	1.2	9	5	0.4	5	0	0.0	0
Song Thrush	R	Y	6	0.5	5	2	0.2	1	0	0.0	0
Starling	R	?	1	0.1	1	0	0.0	0	0	0.0	0
Stock Dove	A	Y	5	0.4	4	8	0.6	2	7	0.5	6
Swallow	G	Y	0	0.0	0	3	0.2	2	0	0.0	0
Swift	A	N	0	0.0	0	29	2.2	2	5	0.4	2
Tawny Owl	A	Y	1	0.1	1	0	0.0	0	1	0.1	1
Treecreeper	G	Y	0	0.0	0	2	0.2	2	9	0.6	8
Whimbrel	R	N	0	0.0	0	1	0.1	1	0	0.0	0
Whitethroat	G	Y	7	0.5	5	9	0.7	6	0	0.0	0
Wood Pigeon	G	Y	261	20.1	13	256	19.7	13	75	5.4	14
Wren	G	Y	15	1.2	10	20	1.5	10	40	2.9	14
Yellowhammer	R	Y	22	1.7	11	7	0.5	4	0	0.0	0
<b>Total</b>			<b>663</b>			<b>950</b>			<b>416</b>		
<b>Species</b>			<b>47</b>			<b>62</b>			<b>36</b>		
<b>Breeding BoCC species</b>			<b>13</b>			<b>18</b>			<b>7</b>		
<b>Breeding BoCC total</b>			<b>118</b>			<b>65</b>			<b>18</b>		

### 3.2.5 - Birds of Conservation Concern

As can be seen from the last two rows in table 3 above, there is a striking difference between the number of species and the total number of birds that can be considered as breeding Birds of Conservation Concern in each treatment. The Rewilded Arable having the most species but almost half the number of individuals as the Control Arable. Grey Partridge, Yellowhammer, Lapwing and Linnet were all more abundant on the Control Arable than the Rewilded Arable. This does suggest that as a direct comparison, these areas are not directly comparable but should still act as a control to measure changes over time that are likely to happen to the avifauna of the rewilded area.

Across the whole survey, 19 Species of Conservation Concern are thought to be breeding on or very near to the rewilded part of the Estate. Perhaps the most surprising find was a Short-eared Owl hunting on the grazing marsh on the Estate but just off the rewilding area on the 21<sup>st</sup> May.

The Rewilded Woodland transects had the least breeding Birds of Conservation Concern both in terms of numbers and species. This really reflects a vitally important issue regarding succession. Closed woodland is generally populated by common birds with more

intensively managed open spaces, especially on lighter soils, carrying a wider range of rarer species associated with the early successional component. Of course, it is much more complex than this in reality and a mosaic of habitat types together produced the greatest diversity, as is already seen here in the Rewilded Arable section.

It is therefore suggested that there should be a limit on how much closed canopy woodland and scrub that is allowed to naturally regenerate through rewilding before some kind of action is taken, what is typically called in rewilding systems a ‘limit of acceptable change’.

### 3.3 - Mammals

Brown Hare dominated the mammalian fauna during the transects with the sum of the overall maxima across all plots being 156 animals. As with the scarcer farmland birds, Brown Hare were more numerous on the Control Arable transects, as can be seen in figures 4 to 6 below. A maxima of 22 being recorded in a single transect in this area.

Tab.4. Control Arable mammal maxima.

Control Arable	1	2	3	4	5	6	7	8	9	10	11	12	13	Mean	Total
Brown Hare	3	2	7	5	12	12	10	3	22	10	2	2	3	7.2	93
Chinese Water Deer	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
Fallow Deer	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
Grey Squirrel	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
Muntjac	0	0	0	0	0	0	0	1	0	0	0	0	0	0.1	1
Roe Deer	1	0	0	1	0	0	0	0	0	0	0	1	0	0.2	3
Total	4	2	7	6	12	12	10	4	22	10	2	3	3	7.5	97
Species-richness	2	1	1	2	1	1	1	2	1	1	1	2	1	1.3	

Tab. 5. Rewilded Arable mammal maxima.

