The value of the green belt south of Cambridge to populations of farmland birds (2021)

Report of a ten-year survey

John Meed, February 2022

Introduction

For the last ten years I have conducted ecological surveys – focusing in particular on farmland birds – in a square kilometre of green belt south of the Cambridge Biomedical Campus to assess the levels of the biodiversity of an area close to the city.

The area studied is largely arable land, with mature hedgerows, watercourses, ponds, scrub and woodland, including the Nine Wells local nature reserve (LNR – right). It includes a cycle path and footpath, and land management has created several permissive footpaths, flower-rich field margins and additional woodland (see Appendix 1). It is widely used by walkers, cyclists and families.

Why do farmland birds matter?

Farmland birds have suffered major declines in recent decades.

- Grey partridge declined by 93% between 1970 and 2018 and corn bunting (right) by 89% while yellow wagtail declined by 68%, yellowhammer by 60% and skylark and linnet by 56% (1).
- Farmland birds are indicators for the UK Government Sustainable Development Strategy (2) and 11 of the 19 indicator species are 'red list' birds of 'high conservation concern' (3).
- Grey partridge are now classified as 'vulnerable' to extinction in the UK while corn bunting and yellow wagtail are classified as 'near threatened' with extinction (3).

Birds are indicator species because of their place as consumers in the ecosystem, and declines in bird populations indicate wider problems. The *State of Nature 2019* report (4) states that 'bird species most closely associated with farmland have declined more severely than birds in any other habitat, with a fall of 54% in the Farmland Bird Indicator since 1970'.

Methodology

I monitor the area using a combination of methods. I adopt the British Trust for Ornithology (BTO) Breeding Bird Survey methodology (5), which involves a habitat survey and walking two parallel transects, each of 1 km, on 2–3 occasions early and later in the breeding season; this approach gives a good snapshot of the species present in an area. I did my transect walks on April 20, May 12 and June 6.

In summer I build a more accurate picture of the number of breeding pairs, drawing on my experience as a surveyor for the Royal Society for the Protection of Birds (RSPB) Volunteer and Farmer Alliance (6). In these visits I observe breeding signs such as singing males, territorial behaviour, courtship displays, nest building and juvenile birds. In summer I also survey butterflies and dragonflies on behalf of the UK Butterfly Monitoring Scheme.

I also visit the site regularly in the autumn and winter, monitoring passage migrants and winter visitors, and in particular grey partridge populations. In 2021 I made 51 visits.

Findings

Over the ten years I have recorded 93 bird species including 21 red list species and 29 amber list species. See Appendices 2 and 3.

In 2021 I recorded 81 species on the three transect walks and other visits:

- On the first transect walk: 29 species and 215 individuals
- On the second transect walk: 34 species and 224 individuals
- On the third transect walk: 33 species and 224 individuals

The 81 species recorded included 17 of the 19 farmland bird indicator species for the Sustainable Development Strategy, of which 14 bred (Appendix 4). In total I recorded 18 red list species and 25 amber list species. This table shows the indicator species recorded.

Breeding red list indicator species	Other indicator species
• 52 pairs of skylarks • 18 pairs of grey partridge • 16 pairs of linnets • 11 pairs of corn buntings • 11 pairs of yellowhammers (above) • 4 pairs of greenfinches • 3 pairs of yellow wagtails • 3 pairs of starlings • Lapwing displayed but bred nearby	All the other amber and green-listed indicator species were present, and most bred: • 18 pairs of whitethroats • 5 pairs of reed buntings • 3 pairs of stock dove • Goldfinch, wood pigeons and jackdaws all bred in good numbers • Kestrels and rooks nest nearby and visit regularly

In total 48 species bred, including red listed house martins and mistle thrushes, as well as several other amber-listed species including song thrush, dunnock, tawny owl and bullfinch. I recorded 20+ hares in spring, and a thriving population of water voles. I recorded 25 species of butterfly, plus 14 dragonflies and damselflies.

The area continues to attract migrating birds, including this year three red-listed species: in late spring 2021 a ring ouzel spent three days here, while tree pipit also visited in spring and whinchat on autumn passage.

I will discuss in more detail at my findings about the populations of two key red list species that do unusually well in the fields around Nine Wells:

- Grey partridge (right)
- Corn bunting

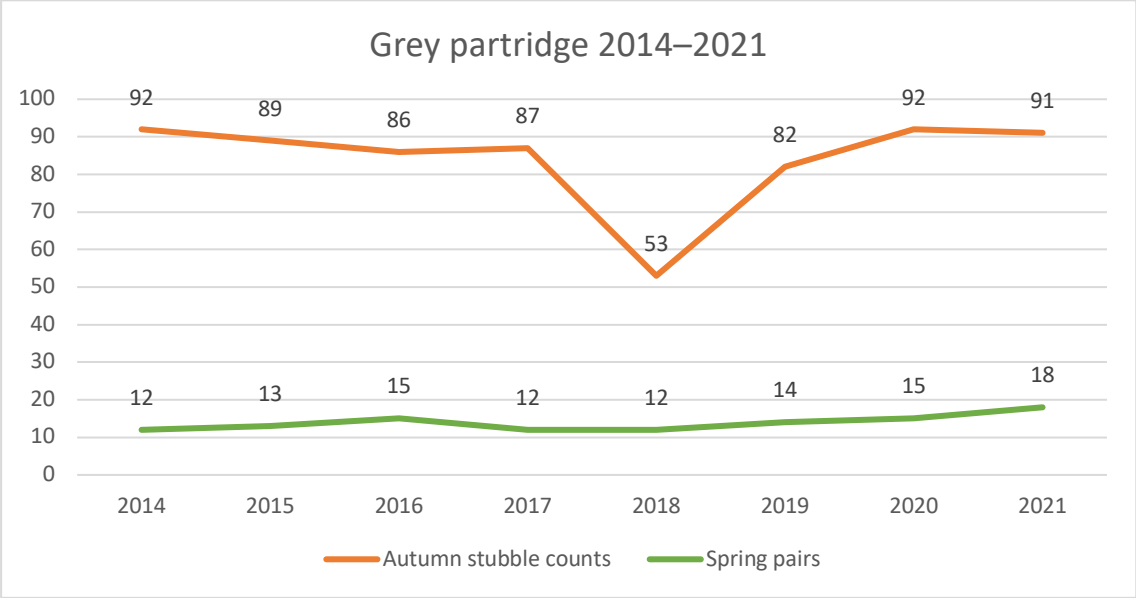
I will then go on to examine my findings for other species.