Rewilded Arable	1	2	3	4	5	6	7	8	9	10	11	12	13	Mean	Total
Brown Hare	10	14	0	2	1	4	0	0	2	18	0	2	3	4.3	56
Chinese Water Deer	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
Fallow Deer	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
Grey Squirrel	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
Muntjac	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
Roe Deer	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
Total	10	14	0	2	1	4	0	0	2	18	0	2	3	4.3	56
Species-richness	1	1	0	1	1	1	0	0	1	1	0	1	1	0.7	

The only mammal recorded in the Rewilded Arable transects was Brown Hare. Just under half the number of hares were recorded in the Rewilded Arable transects as were in the Control Arable transects.

Tab. 6. Rewilded woodland mammal maxima.

Rewilded Woodland	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Mean	Total
Brown Hare	0	0	0	1	2	0	1	0	0	0	1	2	0	0	0.5	7
Chinese Water Deer	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.1	1
Fallow Deer	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0.1	2
Grey Squirrel	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1	1
Muntjac	0	0	0	0	0	0	1	1	0	1	1	0	0	1	0.4	5
Roe Deer	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1	1
Total	0	0	0	1	2	1	3	3	0	2	2	2	0	1	1.2	17
Species-richness	0	0	0	1	1	1	3	3	0	2	2	1	0	1	1.1	

It is remarkable that only a single Grey Squirrel was recorded during these surveys as many, many more were spotted during other surveys carried out by the author. They may be less active early in the morning when these surveys take place.

Even in the woodlands transects (although it was not always possible to place the transects entirely in woodland, so they include some arable at times), Brown Hare was the most numerous mammal recorded. Overall, all six species recorded were recorded here but the overall species-richness was still lower than that of the Control Arable.

### 3.4 - Species of bird recorded outside of the standardised survey

Additional casual recording included many of the more interesting species such as Osprey, Hobby, Great White Egret, Hen Harrier, Spoonbill, Waxwing, Brambling Tree Pipit and breeding Woodlark, Marsh Harrier and Turtle Dove that were not picked up during the standardised surveys. Cetti's Warbler, Reed Warbler and probably Water Rail were also thought to be breeding in the wetland strip to the west of the rewilded area.

The total number of species of bird recorded by the author on the Estate during the 2019 field season was 105. One other species was reported over the summer being a Wood Warbler that was recorded singing in the Plain during migration, making the current species list 106. At least 77 of these are from the rewilded area.

Some of these birds are late arrivals or are falling outside of the transect locations. It is suggested that specific surveys target some of these species, either individually or as a package. Territory mapping in these cases is likely to be more effective. Turtle Dove for example would be a good species to monitor.

## 4 - Conclusions and recommendations

Ken Hill Estate already has a remarkable avifauna. The number of scarce ground-nesting birds is likely to be in part down to successful predator control. The fact that not a single Magpie was recorded during the standardised surveys was remarkable and Carrion Crows were also limited in number. It is almost certainly worth continuing with this level of predator control into the rewilding project, especially as more perches will develop as time goes by which is a known negative factor in corvid predation of ground-nesting birds.

Additional care must be taken to prevent the open areas becoming over-dominated by scrub and worse, secondary closed canopy woodland. This would result in a simplification of the avifauna and a loss of many of the rare species already present on the site. Setting

'limits of acceptable change' at the start of the project should help prevent this from happening.

This report was designed to give a flavour of the analysis that can be carried out in the future. Despite being only four morning's work, the survey generates a wealth of useful data. However, it's not until a run of seven years or more are collated that really meaningful trend analysis can be carried out.

This survey takes four field days to carry out and two days to compile, analyse and report on. The survey returns a great deal of data for only six days work and it is suggested that this survey should be carried out annually. Someone local who is committed to as long as run as possible would be ideal.

## Acknowledgements

A huge thanks to everyone at the Estate, particularly Nick and Michelle Padwick for their hospitality and giving me lifts across the Estate early in the morning to do the bird surveys. Thanks also to the Buscall's for commissioning me to do the survey. Many thanks to Dr Ken Smith for his help putting the methodology together and for help with analyses of the data.

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