Grey partridge 2014–21

Grey partridge numbers have been remarkably high over the study.

- Between 2014 and 2021 autumn counts consistently revealed between 82 and 92 individuals, except in 2018.
- Pairs have varied between 12 and 18.

The following chart shows numbers for the last seven years.



These counts are high: other studies suggest that the arable farms typical of Cambridgeshire support between 0–5 pairs/km^2 in spring and 0–20 birds/km^2 in the autumn. Only with high levels of management aimed at the species do numbers approach those at Nine Wells. For example, the GWCT's Grey Partridge Demonstration Project near Royston saw the density of grey partridge pairs rise from under 3 pairs/km^2 before management to around 15 pairs/km^2, while autumn densities increased from 8 birds/km^2 to around 80 birds/km^2 (7).

Several factors help to explain the success of grey partridge here. Above all, the mosaic of habitats helps provide their three key requirements:

- Nesting and roosting habitat: the birds feed in open fields, but need suitable cover during the day in hedges and margins. Grassy, raised hedge bottoms, notably between Fields 4 and 5 and on the slope of Field 6 (see Figure 1 on page 6), provide good nesting sites.
- Food for chicks – potential chick food in the form of invertebrates live in the field margins and on arable weeds.
- Winter food – autumn stubbles provide foraging for the coveys, while in 2020-21 a cover crop in one part of Field 6 helped contribute to high survival rates, with 39 birds present in around three hectares (as well as meadow pipits, larks and finches).

By contrast, the land on the other side of Granham's Road comprises larger fields and fewer hedges and margins, and while partridge occasionally feed there they are unlikely to breed.

Autumn and winter coveys

Grey partridges have large broods and in the autumn families form groups known as 'coveys'. Numbers are at their highest in November and December, once youngsters have matured but before spring pairing starts. Most coveys range between 5 and 15 birds.

Generally speaking, the number of autumn coveys has reflected the number of spring pairs, suggesting that most pairs reared young successfully. Autumn 2018 was a significant exception, when 12 pairs produced just 8, generally smaller, coveys. This may reflect a national problem that year, possibly caused by a shortage of chick food and water. In 2020 15 pairs produced at least 12 coveys and in 2021 18 pairs produced at least 14 coveys.

- Coveys show a distinct preference for stubbles over freshly ploughed land and in 2019 all coveys remained in Fields 3, 4, 5 and 6 which retained stubble throughout the autumn; in autumn 2016 four coveys were regularly present in Field 2 but moved to Field 1 after ploughing. Later they seem more comfortable where winter wheat is starting to grow.

- Coveys often feed in the early morning and before dusk, probably to avoid predation. They roost in areas of longer grass, hedge bottoms or patchy scrub. They generally avoid woodland and I have rarely recorded them near to the wood at the top of White Hill. When feeding one or two birds keep watch for predators while the rest of the covey eats.

- These two factors – cropping and access to cover – have a major influence over where coveys spend their autumn. In late 2021 there were four coveys in Fields 7 and 8 which were lightly cultivated so that some food was always available. In 2019 the Field 4 stubble was direct drilled without ploughing and held five coveys of 34 birds which also used Field 5, roosting along the hedge bottom between the two fields. Field 6 had five coveys of 40 birds on stubble in 2019.

- Generally speaking, coveys move relatively little between fields. However, this does vary: while a group of 15 in Field 4 in 2020/21 stayed in a small area, groups of 5 and 11 ranged more widely across the field and spent time in Field 5. A group of 10 at the top of Field 6 ventured further away from their cover than other groups.

- Covey feeding times also vary. In 2020/21, the group of 7 in Field 2 emerged in the hour or so before dark, while the group of 11 in Field 4 often emerged earlier and were more often out in the morning.

- There can be interaction between coveys – normally calling, but sometimes two coveys move closer together and may even intermingle. In late October 2021 two coveys of 6 birds met in Field 7 – several individuals made contact and two chased each other.

The autumn coveys appear to suffer relatively little loss from predators, though possibly slightly more in 2021 than in other years.

Spring pairs

Pairs begin to form in the new year, and may be starting slightly earlier now than when I began my survey. Pairing can vary from field to field: in 2017 the partridge in Field 6 were paired on January 18th, whereas those in Field 4 paired a week later.

Initial pairing is often concentrated in specific fields – in early 2021 this was true of a small area of Field 6. In 2016 (prior to development) there were 12 pairs (out of 15) in Fields 1 and 2. Following pairing, the pairs disperse more widely across the area. Figure 1 shows the distribution of pairs in Spring 2021.

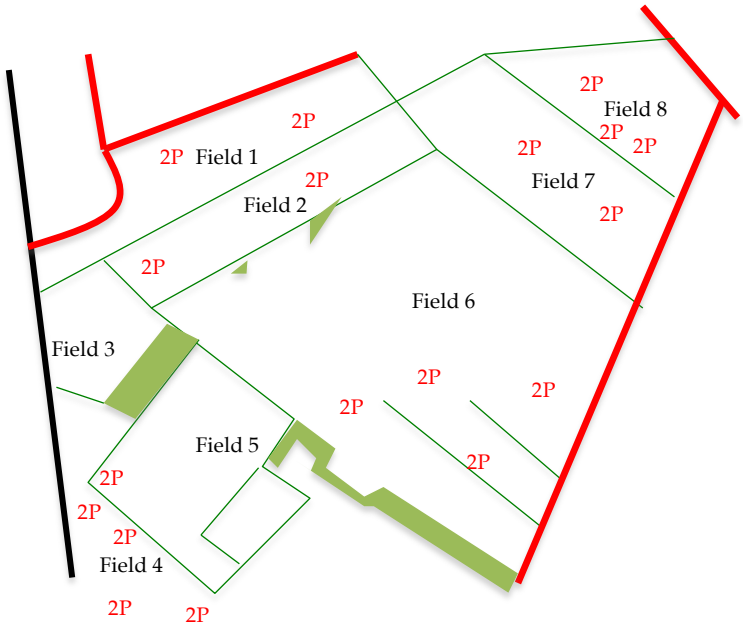


Fig 1: Pairs of grey partridge in Spring 2021

- Partridge behaviour changes during pairing. In the process of seeking a mate birds call repeatedly – one bird calling could spark off others – and display their breast patches much more obviously. Birds will run and on occasion chase each other, which can end in flying to another spot.

- Paired birds resume their normal placid behaviour, even if the above activity carries on in the same field, though they sometimes call. Interaction between pairs, even when close together, is also usually calm, with occasional breast patch display. As the spring develops and crop cover increases the pairs become increasingly discrete.

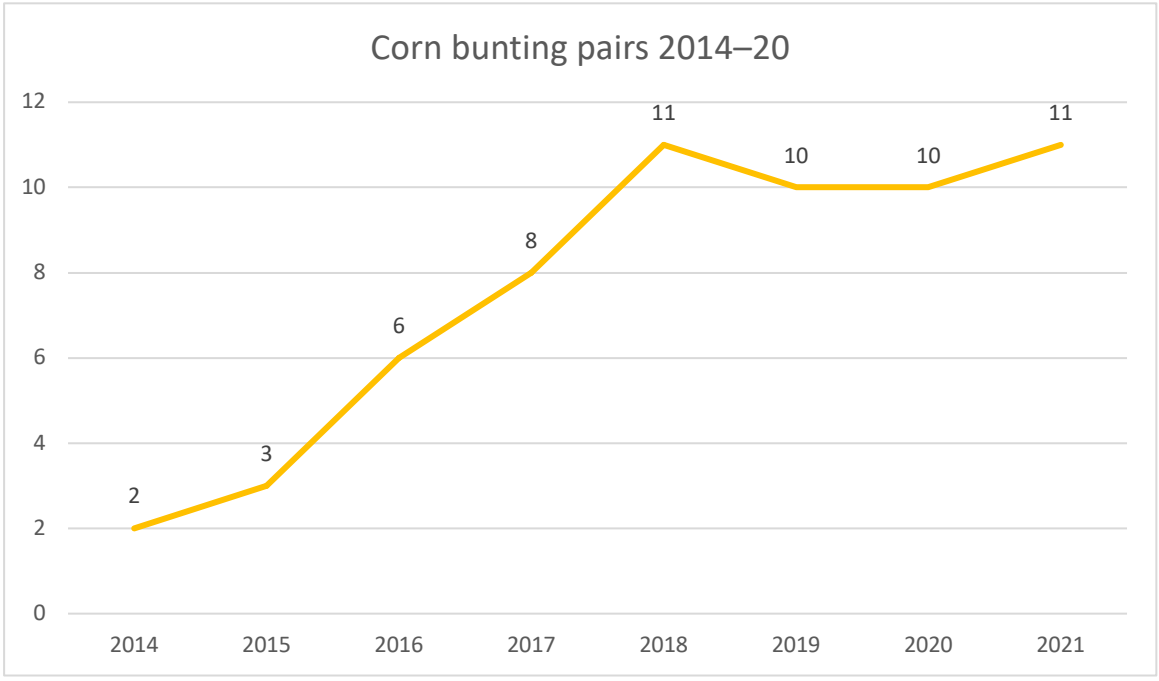
- However some unpaired male birds remain (most noticeably in 2018). Unpaired males call and display their breast patch more than those in pairs.

In 2021 most pairs in Fields 4–8 reared a family. However of the four pairs in Fields 1 and 2, I only recorded one group of four. This may reflect nest failure or simply movement to other fields – greater disturbance from development is one possible factor.

I have written up my observations of grey partridge behaviour in far greater detail in my forthcoming book *A haven for farmland birds*.

Corn bunting 2014–21

2021 was another excellent year for **corn bunting** with 11 singing males.

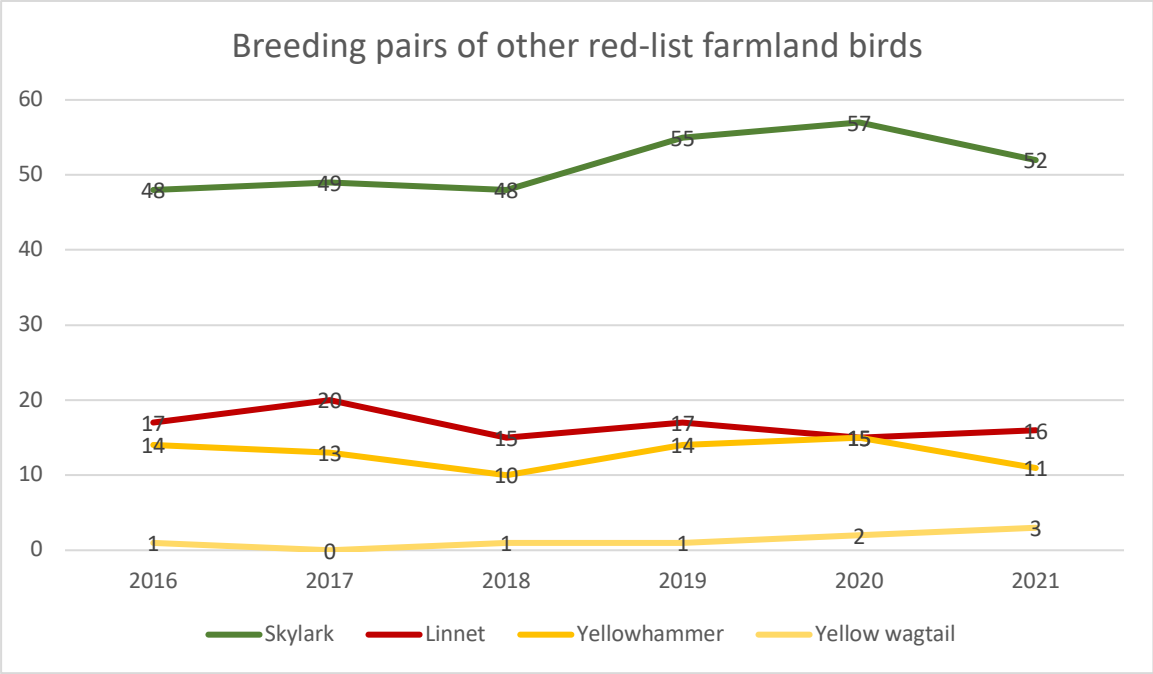


Corn bunting populations in the UK declined by 89% between 1970 and 2018, and their breeding range has contracted by 56% over the same period. There are now only 11,000 territories in the UK and the BTO's 2019 Breeding Birds Survey recorded them in just 148 of 4,005 squares surveyed. The species' recent extinction in Ireland risks being repeated in large parts of Britain if its breeding sites are not protected. Despite the fact that East Anglia is now one of their main remaining areas, a recent survey of populations found a very patchy distribution of singing males across Cambridgeshire (9).

So, the number of birds recorded in this study is important. This importance increases when added to the population across the railway line in Hobson's Park – the 2018 Bioblitz there recorded 8 singing males.

I have also recorded some interesting behaviour – which could only be observed because of the good numbers of populations. In May 2018 I twice recorded gatherings of over 10 corn buntings on the corner of the hedge between Fields 4 and 5 – too late to be a winter flock, and too early to be a family group. In Autumn 2020 I observed gatherings of 25+ birds on August 2nd and 21 (below left in the hedge between Fields 4 and 5) on September 21st. In October 2021 I recorded some 15 birds in Field 7, at least three of which were singing.

Other red-list farmland indicator species



- **Skylark** populations (right), with around 52 breeding pairs, had another good year. I base estimates of skylark numbers on singing males observed (greatest on May 30th). This population density is higher than the mean recorded for similar crops in the BTO's skylark survey (10). Winter counts regularly number over 80 birds.
- I estimated the **linnet** population at 16 pairs; linnets tend to nest more communally than other species (11) so populations are harder to estimate than species with distinct territories; from April onwards I regularly recorded 20-30 birds. Winter flocks were also present, with 80+ birds on September 16th.

- **Yellowhammer** populations, at around 11 breeding pairs, were lower than the 15 recorded last year, but still compare well with populations found by Bradbury et al (12). Densities were highest in the hedge along Granhams Road and the ditch along the cycle path. Birds were also present in winter, with 40+ birds on February 16th.
- Three pairs of **yellow wagtail** (below) also bred, in or near to Field 7. Both 2020 and 2021 have been their best breeding seasons for several years.

- Four pairs of **greenfinch** bred. This species has declined sharply across the country but numbers have risen here.
- At least two pairs of **starlings** bred; flocks of up to 400 were present in the winter.

In 2021 a **lapwing** displayed in spring, raising hopes that they may breed again. I recorded a juvenile turtle dove in 2019, but have never recorded tree sparrow, the final indicator species.

Other farmland bird indicator species

All the other farmland bird indicator species are present:

- Whitethroat with 18 breeding pairs, were slightly down on the 21 in 2020, but higher than the 14 in 2018. Densities were highest along the hedges around Nine Wells and in the hedges along Granham's Road. The most birds on one occasion was 11, on May 12th.
- At least three pairs of stock dove bred.
- Reed bunting (right) populations (5 pairs) were similar to 2020.
- Kestrel and rooks breed nearby and visit regularly.

Goldfinch, jackdaws and wood pigeon all bred.

Lesser whitethroat and buzzard also breed while pairs of stonechat spent the winters of 2017/18 and 2020/21 on the site. In 2021 a pair of reed warblers bred in the bushes along Hobson's Brook. Passage migrants included several wheatears, while winter visitors included little egret and kingfisher, as well as fieldfares and redwings.

Reed warbler

Wheatear

Little egret

Habitat survey and plant species

The habitat survey showed 10 (2.5km) mature hedgerows with thick growth and good variety; 2 newly planted hedges; extensive grassy and flower-rich margins; 2 important watercourses (1km) and 3 ponds; and 4+ha of scrub and woodland including the Nine Wells nature reserve.

I have recorded over 40 trees and shrubs, most of which are native species. The hedge between Fields 2 and 6 is home to several willows and the rare and imposing black poplar (right).

A 2017 survey (14) recorded 45 species of flowering plant in the Nine Wells nature reserve alone, as well as 12 trees/shrubs, 9 mosses and 7 grasses.

Across the site I have recorded well over 100 species of flowering plants, including iconic arable flowers such as knapweed, fumitory, mallow, poppy, speedwell and viper's bugloss.

Mammals

Mammals include good numbers of **water vole** in Hobson's Brook – important as water vole numbers in Britain have fallen disastrously; and regular spring counts of 20+ **brown hare** – Hutchings and Harris (13) recorded a mean density of 7.12 hares/km^2 on arable land.

Other mammals include badger, fox, stoat, weasel, muntjac and roe deer, rabbit, mole, field and bank vole, and wood mouse, as well as common pipistrelle, soprano pipistrelle and noctule bats (14).

Invertebrates

In 2019 I began formally surveying butterflies and have so far recorded 25 species across the site (see Appendix 2). These include colonies of brown argus, small copper, common blue and small heath butterflies. The small heath is now a priority species because of the decline in its population.

In late August 2021 I recorded a clouded yellow on three occasions – the first time I have seen this stunning species. This butterfly does not have a permanently resident population this far north, so individuals are either migrants or their immediate offspring. The area has a good amount of clover, their favourite egg-laying plant, so it is possible that this was a male patrolling a good breeding spot in the hope that female might pass through.

Small copper

Common blue

Brown argus

In 2020 I extended my survey to include dragonflies and damselflies and have recorded 14 species breeding in the area, including the willow emerald (around Nine Wells LNR) and small red-eyed damselfly (in one of the new ponds) which are very recent UK species.

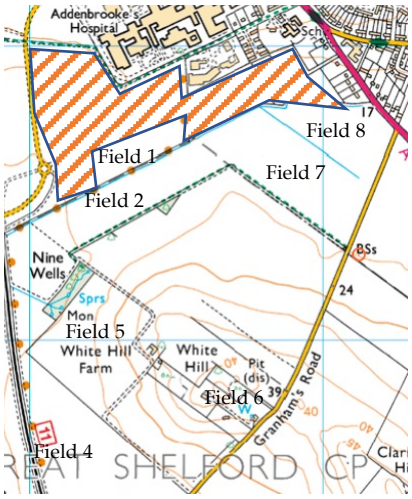
Banded demoiselle

Migrant hawker

Willow emerald

The site supports good populations of other invertebrates including grasshoppers, crickets, beetles, ants, bees and wasps. A moth trap in June 2017 recorded 30 species of moth (14).

The impact of development



Since I began my study of the area there have been some important changes – principally the expansion of the Biomedical Campus, but also the Nine Wells housing development and infrastructure projects. The map on the right shows in orange shading the area of land that has been developed over the ten years. I have compensated for this by extending my study area by an equivalent amount to maintain an area of around 1km^2, principally into more southern areas of Fields 4, 5 and 6.

The shaded area no longer provides suitable habitat for farmland birds, and I no longer record any of the red list farmland species there. The impact on the wider area has been more complex.

So far, the loss of habitat does not appear to have led to a significant reduction in numbers of farmland birds across the whole site, though this is in part because I have maintained a 1km^2 area. Corn bunting, yellowhammer and linnet continue to use Fields 1 and 2 adjacent to the new development, and indeed have used the young trees that line the ditch beside the Abcam building as song posts. Grassland on the southern slope of the road bridge now supports small colonies of brown argus and small copper (as well as common blue and small heath) butterflies. New pond areas are also used as breeding sites by dragonflies.

By contrast, while grey partridge had a good year across the site as a whole, I have concerns that what remains of Field 1 and Field 2 may be becoming less hospitable for them. This has led to a concentration of grey partridge in Fields 4–8. We will need to wait to assess what the longer-term impact may be, especially as what remains of Field 1, and the whole of Field 2 are scheduled for development.

Grey partridge in Field 4

Other parts of the site also face potential threats. Fields 7 and 8 have been recommended for development by the local councils in their next local plan. Such development would remove the last breeding sites of yellow wagtail, halve the population of corn bunting and reduce breeding sites for grey partridge and the other red list birds. And the south east guided busway is currently proposed to run through Field 4, risking further disruption and habitat fragmentation.

The problem is where wildlife can go if good existing habitat is lost. The square kilometre of land on the other side of Granham's Road comprises just three fields, two hedges, one of which is in a poor state with large gaps, and far less margin habitat. The land does support skylark, but is less welcoming to the other red list species.

Conclusions

The data I have gathered over the last ten years provide a picture of an area of green belt arable land on the outskirts of the city of Cambridge that supports important breeding populations of threatened farmland birds, as well as mammals, plants, butterflies and other invertebrates.

1 Over the period of my study the site has supported exceptional populations of grey partridge and corn bunting (species that have declined by around 90% since 1970) and the site may well be among the best in Cambridgeshire for both species.

2 Other red list farmland species also thrive in the area, notably yellow wagtail, linnet, skylark and yellowhammer. The area also supports good populations of water vole and brown hare, as well as plants and invertebrates.

3 Habitat variety and land management contribute to the richness of the area. The combination of arable crops with grassy hedgerow bottoms and margins benefit grey partridge, skylark, corn bunting and yellow wagtail; the ditches benefit yellowhammer and reed bunting, as well as water vole, while hedges are well used by linnet, yellowhammer, whitethroat and dunnock, and by grey partridge for cover. Hedges which are around 2 metres high with slightly raised bottoms (such as that between Fields 4 and 5) provide excellent nesting habitat for grey partridge in particular and must be conserved.

4 Development and infrastructure work has resulted in lost farmland habitat and some habitat fragmentation. This has not yet reduced significantly populations of red list birds, but may well have led to a concentration of birds in the relatively undisturbed areas, and I will continue to assess the longer-term impact.

5 Proposed further construction and infrastructure development would place real pressure on populations. If this were to go ahead, considerable, and urgent, new habitat creation would be needed in adjoining fields to provide a refuge for displaced wildlife.

6 The area provides an important green space and area for walking, cycling and relaxation for local residents who are clearly able to co-exist with nature; the land also forms part of the area covered by the local councils' *Strategic Green Infrastructure Initiative 3*.

John Meed, February 2022

John Meed is a researcher, writer and musician who lives in south Cambridge. He conducts regular surveys on behalf of the BTO and RSPB. His forthcoming book *A haven for farmland birds* provides much more detail about the ecology, behaviour and social lives of the birds he has studied in this area.

See: http://johnmeed.net/john-meed/nine-wells/

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Appendix 1: The area covered

Looking towards White Hill

The Nine Wells LNR from White Hill

Mature hedge and permissive path

Cycle path and flower-rich margin

Grey partridge on Field 4, autumn 2020

Yellowhammer on Field 4/5 hedge, 2020

Appendix 2: Species recorded (2012–21)

This list shows the 93 bird species recorded over the last 10 years: 21 red list birds, 29 amber list birds, and 42 green list species. The numbers show the number of breeding pairs/territories (except n/c where not counted); (S) denotes summer visitor, (W) winter visitor, (P) passage migrant and *italic* = not recorded in 2021.

Species		Species		Species		Species	
Black-headed gull		Golden plover	W	Long-tailed tit	5	*Siskin*	W
Blackbird	12	Goldfinch	5	Magpie	c7	Skylark	52
Blackcap	7 (S)	Great black-back gull	W	Mallard	3	Snipe	W
Blue tit	c10	Gt spot woodpecker	1	*Marsh harrier*		Song thrush	5
Bullfinch	1?	Great tit	c10	Meadow pipit	W	Sparrowhawk	
Buzzard	1	Green woodpecker	2	Merlin	W	Starling	2
Canada goose	W	Greenfinch	4	Mistle thrush	2	Stock dove	3
Carrion crow	n/c	Grey heron		Moorhen	3	Stonechat	W
Chaffinch	1?	Grey partridge	18	Mute swan		Swallow	2
Chiffchaff	5 (S)	Greylag goose		Peregrine		Swift	S
Coal tit	1	Herring gull	W	Pheasant	3	Tawny owl	1?
Collared dove	1	Hobby	P	Pied wagtail	2	Tree pipit	P
Common gull	W	House martin	4 (S)	*Raven*		*Turtle dove*	P
Common tern	S	*House sparrow*		Red kite		Wheatear	P
Cormorant		*Jack snipe*		Red-legged partridge	5	Whinchat	P
Corn bunting	11	Jackdaw	n/c	*Redstart*	P	Whitethroat	18
Crane		Jay	2	Redwing	W	Willow warbler	P
Cuckoo		Kestrel		Reed bunting	5	Wood pigeon	n/c
Dunnock	20	Kingfisher	W	Reed warbler	2	Wren	15
Egyptian goose		Lapwing		Ring ouzel	P	Yellow wagtail	3
Feral pigeon	R	Lesser black-back gull	W	Robin	27	Yellowhammer	11
Fieldfare	W	Lesser whitethroat	3	Rook			
Garden warbler	3 (S)	Linnet	16	*Sand martin*	P		
Goldcrest	1	Little egret	W	Sedge warbler	P		

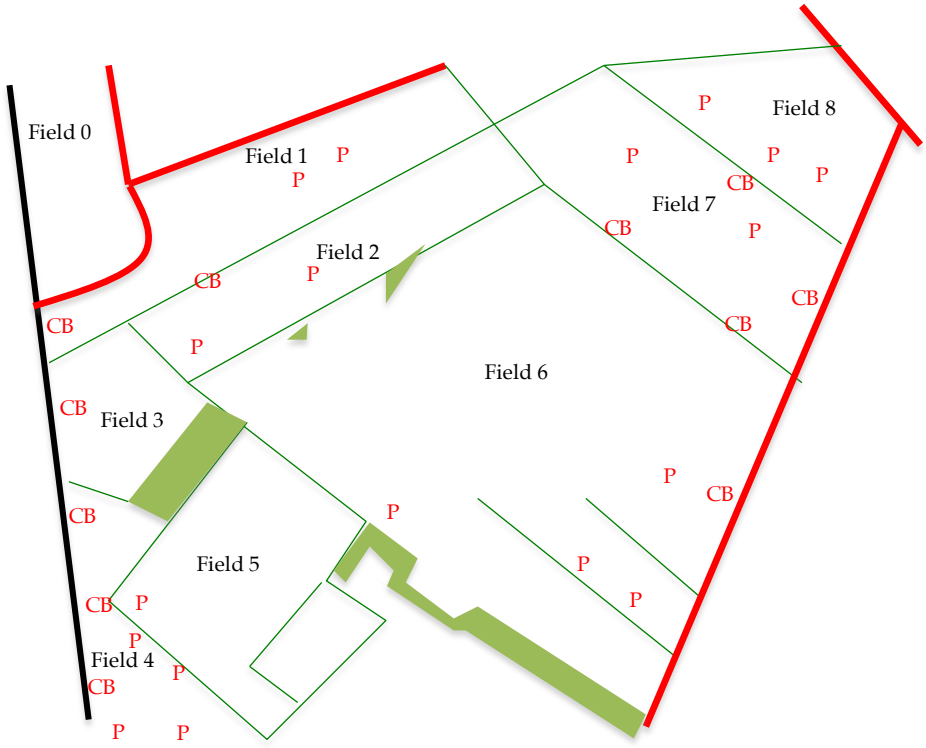
This table shows the 25 butterfly species and 14 dragonfly/damselfly species recorded:

Butterflies			
Brimstone	Green-veined white	Orange tip	Small skipper
Brown argus	Grizzled skipper	Painted lady	Small tortoiseshell
Clouded yellow	Holly blue	Peacock	Small white
Comma	Large skipper	Red admiral	Speckled wood
Common blue	Large white	Ringlet	
Essex skipper	Marbled white	Small copper	
Gatekeeper	Meadow brown	Small heath	
Dragonflies			
Azure damselfy	Brown hawker	Large red damselfly	Southern hawker
Banded demoiselle	Common darter	Migrant hawker	Willow emerald
Black-tailed skimmer	Emperor	Ruddy darter	
Broad-bodied chaser	Four-spotted chaser	Small red-eyed damselfly	

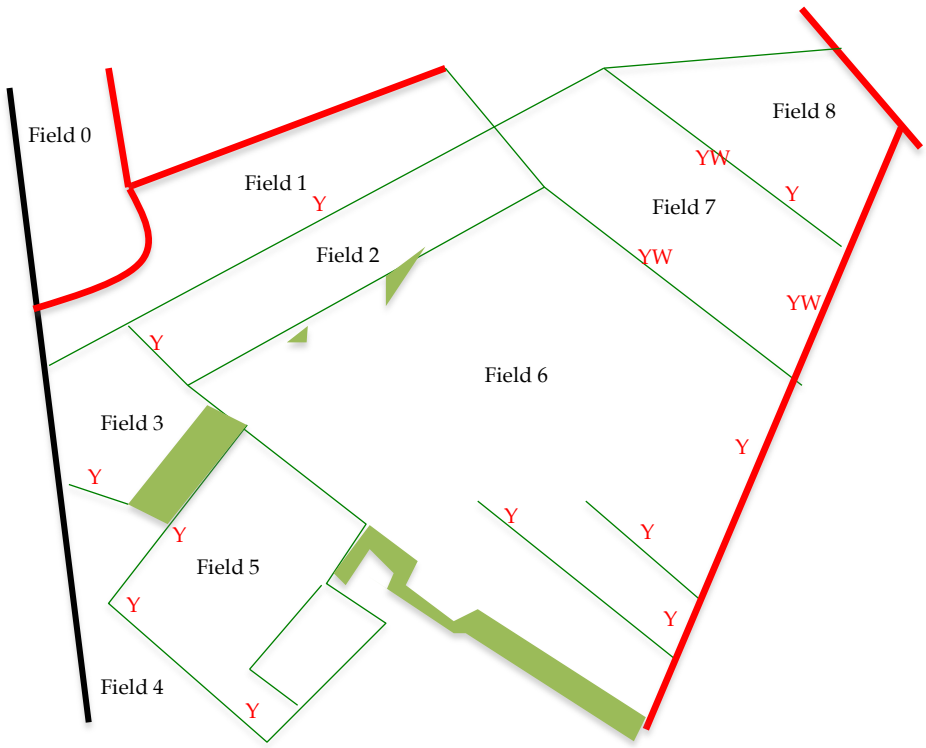
Appendix 3: Maps showing breeding pairs

These maps show estimated breeding pairs in 2020 of the red- or amber-listed farmland bird indicator species, plus green-listed whitethroat, breeding in the one kilometre square:

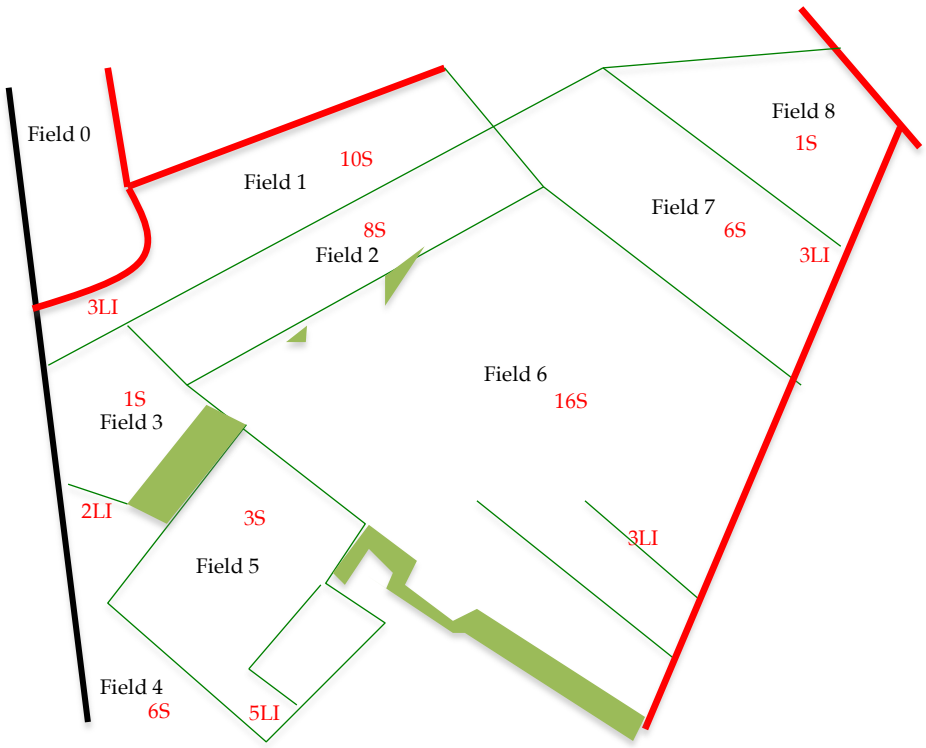
Grey partridge (P) and corn bunting (CB)



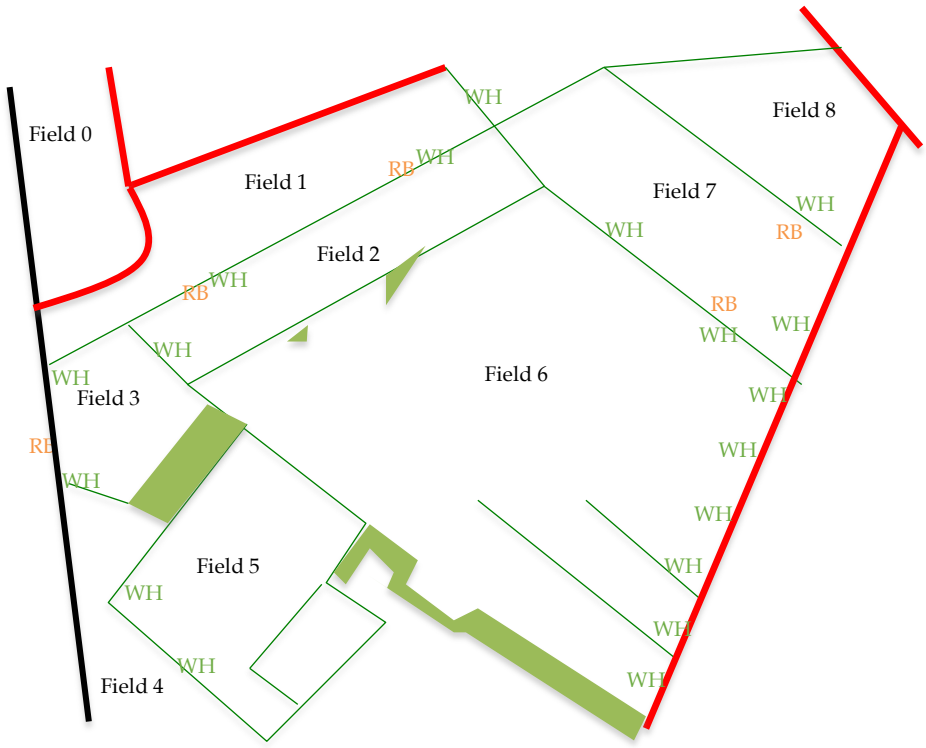
Yellowhammer (Y) and yellow wagtail (YW)



Linnet (LI) and skylark (S)



Whitethroat (WH) and reed bunting (RB)



Appendix 4: Farmland bird indicator species

This table shows the 19 species on the UK Farmland Bird Indicator; the second column shows which I recorded on the site in 2021; the second column shows which bred on the site; and the final column shows the percentage change in their national populations for the period 1970-2018:

Species	Present?	Breeding?	Per cent change**
Turtle dove	(2019*)	–	-98%
Grey partridge	☒	☒	-93%
Tree sparrow	–	–	-90%
Corn bunting	☒	☒	-89%
Starling	☒	☒	-82%
Yellow wagtail	☒	☒	-68%
Lapwing	☒	–	-64%
Greenfinch	☒	☒	-64%
Yellowhammer	☒	☒	-60%
Skylark	☒	☒	-56%
Linnet	☒	☒	-56%
Kestrel	☒	–	-48%
Reed bunting	☒	☒	-28%
Whitethroat	☒	☒	-13%
Rook	☒	–	+5%
Woodpigeon	☒	☒	+121%
Stock dove	☒	☒	+127%
Jackdaw	☒	☒	+157%
Goldfinch	☒	☒	+197%

* A juvenile turtle dove passed through on migration in 2019.

** Source: Burns F, Eaton MA, Balmer DE, Banks A, Caldow R, Donelan JL, Douse A, Duigan C, Foster S, Frost T, Grice PV, Hall C, Hanmer HJ, Harris SJ, Johnstone I, Lindley P, McCulloch N, Noble DG, Risely K, Robinson RA, Wotton S (2020) *The state of the UK's birds 2020*. The RSPB, BTO, WWT, DAERA, JNCC, NatureScot, NE and NRW, Sandy, Bedfordshire